BOOK OF ABSTRACTS

YOUNG
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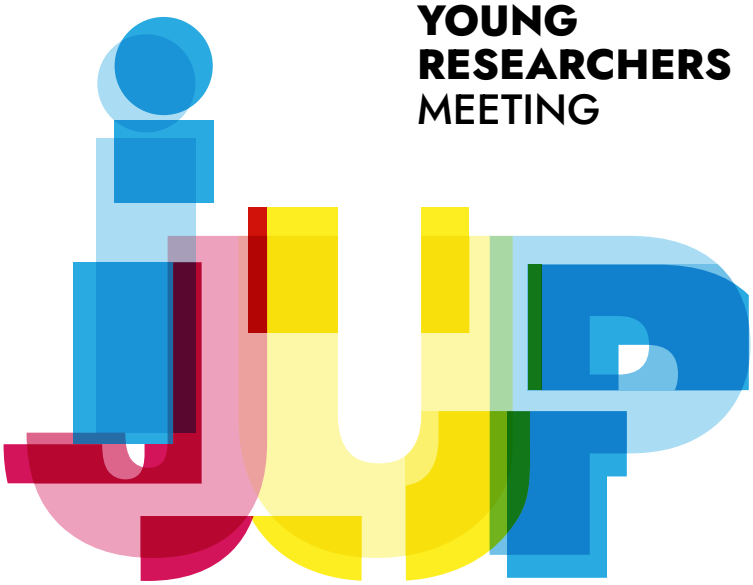
MEETING



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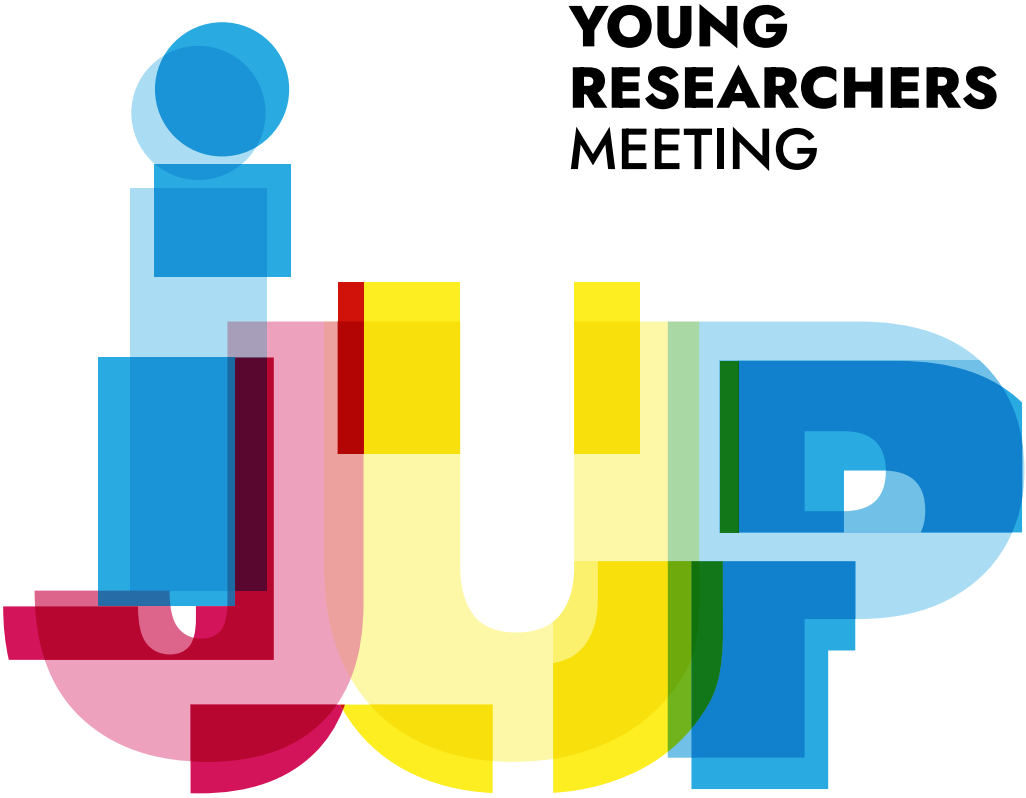
YOUNG RESEARCHERS MEETING



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TÍTULO | *TITLE*

Livro de Resumos do 15.º Encontro de Investigação Jovem da U.Porto

Universidade do Porto

Vice-reitor para a investigação, inovação e internacionalização

Professor Doutor Pedro Rodrigues

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ONLINE **EVENT LINK** (CLICK HERE)

	MAY, 4TH	MAY, 5TH
08:00 - 18:00		
09:00 - 10:30	**PARALLEL ORAL SESSIONS I**	**PARALLEL ORAL SESSIONS VI**
	A1 – Mathematics	A1 – Biological Sciences IV
	A2 – Architecture I	A2 – Engineering I
	A3 – Chemistry I	A3 – Physics II
	A4 – Environment I	A4 – Language & Communication
	A5 – AgroFood I	A5 – Health Sciences VI
	A6 – Health Sciences I	A6 – Psychology & Sciences of Education I
10:30 - 10:40	Break	
10:40 - 12:00	**PARALLEL ORAL SESSIONS II**	**PARALLEL ORAL SESSIONS VII**
	A1 – Health Sciences II	A1 – Biological Sciences V
	A2 – Architecture II	A2 – Engineering II
	A3 – AgroFood II	A3 – Chemistry II
	A4 – Environment II	A4 – Geo-Politics I
	A5 – Physics I	A5 – Health Sciences VII
		A6 – Psychology & Sciences of Education II
12:00 - 12:20	Break	
12:20 - 13:40	**PARALLEL ORAL SESSIONS III**	**PARALLEL ORAL SESSIONS VIII**
	A1 – Economics & Management	A1 – Biological Sciences VI
	A2 – Biological Sciences I	A2 – Engineering III
	A3 – Architecture III	A3 – Geo-Politics II
	A4 – Chemistry III	A4 – Health Sciences VIII
	A5 – Sport Sciences I	A5 – Health Sciences IX
	A6 – Health Sciences III	A6 – Psychology & Sciences of Education III
13:40 - 14:30	Lunch Break	
14:30 - 16:00	**PARALLEL ORAL SESSIONS IV**	**PARALLEL ORAL SESSIONS IX**
	A1 – Arts I	A1 – Biological Sciences VII
	A2 – Biological Sciences II	A2 – Engineering IV
	A3 – Sport Sciences II	A3 – Law and Criminology I
	A4 – Chemistry IV	A4 – Health Sciences X
	A5 – Architecture IV	A5 – Heritage & History I
	A6 – Health Sciences IV	A6 – Psychology & Sciences of Education IV
16:00 - 16:10	Break	
16:10 - 17:40	**PARALLEL ORAL SESSIONS V**	**PARALLEL ORAL SESSIONS X**
	A1 – Astronomy & Physics	A1 – Law and Criminology II
	A2 – Arts II	A2 – Health Sciences XI
	A3 – Sport Sciences III	A3 – Psychology & Sciences of Education V
	A4 – Biological Sciences III	A4 – Heritage & History II
	A5 – Health Sciences V	

RECTORATE OF THE UNIVERSITY OF PORTO

MAY, 6TH	
08:30 - 09:00	*Opening of the secretariat for all participants*
09:00 - 10:00	**POSTER SESSION I**
10 min	Coffee-break
10:10 - 11:00	**POSTER SESSION I**
11:00 - 11:15	Break
11:15 - 12:00	**POSTER SESSION II**
10 min	Coffee-break
12:10 - 13:15	**POSTER SESSION II**
13:15 - 15:00	Lunch Break
15:00 - 18:00	**CLOSING SESSION AND CELEBRATION OF THE 15-YEARS ANNIVERSARY OF IJUP**

ENCONTRO INVESTIGAÇÃO JOVEM

IJUP

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APRESENTAÇÃO | *FOREWARD*

É sempre com grande satisfação que preparamos mais uma edição do IJUP, evento emblemático da Universidade do Porto que, ao longo de 14 anos, se impôs pelo carácter pioneiro e formato inovador como promove a investigação jovem.

Para muitos dos nossos atuais investigadores, o IJUP foi a sua primeira vez. A primeira vez que treinaram a apresentação pública de um projeto. A primeira vez que deram a conhecer o seu trabalho científico junto de um público especializado. A primeira vez que debateram publicamente experiências, resultados e metodologias com colegas e docentes/investigadores. A primeira vez que foram distinguidos pelo seu mérito na produção de conhecimento. A primeira vez, enfim, que se sentiram cientistas, abrindo a porta a uma carreira na investigação.

Por tudo isto, o IJUP é uma verdadeira escola de ciência e um tirocínio fundamental no percurso de muitos jovens investigadores. O evento vai assim ao encontro da vontade da Universidade de instituir uma verdadeira cultura de investigação entre a comunidade estudantil, incentivando-a a consolidar o seu processo formativo com a prática regular de atividades de produção e valorização do conhecimento.

De resto, a Universidade do Porto tem procurado ser uma instituição especialmente vocacionada para a produção de conhecimento tecnocientífico com impacto internacional, em cujo campus se estabelece uma relação sinérgica entre os processos de ensino-aprendizagem e as atividades de I&D+i. Ora, o IJUP visa, justamente, promover a transição entre a sala de aula e o laboratório, entre o ensino teórico e a experimentação científica, entre a aquisição de competências e a produção de conhecimento. Por conseguinte, é um poderoso instrumento para o reforço do nosso estatuto de universidade de investigação.

Criado em 2008, o IJUP não só não envelheceu como continua a revelar o fulgor inicial. A adesão dos estudantes ao evento mantém-se elevada e entusiástica, assim como a mobilização de docentes/investigadores da Universidade e de voluntários da nossa Comunidade Académica. Acresce que se trata de um encontro científico eminentemente multi e interdisciplinar, com projetos que resultam da interceção entre diferentes áreas científicas. Neste ponto, o IJUP abraça o desígnio de transversalidade científica perseguido pela Universidade, tanto na componente de ensino como na de investigação.

Resta-me agradecer a todos os membros da Comunidade Académica que participam no IJUP 2022, desde os estudantes responsáveis pelos projetos aos docentes/investigadores que os orientam, sem esquecer os técnicos e voluntários envolvidos na organização do evento. A todos o meu muito obrigado.

António de Sousa Pereira

Reitor da Universidade do Porto

ORAL SESSIONS

YOUNG
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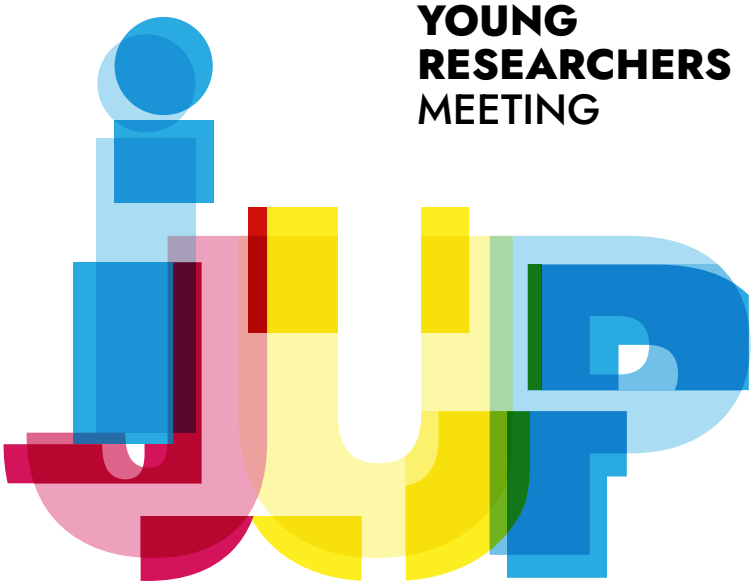
MEETING



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Targeting homologous recombination DNA repair in pancreatic ductal adenocarcinoma therapy

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Abstract

Introduction: Pancreatic adenocarcinoma (PDAC) is a highly lethal disease with poor prognosis, and a rising incidence [1]. PDAC is associated with germline mutations in genes with a crucial role in DNA damage response (DDR), which have been explored in therapeutics [1]. The poly-ADP-ribose polymerase inhibitor (PARPi) Olaparib was recently approved for PC treatment. Yet, resistance to Olaparib has often been reported [2]. Recently, our group has disclosed the BBIT20 compound [3], which has shown potent antitumor activity against PDAC cells.

Methods: The growth inhibitory activity of BBIT20, in PDAC cells, was evaluated by sulforhodamine B assay, being compared to conventional (gemcitabine) and targeted (Olaparib) chemotherapeutics. The effect of 6-12 µM BBIT20 on cell cycle progression and apoptosis was evaluated by flow cytometry analysis after 48h of treatment. The interference with key homologous recombination (HR) protein levels was assessed by immunoblotting. Genotoxicity was analyzed by quantification of γH2AX phosphorylation and COMET assay after 48h of treatment.

Results: The results showed that BBIT20 has anti-proliferative activity in PDAC cells (Miapaca-2, IC50=6.18±0.22µM, n=4; and Panc1, IC50=5.63±0.26µM, n=4), with no significant effect on normal cells (HFF-1, IC50=33.60±3.20µM, n=4). A much lower anti-proliferative activity was observed with Olaparib (Miapaca-2, IC50=52.40±3.20 µM, n=4; and Panc1, IC50= 29.88±2.30µM, n=4). BBIT20 also induced G1-phase cell cycle arrest, apoptosis and genotoxicity, and downregulated HR DNA repair protein levels.

Conclusions: These data support the promising antitumor activity of BBIT20 in PDAC therapy by inhibiting HR DNA repair. Further studies are underway to validate these results.

Acknowledgments

We thank FCT/MCTES through UIDB/50006/2020 and the fellowship (2020.04613.BD) (J Calheiros)

References

[1] Ilic & Ilic. World J Gastroenterol 2016
[2] Zeng et al. Int J Mol Sci. 2019
[3] Raimundo et al. Br J Pharmacol 2021

Effect of different modes of exercise on muscle mass and strength of lower and upper limbs in patients with Chronic Obstructive Pulmonary Disease (COPD): A systematic review and meta-analysis of randomized controlled trials

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Afonso, José, Faculdade de Desporto, Portugal
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Abstract

Purpose: Chronic Obstructive Pulmonary Disease (COPD) is one of the most prevalent diseases with about 384 million people affected worldwide. Muscle strength is a major risk factor for quality of life and exacerbation risk in these patients. It is unclear which exercise modes most effectively improves skeletal muscle mass and strength in patients with COPD. This work reviewed and meta-analysed the effects of different exercise modes on muscle strength of the upper and lower limbs in patients with COPD.

Methods: The protocol can be found at PROSPERO (CRD42021235920). Searches were conducted in 10 databases from inception to July 6, 2021. PRISMA guidelines were followed. Only randomized clinical trials were included and the Cochrane risk-of-bias tool for randomized trials (RoB 2) was used to assess the risk of bias. A random effects model was used to calculate the difference of standardised means (SMD) and 95% confidence intervals (CIs).

Results: Forty-nine studies (n=2850) were included in the narrative synthesis and, 24 studies were included in the meta-analysis. Results suggest that there is a slight advantage in total (upper and lower limb) strength gains from participation in exercise programmes compared to usual medical care control groups not performing exercise (SMD = 0.22, 95% CI = 0.14 to 0.31; z= 5; p = 0.01). Sub-analyses carried out to determine whether specific exercise modes are more effective in increasing muscle strength in the upper and/or lower limbs of patients with COPD showed no significant differences.

Conclusions: There is an improvement in muscle strength in the upper and lower limbs in COPD patients participating in physical exercise programmes, regardless of the type of exercise or anatomical region assessed.

Occurrence and diversity of invasive multidrug resistant *Klebsiella pneumoniae* in hospitalized patients

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Novais, Ângela, REQUIMTE, Portugal

Abstract

Background: Multidrug-resistant (MDR) *Klebsiella pneumoniae* are increasingly associated with invasive human infections and this work aims at investigating the population diversity of invasive *Klebsiella sp.* isolates from hospitalized patients in Portugal.

Methods: *Klebsiella sp.* strains (n=177 blood culture; n=3 cerebrospinal fluid), were isolated from hospitalized patients in a central Portuguese hospital (2017-2018). Isolate identification and susceptibility testing was performed by VITEK/disk diffusion and rpoB sequencing. β-lactamases were identified by PCR/sequencing, and capsular K-type diversity by FT-IR spectroscopy. The string test was performed on all K2 isolates.

Results: Isolates (179 *K. pneumoniae* and 1 *K. variicola*) were resistant to third-generation cephalosporins (45-48%), fluoroquinolones (50%), fosfomycin (20%) and carbapenems (10-13%). In fact, 45% (n=81/180) of the isolates were considered MDR. Most of these produced extended spectrum β-lactamases (ESBLs) (73%), carbapenemases (18% KPC-producers) or both (5% KPC+ESBL, 4% OXA-48+ESBL). CTX-M-15-like was the only ESBL identified, and ESBL-producers (n=59) exhibited a high capsular diversity (12 K-types), with KL102 and K19 being the most represented (25% each). Carbapenemase-producers (n=15) were less diverse (4 different K-types) and dominated by K64 (73%). Four out of seven carbapenemase+ESBL-producers (3 OXA-48+CTX-M-15, 1 KPC+CTX-M-15) carried a new wzi24-like. The highest resistance rates amongst non-MDR isolates (55%) were observed for amoxicillin/clavulanic acid (31%) and fosfomycin (24%). The same K-types (K23, K24, K27, K62, K64, KL102) were identified in this group, whereas wzi2-K2 was exclusive, but all were negative in the string test (n=12).

Conclusions: This study revealed that invasive *Klebsiella sp.* infections are common and caused by a set of diverse high-risk clones, circulating with or without acquired resistance to extended spectrum cephalosporins.

Digitization of works of art: Concepts and Practices

Geraldes, Daniela Fatela, Faculdade de Letras, Portugal

Abstract

With this presentation, it is going to be exposed what is the Digitization of works of art. In this sense, it is going to be explained the concept of Digitization and its importance, for instance, in the safeguarding of documents or works of art. And how Digitization can be processed, with processes of «Contact Digitization» or «Non-Contact Digitization».

In addition to this theoretical approach, it's going to be named the products that can come from Digitization and how they are changing the way we consume and see art. For instance, the high-resolution 2D Digital Images, the Virtual Museum that uses Google Street View technology, 3D Objects using Photogrammetry technology; or Immersive Environments, which can be developed through Extended Realities (ER): Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) or through Projections, using Video Mapping technology or 3D Holograms.

This presentation will be illustrated with several examples of exhibitions that take place in the museum space, but also in other institutions that create Interactive Experiences with the goal of developing a connection between Art, Science, and Technology.

It is also going to be explained how the new imaging techniques are changing how Art Historians and researchers of Conservation and Restoration are studying the works of art, using new techniques, based on technology, that allows them to see new details that could not be seen in the past. This analysis is going to be explained through some recent discoveries made by some museum teams on works of art.

The aim of this oral presentation is to show how today we see art as no other generation could have seen it before. This means that nowadays, with technology, art and culture can be more close to us, and all of our society can access and experience it.

Keywords: Digitization; Digital Images; Extended Realities; Conservation and Restoration.

Coastal Planning, a comparative study

Santelices, Nicolás, Faculdade de Engenharia, Portugal

Abstract

According to Ulrich Beck, the Anthropocene paradigm constitutes a scenario of large-scale catastrophic change for human societies, to which he also associates the idea of the metamorphosis of the world (Beck, 2016).In this sense, it is possible to note that if there is a global territory that we could currently define as paradigmatic in terms of its continuous transformations, both on a geological and historical scale and for being subjected to increasing metamorphosis due to the natural and anthropic forces that affect it, it is undoubtedly the coastal zone. In the case of Chile, the CZ has been undergoing profound socio-territorial transformations over the last few decades as a result of anthropisation processes, which have caused effects such as the exposure of human settlements to natural hazards and the accelerated deterioration of its marine-coastal ecosystems. This context generates critical challenges for coastal planning in Chile due to the ecosystemic systems provided by the coast, which are essential for sustainable development and constitute strategic elements to manage in order to conduct the processes that the territory requires in the face of the effects of climate change. From this perspective, the objectives of this paper are aimed at identifying some of the main theoretical approaches and paradigms that guide coastal planning and its main instruments, together with the elaboration of a comparative analysis framework between a case study considered as a good international practice and a case of a coastal planning instrument in Chile. To this end, the work is based on an exploratory approach using literature review and documentary analysis as sources of information. The results show that planning instruments in Chile do not adequately integrate the main approaches to coastal planning, which makes them ineffective in their response to current challenges.

Keywords: Coastal planning, coastal zone, coastal spatial planning, coastal land use plans.

Administrative decentralization: philosophical concept

Ramos, Luís C. V., Faculdade de Letras, Portugal

Abstract

Whenever the need or impossibility of administrative decentralization is discussed, the idea that everyone has in mind is often unclear and indistinct: sometimes, it is an idea that does not sufficiently include what the concept intends to express, reducing administrative decentralization to mere Parochialism, Municipalism or Regionalization; other times, the idea is mistakenly confused with other similar ideas such as the idea of deconcentration or the idea of disconnection. In this sense, within the scope of the master's thesis that I am writing on this subject, the main objective of this communication is to present the meaning of the concept of administrative decentralization from the point of view of political philosophy, concluding: first, that decentralization is an administrative system rooted in an idea of an Organic State, that is, in an idea in which the State consists in an aggregate of organisms, since individuals come together to form the family, these come together to form the village, these come together to form the parish, these come together to form the municipality, these come together to form the district, these come together to form the region and, finally, these come together to form the State; second, that the Organic State is organized according to the political principle that each organism is constituted through a political pact, in which it decides what functions it intends to perform and what functions it intends to delegate to the superior organism that succeeds it in the hierarchy of organisms that integrate the State; third, that administrative decentralization is based on the administrative principles that each of these organisms must have the right to manage itself a) autonomously and b) without interference from higher bodies.

Keywords: Administrative decentralization; Administrative principles; Metaphysical conception of State; Organic State; Principle of political organization.

Olive pâté with olive pomace paste: a strategy to add value to a by-product

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Abstract

Olive oil production generates high amounts of olive pomace (OP). OP is a biomass composed by olives pulp, stones, and skin [1]. To be used as food ingredient, stone pieces of OP must be removed, resulting the olive pomace paste (OPP).

This work aimed to access the composition of pasteurized OPP and the suitability of its incorporation in an olive pâté. OP was from Trás-os-Montes and the stone pieces were removed with a stainless-steel sieve. Then, OPP was pasteurized at 88 oC/15 sec. For the characterization of the obtained product it was performed the nutritional analysis [2]; total phenolics [3] and hydroxytyrosol (HPLC-DAD-FLD) contents; FRAP and DPPH● inhibition [3]. Four olive pâtés were formulated with increasing percentages of OPP (0, 10, 20 and 30%).

Pasteurized OPP had a protein content of 2.3% and a low-fat content (2.5%). Other features are high moisture (65.3%), fiber (12.2%), and carbohydrates (15.1%). It showed a high phenolics (1.50g GAE/100g) and hydroxytyrosol (0.17g/100g) contents, and interesting antioxidant activities considering the FRAP (1.56g FSE/100g) and DPPH● (0.58g TE/100g) results.

A preliminary sensory test showed that consumers accept the incorporation of 20% OPP in the olive pâté. To conclude, it incorporation in olive pâtés can be a strategy to add-value to a by-product and contribute to food security and diversity.

References

[1] Nunes et al., Innov Food Sci Emerg, 35 (2016) 139-148.
[2] Official Methods of Analysis of AOAC International (21th Edition Vol. I) (2019).
[3] Costa et al., Ind Crops Prod, 53 (2014) 350.

Acknowledgments

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Online consumer fraud victimization and reportability: a quantitative study of the predictors and motives

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Abstract

Online consumer fraud is one of the most fast-growing crimes. It corresponds to situations where, for instance, the products that are bought, but are not delivered. Despite theoretical and criminological advances in cybercrime, literature and empirical studies on the determinants and reportability issues of online consumer fraud in the Portuguese context are rare. Thus, the present study (N = 1710) aimed at exploring, on the one hand, the predictors of online fraud victimization and, on the other hand, to examine the reportability to the police and/or reportability to alternative entities. Even though 223 were victims of online consumer fraud, only 20 reported to the police. Moreover, while individual variables were not predictors of victimization, online routines were relevant to its explanation. Finally, monetary loss was the most important predictor of reportability to the police.

Treating the health in medieval Portugal

Marques, Ana, Faculdade de Letras, Portugal

Abstract

Let's remember ancient cases when someone was hurt at work, when a man attacked another and caused him 'open and bleeding wounds', or when someone got sick without knowing how or why. What possibilities for help and assistance did these 'victims' had throughout medieval ages? There were minimal resources that an injured or sick person could then get access, when trying to treat himself and others, apart from preparing home remedies or potions, an ancestral wisdom passed down from generation to generation through the elders. We are not fully aware of the practical treatments and healing skills spread throughout most of the medieval population. A documented nocturnal drama that took place in Almeirim (Santarém) reveals a young man, who had just struck a man in the face with a sword, trying to heal the wound immediately, conscious of the criminal consequences he had just committed. In medium-sized villages, that would be able to guarantee the sustenance of craftsmen, a barber surgeon would alternate his usual job of haircutting and shaving with blades and swords sharpening, often offering basic curative cares. Next, would come the "sellorgiam" or surgeon, a mix of nurse and doctor, capable of performing complex surgical operations on patients and surely a savior of countless lives. And, finally, the physicist who would examine and treat health issues. While we know a lot about them, still we know not enough about their professional practices. Such as whether they treated at home or only made house calls, in under what circumstances they were called to prisons or hospitals or if there were considered specialists.

Metformin treatment up-regulates eNOS and down-regulates ET-1 lessening endothelial dysfunction in the heart of a rodent model of endometriosis

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Abstract

Endometriosis, characterized by the presence of ectopic endometrium, is associated with an increased risk for cardiovascular diseases. We aim to study if endometriosis affects the expression of molecules involved in vascular function, like endothelin-1 (ET-1), vascular endothelial growth factor (VEGF), endothelial nitric oxide synthase (eNOS) and NF-κB and if metformin, an oral antidiabetic with pleiotropic effects, could mitigate the endometriosis-associated heart modifications.

37 B6CBA/F1 mice were divided into 4 groups: S–sham, M–metformin, E-endometriosis, and ME–endometriosis/metformin. Proteins were identified by immunofluorescence and semi-quantified by western blotting. Cardiomyocyte area and heart fibrosis were assessed by computerized analysis and microRNAs expression by Real-Time PCR.

ET-1 expression, detected in vascular smooth muscle cells (VSMC), decreases in group ME comparatively with group E. An increased expression of eNOS, identified in the endothelial cells and endocardium, was found in group ME, relatively to groups E and M.

VEGF was detected in VSMC and myocardium, while its main receptor, VEGFR-2, was identified in the endothelium and in VSMC. VEGF expression presented a decreasing trend in group ME comparatively with group E.

Both groups E and ME presented an NF-kB increased expression relative to controls.

Cardiomyocyte cross-sectional area increased in group M comparatively with all other groups. Groups E and ME revealed a higher ratio of the fibrotic area than controls.

Among the studied micro-RNAs, expression of miRs 199a, 16, and 18a was decreased in mice with endometriosis compared with controls.

Data suggest that metformin mitigates endometriosis-associated endothelial dysfunction, but not inflammation response and cardiac fibrosis. In addition, metformin presented an apparent hypertrophic effect.

Additional data is necessary to fully understand the effect of metformin in the cardiac tissue of mice with endometriosis.

Development of Writing Motivation and Its Association with Writing Quality: A Longitudinal Approach

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Abstract

In the last decades, a motivational perspective has been increasingly adopted to the study of writing. Cross-sectional research consistently showed that students´ motivation to write becomes weaker with schooling and is linked to their writing quality. Besides the dearth of longitudinal approaches, previous studies tended to reduce motivation to unidimensional measures of self-efficacy, while neglecting other important aspects, such as attitudes and reasons to write. Stemming from these limitations in the field, we conducted a longitudinal study to examine how different motivational beliefs (viz., attitudes toward writing, writing self-efficacy domains, and motives to write) developed over middle school as well as their role predicting writing quality. Participants were 112 Portuguese students in Grade 6, who were reassessed one year later in Grade 7. In each wave, they completed three motivation-related questionnaires and wrote two opinion essays. These essays were then evaluated by two researchers blind to the study purpose with a single overall assessment targeting creativity, coherence, syntax, and vocabulary. Results from a t-test and two ANOVAs revealed a moderate-to-great decrease in attitudes and motives to write from Grade 6 to 7, but not in self-efficacy. Using a multiple regression, we found that Grade 7 self-efficacy for self-regulation and intrinsic motives to write were the only motivational variables contributing to the opinion essays quality in Grade 7. The lack of association between Grade 6 motivation and Grade 7 writing quality suggested that writing motivation was linked to writing performance concurrently, but not longitudinally. These findings indicate that, even if students had previous bad experiences with writing, teachers´ yearly endeavours to enhance motivation in middle school are still worthwhile, given its association with writing quality.

Observational constraints on nonlinear matter extensions of general relativity: Separable trace power models

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Abstract

The search for the physical mechanism underlying the observational evidence for the acceleration of the recent universe is a compelling goal of modern fundamental cosmology. Here we quantitatively study a class of homogeneous and isotropic cosmological models in which the matter side of Einstein's equations includes, in addition to the canonical term, a term proportional to the trace of the energy-momentum tensor, $T=\rho-3p$, and constrain these models using low redshift background cosmology data. One may think of these models as extensions of general relativity with a nonlinear matter Lagrangian, and they can be studied either as phenomenological extensions of the standard ΛCDM model, containing both matter and a cosmological constant, or as direct alternatives to it, where there is no cosmological constant but the additional terms would have to be responsible for accelerating the universe. Overall, our main finding is that parametric extensions of ΛCDM are tightly constrained, with additional model parameters being constrained to their canonical behaviours to within one standard deviation, while alternative models in this class (which do not have a ΛCDM limit) are ruled out. This provides some insight on the level of robustness of the ΛCDM model and on the parameter space still available for phenomenological alternatives and extensions.

Hydroconversion of vegetable oils as sustainable catalytic process to green diesel generation

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Abstract

Biofuels play a vital role as a sustainable alternative to fossil fuels able to address the growing energy demand and the consequent global warming and climate changes.1,2 Green diesel is a biomass derivative (renewable source) obtained by the catalytic deoxygenation of vegetable oils (VO), representing a sustainable alternative to mineral diesel, as they have similar physicochemical properties. The hydroconversion (HC) of VO and fats in the presence of high pressure H2, high temperatures (> 300 ºC) and noble metals-heterogeneous catalysts is currently the most common approach to obtain this biofuel.3 However the high cost constraints made them unattractive.This project, in collaboration with INNOVCAT, aims to develop efficient and robust catalysts using biochar (carbon based material derived from shrimp shell waste)4 activated and functionalized with transition metals (Ni, Co, Mo) to be used in the catalytic HC of VO into green diesel,5 using only water, T < 300 ºC and formic acid as alternative source to generate in situ green hydrogen avoiding the used of high pressure H2 derived from fossil resources. Under these conditions we were able to convert (100 % conversion) linoleic acid (unsaturated free fatty acid-FFA) in other saturated derivatives. The same catalysts were used to HC of other lignocellulosic biomass derivatives and the results will be presented. All the products and catalysts were characterized by GC-MS, 1H and 13C NMR, FTIR, SEM-EDS, XPS, etc.

Acknowledgments

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References

1. A. F. Peixoto, et al., Fuel, 303 (2021) 121227.
2. S. Silva, A. F. Peixoto, C. Freire, Ren. Energy, 146 (2020) 2416.
3. L. J. Konwar, B. Oliani, A. Samikannu, P. Canu, J.-P. Mikkola, Biomass Conv. Bioref. 12 (2022) 51.
4. Ongoing project: EXPL/BII-BIO/0436/2021: Shell4

Synthesis of a carbon-based nanomaterial to catalyze ozone degradation of textile dyes

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Abstract

Water resources and water scarcity worldwide are an increasing concern, having gained a main focus in the most environmental reports. The textile industries stand out negatively due to the high consumption of water and the generation of large amounts of contaminated water, particularly with dyes. In an attempt to degrade dyes, and textile effluent by-products, advanced oxidation processes (AOP) are widely used. Among the most common AOPs, those based on ozone stand out, as this is one of the strongest oxidants. The coupling of nanomaterials to these AOPs systems has been shown to be beneficial, allowing the quantitative elimination of chemicals involved in wastewater treatment.

The main objective of this work was to synthesize a carbon-based nanomaterial (Carbon dots - CD) that could act as a catalyst in the discoloration of textile dyes by ozonation. For this, four dyes were studied: methyl orange (MO), orange II sodium salt (O-II), reactive black 5 (RB-5), remazol brilliant blue R (RBB-R) and a real industrial textile effluent. After a preliminary exploratory analysis for catalyst optimization, a Plackett-Burman experimental design was carried out to obtain the optimal conditions for its synthesis. In order to evaluate the effect of CD on the acceleration of ozone decomposition and consequent increase in dye degradation, the first order apparent rate constants of aqueous dye solutions were calculated. The coupling of CD with ozone allowed a maximum increase of about 600 times in the rate of dye discoloration.

Advanced UV-based oxidation processes to catalyze the degradation of textile dyes

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Abstract

With regard to the sustainability of natural aqueous resources, the textile industry is one of the activities with the greatest negative environmental impact due to the highly contaminated effluents, particularly with high concentrations of dyes. If these effluents are not treated properly, they can pose a serious threat to human and environmental health. Conventional treatment methods cannot always effectively remove these dyes, so advanced oxidation processes (AOPs) have recently attracted attention in the treatment of these wastewaters. Among the various AOPs, those based on UV radiation have stood out due to the high efficiency they have shown in terms of the degradation of organic compounds, such as textile dyes.

This work aims to increase the discoloration effectiveness of textile dyes by UV. For this, four dyes were studied: methyl orange (MO), orange II sodium salt (O-II), reactive black 5 (RB-5) and remazol brilliant blue R (RBB-R). Different homogeneous (hydrogen peroxide and sodium persulfate) and heterogeneous (titanium dioxide) catalysts were coupled to the UV-based AOP to increase the degradation efficiency. Also, and since nanomaterials have been shown to be useful in wastewater treatment, a carbon-based nanomaterial (carbon dot - CD) was synthesized and the effect of its use in UV-based AOPs evaluated. In order to assess the effect of different catalysts on the degradation of the dyes, the apparent first-order rate constants of the aqueous solutions of the dyes and the respective degradation percentages were analyzed. This communication will show and discussed the results.

Role of salt marsh plants in the removal of metals and pharmaceuticals in the lima river estuary

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Abstract

Estuaries are extremely relevant areas in terms of ecological and economic importance. Since many urban areas are located close to estuarine areas, these ecosystems can suffer from discharges of effluents, which might contain different contaminants. Metal contamination in aquatic environments has been a concern for several years and, more recently, contaminants of emerging concern (CECs) have been added to this equation since many of them, such as pharmaceuticals, are not properly removed from water/wastewater matrices. Thus, it is relevant to guarantee an effective removal of these compounds from contaminated areas. Moreover, the presence of multiple contaminats can compromise ecosystem health. Previous studies have shown the potential of different salt marsh plants (e.g., Juncus maritimus, Spartina patens, Phragmites australis, and Triglochin striata) for the retention/removal of metals in estuarine sediments, a sink of CECs. The aim of this project is to evaluate the potential of saltmarsh plant/sediment systems to retain/remove simultaneously different types of pollutants, namely metals and CECs (e.g., paroxetine and bezafibrate) in estuarine environments, investigating also possible seasonal variabilities in the retention/removal processes. Sampling campaigns are being carried out, collecting vegetated and non-vegetated sediments, and salt marsh plants in Lima river estuary. In the 1st sampling no bezafibrate or paroxetine was detected, but it was observed that plants retain Zn, Cu, Pb, Cr and Ni in their rhizosediments, and incorporate Cu in its roots showing their phytoremediation potential.

Acknowledgments

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João Antunes and the Lesson of Civil Architecture of Ribeira's Palace (late XVII century)

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Abstract

In 1681, João Antunes (1643-1712) presented the project for the reconstruction of the church of Santa Engracia thus demonstrating his mastery of architectural design and planning, as well as his knowledge of the current architectural theory. Two years later, in 1683, he was nominated an apprentice of Civil Architecture, with the duty of learning with the priest and architect Francisco da Silva Tinoco.

Some art historians have already questioned if this Lesson had any beneficial outcome in João Antunes´ career and training, considering Santa Engracia's bold project both from a technical and artistic point of view, without adding new conclusions to what we previously knew.

Thus, our paper aims to demonstrate the importance of this lesson in João Antunes´ training and career by understanding the Lesson of Civil Architecture pedagogical structure - from a theoretical and practical point of view, as well its backgrounds - and its importance - in an architect's curriculum and social prestige - through the reinterpretation of archival documentation already published.

Feminist Rethoric in RAP

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Abstract

Hip-Hop, and in particular RAP, has, from early on, impacted the social and cultural experience of its listeners and its influence has been growing as time goes by. Nevertheless, there are few studies that have analyzed their effects and the indisputable relationship with the patriarchal norms imposed on society, specially in Portugal. Thus, we have come forward with the aim of assessing the existence, or the legibility, of a feminist rhetoric in RAP and explore its meaning. Our research will go through the historical context and current analysis of the RAP universe and the conceptual and theoretical framework core to the understanding of the study. We proceed explaining the role of the women in this music industry, scrutinizing the differences between the sexist rhetoric and the (so-called) feminist rhetoric. Finally, we will seek to demonstrate the impact of these types of rhetoric and foresee the future of RAP as a vehicle of the feminist ideology.

Keywords: RAP, Political Rhetoric, Feminism, Gender Studies, Portugal/ EUA

Organizational Identity and Corporate Communication: the case study for Centre-X

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Abstract

How is an organization´s identity constructed? How does it transform and sustain itself? Knowing and understanding the shared stories, the articulation of discourses and the installed practices, constitutes the raw material used in this dissertation.

Rooted in a previous ethnographic project, carried out for two years, the present investigation is a single case study, in an engineering center, designated by the pseudonym Centro-X.

The case analysis explores how the different forms that internal communication takes, in the specific case of Centro-X, impact people's practices, emotions and beliefs, that is, the organizational culture.

Thus, the aim is to understand how the signals given by management - sensegiving - are appropriated by individuals - sensemaking - in a process of alignment (and/or misalignment) of the various 'I's' for the construction of a 'we'.

This dissertation has two objectives. On the one hand, to give voice to the perceptions and experiences within the organization, and by doing so, allowing for a deeper understanding of the subjective, discursive and relational nuances of organizational dynamics among individuals, in the construction of a collective identity.

On the other hand, by analyzing and reflecting on the way through which internal communication contributes to the regulation of identity construction processes, it aims to research the relationship between internal communication management and the engineering and the deliberate orientation of organizational culture.

Chronicles of the Blue

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Abstract

Starting with the objective of characterizing and highlighting the project practice and consequent architectonic production of the Portuguese architect Manuel Graça Dias, this research finds in the Municipal Theatre Joaquim Benite, in Almada, a central `object´ of study capable of stimulating the intended reflections.

As if it were a genealogical analysis, this study starts with a tool that was considered essential to the design process of Manuel Graça Dias: the croquis. The drawings are understood as an instrument subordinate to the project practice and a fundamental mediator between the idealized and the materialized.

It is understood that the DNA of this architecture is also diluted in its author´s own genetics. Thus, we considered the analysis of various geographical contexts and some `characters´ that have changed the history of Manuel Graça Dias, as an important subject for the understanding and characterization of the central theme of this study.

From the spatial experiences gathered during the visit to the central `object´ of the dissertation, we built a series of chronicles or narratives of Architecture, from which six readings were selected and refined that were considered essential to answer the central objective established here.

The documentary collection built up during the production of this study, which should be understood as the crucial basis of the work, from which the words for the formulation of the synthesis presented here were found, will remain available as an open field of study on which to pursue new questions.

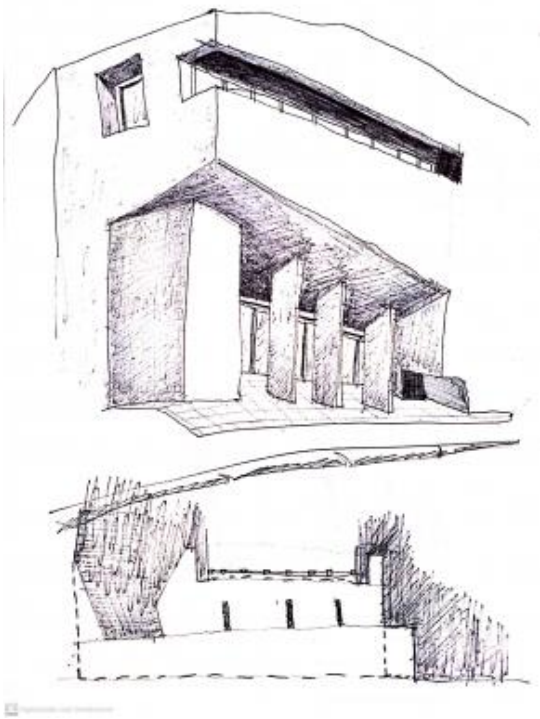

Figure 1. Desenho de Viagem

The construction of the ritual as a constant on the project. Study of Paolo Zermani's work.

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Abstract

The present work proposes a reflection on the life and work of Paolo Zermani, professor and architect from Parma. Based on the recognition of the importance of all his work - which is more evident in the Italian context - this research establishes a complementary perspective on this architect who, by his ability to go through various epochs of the history of architecture, builds a very particular understanding of each circumstance, which manifests itself in a remarkable coherence on each project.

Place, Time, Earth, Light and Silence are then presented as fundamental concepts, guiding the discourse and, above all, an idea of architecture. These take shape through six author's works: Cappella sul Mare (1989), Restauro e Ricostruzione del Castello Sforzesco-Visconteo di Novara (2016), Chiesa di San Giovanni (1997-2007), Mausoleo dei Primi Cristiani sul Bastione del Sangallo (1994), Cappella nel Bosco (2012) and Casa Zermani (1997). To highlight some projects that are part of an architect's work is to separate them into their most elementary parts - meaning, language, articulation, circumstance - putting theory and practice in tension. In Zermani, these tensions are also promoted by the act of writing - about others and, above all, about himself - allowing distances to be closer.

Therefore, they are - the concepts - assumed as moments of an attempt to construct a ritual, from the point of view of the principles they establish, resulting in an opportunity to be able to contribute to the spread of his architecture. It also provides motivation to study his work in a Portuguese context, through the identification of links with his biography and his references, thus recognising the coherence of his approach. It is a legacy that is built according to tradition "in the sense of the transmission of what remains current." 1

References

1. ALVES COSTA, Ana. Projeto e circunstância. A coerência na diversidade da obra de Rogério de Azevedo. Porto: FIMS/ Afrontamento, 2021, p. 294.

Figure 1. Casa Zermani: ritual, house, ground.

Prior Knowledge About Object-Color Associations Can Improve Visual Working Memory and Visual Episodic Memory

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Abstract

Elaboration is a cognitive process that enriches the memory retention of newly encoded information by connecting it to prior knowledge. In working memory (WM), elaboration of verbal materials was found to be ineffective to improve performance. Yet, no study has investigated whether elaboration could boost the retention of visual features in WM. Here, we tested if prior knowledge about object-color associations can improve WM encoding of colors. Participants encoded a sequence of four colored objects presented in four screen locations, and had to reproduce their colors from a continuous color wheel when cued by its spatial location. We manipulated the relation between the object and the color which was either: (a) congruent with prior knowledge (e.g., red tomato) or (b) incongruent (e.g., blue tomato). In Experiments 1 and 2, the object was irrelevant to the memory task. Congruency had no effect on memory irrespective of the format of the memoranda (image or words), the time to encode each stimulus (1500 vs. 4500 ms), and a direct instruction to elaborate. In Experiment 3, we made the object relevant by also testing it with a 3-alternative forced choice test either before or after probing color memory. We additionally included a neutral condition (i.e., the object had no consistent association to a color) and an abstract shape condition, and tested WM and long-term memory. For both types of memory tests and test order (color or object first), congruent colors were remembered better compared to all other conditions, which did not systematically differ from each other. Hence prior knowledge can boost visual WM akin to what has been reported to long-term memory, but only if the association created is relevant for the memory test.

Evaluation of Chemiluminescent Mimetics with Anticancer Activity

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Abstract

Cancer is still a disease challenging to treat, both in terms of therapy efficiency and side-effects [1]. Photodynamic therapy (PDT) presents potential to overcome these problems, due to its minimally invasive nature and few side-effects [1]. However, PDT is dependent on an external light-source for its activation. So, PDT is generally limited to treat tumors on or just under the skin or on the outer lining of organs/cavities [1].

In previous research made by members of this team, molecules with PDT effect were obtained, which anticancer activity and safety to healthy cells [2-4]. Interestingly, these molecules did not need for an external light source for their activation, which was induced by a chemiluminescent (CL) reaction triggered by a cancer marker [2-4]. CL is the light-emission from a chemical reaction, which is easily recognizable in fireflies [2-4]. These new mimetics use the generated energy from CL reactions to produce cytotoxic species, instead of releasing it a light [2-4].

As the addition of brominated moieties to the mimetics was found to be key to their anticancer activity, this present has the aim of further evaluating this strategy towards optimizing their activity. Efforts are also being pursued to evaluate if their CL reactions (with emission of light) could be employed in diagnostics/imaging purposes.

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References

[1] J. Swinnen et al. Cancers, 11, 2019, 1782.

[2] L. Pinto da Silva et al. Eur. J. Med. Chem. 2019, 183, 111683.

[3] L. Pinto da Silva et al. Biomolecules 2019, 9, 384.

[4] C. Magalhães et al. Biomedicines

Target-Oriented Development of New Anticancer Compounds based on Marine Coelenterazine

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Abstract

Nowadays, the most prominent pathology at a global level corresponds to cancer, characterized by abnormal cellular growth that can compromise vital functions [1]. Unfortunately, cancer is very challenging to treat, due to issues in treatment efficiency, potentially serious side-effects and the heterogenous profile between individuals [1].

Thus, it would be essential to devise alternative therapies specific to tumor cells and with anticancer activity. Recently, members of this team used the chemiluminescent (CL) family of marine Coelenterazine as basis for the development of new compounds with anticancer activity toward different tumor cells, which were safe toward healthy cells [1-3]. CL is the emission of light from a chemical reaction (recognizable in fireflies), with Coelenterazine being a known substrate in marine species [4].

Herein, this work focused on the development of new analogues based on that family, and their evaluation as new anticancer drugs. Here, we will report their synthesis, their chemical characterization, and their in vitro anticancer and safety profile. These new compounds showed relevant activity toward stomach and lung cancer cells, while being safe to normal cells, showing potential as new chemotherapeutic agents.

Acknowledgments

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References

[1] J. Swinnen et al. Cancers, 11, 2019, 1782.

[2] L. Pinto da Silva et al. Eur. J. Med. Chem. 2019, 183, 111683.

[3] L. Pinto da Silva et al. Biomolecules 2019, 9, 384.

[4] C.M. Magalhães et al. Biomedicines 2021, 9, 1199.

The role of sexual selection and population structure in the ability of individuals to cope with rising temperatures

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Abstract

Sexual selection has been proposed as an important evolutionary force that can both facilitate or hamper adaptation to novel and changing environments. For example, through enhanced selection on general vigor, viability, or condition, and the action of purging deleterious mutations, sexual selection could help individuals to adaptively respond to novel conditions. In contrast, sexual selection could instead hinder adaptation if novel conditions increase the costs inherently associated with male-male competition and female mate-choice, or if environmental change aggravates the negative consequences of sexual conflict. Interestingly, the role played by sexual selection can be moderated by population spatial structure if this changes the intensity and/or form of sexual selection/conflict. This might happen if the population structure alters the operational sex ratio, the sex allocation, and/or the reproductive strategies of individuals. Here, we used experimental evolution in the model system *Callosobruchus maculatus*, to assess the independent and interacting effects of selection histories associated with the mating system (monogamy vs. polygamy) and population spatial structure (population subdivision or not) on the ability of animals to respond to changing temperatures. We exposed individuals to original (29C) and two heightened (hot, 32C, and stressful, 35C) temperatures during development, and inspected the fitness consequences of such exposure as a proxy for the ability of individuals coming from different evolutionary histories to adaptively respond to the novel conditions.

Botanical scientific illustrations by Sara Cabral Ferreira – an historical and iconographic Analysis

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Abstract

Throughout Europe, the 19th century presented as a fruitful period for advances in Natural History studies. Portugal followed this evolutionary rise of the natural sciences, among which, botany, which supported by trips to the colonies, found in scientific illustration a vehicle of communication for the scientific and political message.

During the 19th century, Portuguese botanists of excellence, such as J. Henriques, A. X. P. Coutinho, and G. Sampaio started publishing their works with scientific illustrations made by their hand or by illustrators. At the same time, through the influence of Romanticism and Horticulture, the interest in botany extended to the educated popular masses, in particular for ladies, with publications teaching the entire process of herborization, identification, nomenclature, and representation through drawing.

Despite being a predominantly masculine work, very gradually, women gained a more evident place in scientific communication contexts. At Porto, the understanding of women´s participation in the cultural environment of the bourgeois society of Porto in the transition from 19 to 20th centuries were vital to outline a biographical path of Sara Cabral Ferreira (1871-1926), an illustrator of the Biological Sciences Section of the Faculty of Sciences of Porto from 1919 to 1926. Having collaborated with the illustrious botanist, Gonçalo Sampaio, her botanical drawings were all published at "Iconografia Selecta da Flora Portuguesa".

Our research was based on the survey of manuscripts and published sources to delineate this illustrator´s sociocultural environment. Moreover, through an iconographic analysis of the illustrations, followed by the identification of the herborized specimens existing at the Museum of Natural History and Sciences of the University of Porto, we will try to outline the conditions in which the illustrator developed her work.

Keywords: Sara C. Ferreira; Scientific Illustration; Botany; G. Sampaio

The importance of green recreational spaces in environmental justice. The case of the oceanic region of Niterói, Brazil.

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Abstract

Green spaces in urban areas are considered essential to guarantee the quality of life of the population and maintain natural and urban ecosystems.The growth of cities does not always consider a proper planning and spatial distribution of such spaces a key element for the quality of life of urban populations and for environmental justice.The need for recreation green spaces of proximity, stimulated by the Covid 19 pandemic, brought to light the importance of these spaces for the physical and psychological wellbeing of populations, for social cohesion, but also highlighted the existing asymmetries in the access to these benefits. Environmental inequalities are revealed in urban areas, either because of a differentiated exposure to environmental risk, or because of unequal access to the benefits of green spaces. This work presents a reflection on the theme of environmental justice, and its relationship with urban growth and green infrastructure. As a case study, an analysis of environmental inequality in the access to public recreational green and blue spaces in the Oceanic Region of Niterói is made, a city that has indexes of green spaces per capita much higher than those recommended by the WHO, as well as a proposal to mitigate these inequalities. Despite the high indexes of green spaces per capita in the study area, the indexes of green and blue public recreational spaces per inhabitant are much lower and distributed asymmetrically among the neighborhoods of the Oceanic Region, with neighborhoods with null and low indexes and others with high indexes.This asymmetry in the access to recreational green spaces corresponds to an asymmetry of rents, with a concentration of these green spaces in the richest neighborhoods.To promote environmental justice with regard to access to green recreational spaces, a central linear park is proposed to harbor recreation and promote soft mobility, and a network of new green recreational spaces.

Seafront of Porto: assets, areas of protection and guardianships

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Abstract

The paper aims to understand the bond between heritage, protection zones and guardianship of Porto´s seafront. The study of this urban area has been focused on its evolution and relationship with the practice of tourism, lacking a heritage vision, being an area characterized by the overlapping of protection zones and competent guardianships, which contribute to a complex organization and planning of the urbanism and local heritage. Thus, through the analysis of legal regimes concerning cultural heritage, nature conservation and biodiversity, criteria for classification of assets and establishment of protection areas, spatial planning maps and processes of classification, we will try to distinguish the various protection regimes. The study is organized in a first part concerning the concept of protection zone, addressing when and with whom it arises, as well as its application in the Portuguese case, presenting concomitantly international doctrine in which the same concept is pointed out. Next, we will look at the immovable cultural heritage existing in the study area, encompassing both architectural and archaeological heritage, and the various associated protection zones, referring to the legislation relating to their establishment. Finally, the natural heritage existing on the site will be addressed, as well as the legal framework applied, paying attention to the extent of it and the complexity of existing protection. In this sense, and recognizing the urgency of the subject, it is intended to contribute to a holistic reading of cultural and natural heritage of the same place, recognizing the importance of protection zones as an instrument to safeguard the context, as well as understanding the various levels of protection in place and the correlation of the entities responsible for the assets and their respective protection zones.

Effect of carotenoids on nutrient uptake by MDA-MB-231 cells

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Abstract

Breast cancer is a major cause of cancer-related mortality in women worldwide. Triple negative or basal subtype of breast cancer presents an aggressive behavior and a poor response to molecular target therapy. Cancer development, which is dependent on high energy and macromolecules supply, is associated with the reprogramming of some metabolic pathways, including glucose, glutamine and folic acid. Carotenoids have been described as having anti-cancer activity. The aim of this study was to investigate if carotenoids interfere with nutrient uptake by triple-negative breast cancer cells. We verified that four distinct carotenoids (β-carotene, crocin, fucoxanthin, astaxanthin) interfere with cell proliferation, culture growth, migration and viability of a triple-negative cell line (MDA-MB-231 cell line). Of the tested compounds, β-carotene presented the most interesting antitumor effect, which was further characterized. We verified that β-carotene significantly increased 3H-deoxy-D-glucose uptake and decreased Na+-independent 3H-glutamine uptake. 3H-folic acid uptake, which was found to be pH-independent, was not affected by β-carotene. β-carotene did not change oxidative stress levels (lipid peroxidation and protein carbonylation levels). We also verified that the antiproliferative effect of β-carotene involves activation of the JNK intracellular pathway, and that it enhances the antiproliferative effect of doxorubicin.

In conclusion, β-carotene presents an anti-tumoral effect in relation to a triple-negative breast cancer cell line, which is not correlated with a decrease in the cellular uptake of nutrients nor with an antioxidant effect, but which is dependent on activation of the JNK intracellular pathway.

Space Sacralization Marks in Vila do Conde

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Abstract

Inherent to the experience of human life, the need for security and comfort in the face of fears and adversities determined the election of certain places as sacred spaces: spaces that, due to their characteristics and particularities, differ from the common profane space. Demarcated through material testimonies - marks of sacralization -, by the construction of a church, a chapel, an oratory or by the presence of an image or an object with religious and/or apotropaic symbolism, these spaces assume an enormous importance for the community that is connected to them. The cyclically repeated traditions and religious practices renew the bonds of belonging to the territory and its sacredness.

The present work aims to identify, register, and interpret the marks of sacralization existing in the old nucleus of the city of Vila do Conde. Recognizing them through the exploration of the territory - through photographic registration, inventorying, and cartography -, subdividing them between collective and private, and interpreting them as a special form of creativity. Combining an anthropological perspective with the concept of Hierotopy, different micro-spaces were studied relating them to the cult and traditions; their typologies are: alminhas, Passos da Paixão chapels, crosses, images placed in public and private spaces; and other material expressions that intend to sacralize and protect the home. Through the continued visit to these sacred spaces, we tried to find out if they remain used and what is their relevance today. The data obtained during the investigation would allow us to conclude that most spaces show signs of activity, receiving offerings and worship from the community, and providing a stage for different dynamics where the tangible and intangible dimensions converge and mix.

Through the inventory, this work offers a contribution to the safeguarding of material and immaterial heritage, while looking, at the same time, at the contemporary history of Vila Conde.

Alcohol consumption during pregnancy in Sao Tome and Principe

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Abstract

Introduction: Alcohol consumption is the most common teratogen in pregnancy, leading to a range of lifelong conditions.
Aim: To characterize the intake of alcoholic beverages during pregnancy in Sao Tome and Principe, according to socio-demographic characteristics and comparing adolescents and adults.
Methods: A sample of 354 Santomean pregnant women was evaluated in a cross- sectional observational study. Participants were asked about the frequency and quantity of alcoholic beverages consumption and binge drinking habits. Women who reported to have consumed alcohol in the previous month were classified as current drinkers. The Chi-square test was used to compare proportions between adolescents and adults. A binary logistic regression model was used to estimate the association between current drinking and socio-demographics. Odds Ratios (OR) and respective 95% Confidence Intervals (95%CI) were calculated.
Results: The prevalence of current drinking was 21% in adolescents and 37% in adults (p=0.118), and 10.3% of adolescents and 24.7% of adults reported a consumption of >= 1 standard drink/week. After adjusting for confounders, adolescents with children were more likely to be current drinkers than those without children (OR=78.8, 95% CI: 2.3-2742.5; p=0.017) and adults with college education were less frequently current drinkers than those without schooling (OR=0.2, 95% CI: 0.05-0.7; p trend=0.007). The most frequently consumed drink was the sweet palm wine. Binge drinking was reported by 5.6% of adults.
Conclusion: The prevalence of current drinking during pregnancy is high in Sao Tome and Principe. Implementing public health measures that promote the restriction of alcohol consumption during pregnancy is crucial.

Blocking SARS-CoV-2 Infection: Inhibiting the Human Enzyme TMPRSS2

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Abstract

Since COVID-19 was declared an international pandemic, several efforts have been made to control the spread of the SARS-CoV-2 virus. However, records of a high number of daily cases remain to this very day. It is thus urgent to understand the biological mechanisms underlying this pathology, so it can be used to develop novel therapeutic targets [1]. One attractive drug target is the transmembrane protease serine 2 (TMPRSS2), a physiological enzyme that participates in the SARS-CoV-2 infection mechanism. TMPRSS2 exerts a required proteolytic cleavage on SARS-CoV-2 Spike (S) protein, which facilitates host-cell entry [2]. Through computer-aided molecular modeling and quantum mechanics/molecular mechanics (QM/MM) calculations, the first stage of the reaction mechanism, corresponding to the rate-limiting acylation stage, was studied. We observed that it occurred in 2 steps: 1) a nucleophilic attack of Ser441 to the substrate´s P1-Arg in a concerted manner with a proton transfer from Ser441 to His296, and 2) a proton transfer from His296 to the Substrate´s P1´-Ser concerted with the cleavage of the P1-P1´ peptide bond. The 2 steps had a Gibbs activation energy of 17.1 kcal/mol and 15.8 kcal/mol, respectively. An oxyanion hole stabilized the rate-limiting transition state by 8 kcal/mol. An analysis of the interactions presents in the tetrahedral intermediate pointed out specific ways to construct higher-affinity non-covalent transition-state analog inhibitors with the potential to be used as therapeutics against SARS-CoV-2.

Acknowledgments

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References

1. Y.W. Zhou, Y. Xie, L. S. Tang, et al., Signal Transduct Target Ther, 2021, 6, 317;
2. J. Shang, Y. Wan, G. Ye, Q. Geng, A. Auerbach, F. Li, PNAS, 2020, 117 (21), 11727.

From stellar to planetary compositions: the challenging case of M dwarfs

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Abstract

In recent years, substantial progress has been made in modeling the inner properties of rocky planets. Knowledge of radius and mass of rocky planets allows to characterize their bulk composition but doesn´t give much information about planet interiors. It has been suggested that individual abundances of heavy elements (e.g. Mg, Si, and Fe) end up controlling the structure and composition of planets. Because of the detection efficiency, most of low-mass planets are discovered around M dwarfs, but precise chemical composition of these stars is very difficult to determine, limiting the characterization of their rocky planets. Based on the fundamental assumption that the Galactic chemical evolution is a 'unigalactic' process -- i.e regardless of their mass, stars formed at the same time and place in the Galaxy should share the same composition - we developed calibration relationships between the stellar metallicity, total galactic velocity, and chemical composition of stars. Machine learning techniques were used to create these relationships based on FGKM stars from large spectroscopic surveys. We use these calibrations to determine the iron-mass fraction (correlated with the planet core size) and water-mass fraction (important for the habitability of terrestrial planets) of the planet building blocks of the rocky planets orbiting around M dwarfs. In this presentation, I will show our findings about the chemical link between rocky planets and their cool host stars.

Immunoproteomic analysis of *Toxoplasma gondii* membrane extract

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Abstract

Toxoplasma gondii is an obligate intracellular protozoan, causing toxoplasmosis, a zoonosis of worldwide distribution that affects approximately thirty percent of the world's population. At present, there are no vaccines targeting human toxoplasmosis capable of preventing congenital infection or cyst formation. In this context, immunoproteomics emerges as a strategy to recognize and identify immunogenic *T. gondii* proteins to be included in vaccine formulations. The characterisation of membrane antigens from *T. gondii* is crucial in this proteomic analysis since include several proteins determinant in the motility, invasion and multiplication of the parasite. These proteins are involved in the activation of the host immune response. Previous work by us has demonstrated that intranasal immunization using membrane antigens from *T. gondii* (TgMP) plus CpG adjuvant conferred protection against murine infection. This project aimed to identify and characterize immunogenic proteins candidates for vaccine development using an immunoproteomic approach. For this purpose, Western-blot analysis of TgMP from strain Me49 was performed using sera from TgMP-immunized mice. Serum immunoreactive proteins were then immunoprecipitated for identification by LC-MS/MS. Mass spectrometry analysis revealed nine T. gondii membrane proteins, among them: dense granule proteins, microneme proteins and surface antigen proteins (SAG)-related sequences. All the identified proteins play a key role in the host cell invasion, with immunogenic features, which make them particularly interesting. As a future perspective, we wish to determine and standardize a methodology for extraction and/or production of the identified immunoreactive proteins to be used as vaccine components.

The mitoxantrone neurotoxicity evaluated in CD-1 mice: a focus on cell death, redox homeostasis and astrogliosis

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Abstract

The increasing effectiveness of anti-cancer treatments along with the earlier diagnosis have contributed to the increase in cancer survivors. Yet, survivors frequently show signs of chemotherapy-induced cognitive impairment also called 'chemobrain'. Mitoxantrone (MTX) is a chemotherapeutic drug used in cancer and multiple sclerosis. However, its' potential neurotoxic consequences and mechanisms are still undisclosed (1).

Evaluation of MTX underlying neurotoxicity and its key events in adult male CD-1 mice using a clinically relevant dose.

To mimic human cycles of chemotherapy, a cumulative dose of 6 mg/kg of MTX was given bi-weekly intraperitoneally to mice for three weeks. One week after the last administration, brains were removed. In the whole brain, biomarkers of oxidative stress, neuronal damage, apoptosis, and autophagy were evaluated. In the prefrontal cortex (PFC) and hippocampal formation (HF) of coronal sections of fixed brains, biomarkers of neuronal damage were detected through immunofluorescence. The volume of the HF regions and the total number of GFAP-ir astrocytes present were determined. Experiments were approved by the local Animal Welfare Body (ref. 140/2015) and National Authority (ref. 021322 of 2016/10/26).

In the whole brain, MTX caused redox imbalance, seen by increased eNOS and reduced MnSOD expression. ATP β expression also diminished. LC3II increased and p62 tended to decrease. PSD95 expression decreased. Regional analysis exhibited a reduction in the volume of the dentate gyrus (DG) and CA1 region of the HF. GFAP-ir astrocytes increased in all regions of the HF except in the DG. Bax expression increased in the PFC and CA3, whereas p53 decreased in all brain areas evaluated. Furthermore, MTX caused hyperphosphorylation of Tau in the PFC.

MTX promoted brain damage in adult CD-1 mice, being that this work brings new highlights on key events related to its neurotoxicity.

References

(1) Dias-Carvalho, A. et al., Archives of Toxicology, 2022.

Healthcare services during COVID-19 pandemic: the right to be accompanied of Alzheimer patients

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Abstract

The COVID-19 pandemic has challenged most public services in Portugal, since barely any were prepared for calamity and overpressure. As the disease spread, the government announced several measures to mitigate predictable consequences.

This paper focuses on the way's healthcare services dealt with legislative information and how their lack of instruction on technological and legal interpretation of information led into patients not being granted their right to be accompanied; particularly in the case of Alzheimer patients, a group of people prone to vulnerability and often depending on others.

The Law 15/2014 of March 21st, which regulates the rights and responsibilities of healthcare patients, consolidates healthcare related law and extends the right to be accompanied of the patients to both public and private healthcare services, with the only exception of situations where the presence of a third party would jeopardize the technical conditions and requirements to provide the necessary care. Bearing in mind that Alzheimer patients need different protection regarding the safeguard of their dignity, their right to be accompanied is a clear matter of health protection and an undeniable fundamental right of social nature, according to Article 64 of the Portuguese Constitution.

The power to restrict or suspend fundamental rights is exceptional: it can only occur in constitutionally described situations and it must be authorized by the Parliament, therefore it cannot be converted into a standard practice. Since the pandemic started, over 1000 legislative decrees were implemented in Portugal and none has restricted or suspended the right to be accompanied. Despite the Directorate-General of Health's Orientation no. 38/2020 of December 17th that compiled all the safety measures that services should enforce to grant patients their lawful rights, healthcare services have restricted this right based on internal regulations, going against the law and the Constitution.

Tumor-Targeting Functional Nanoparticles for Cancer Therapy

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Abstract

Glioblastoma (GBM) is s a highly invasive and lethal brain tumor. The GBM´s standard care consists of neurosurgery, followed by radiotherapy combined with chemotherapy with temozolomide (TMZ). However, this therapeutic approach is not curative, only increasing modestly the patient's survival. The therapy failure is mainly due to the intrinsic resistance mechanisms mediated by the DNA repair protein, O6-methylguanine DNA methyltransferase (MGMT). Additionally, the blood-brain barrier (BBB) poses as a major obstacle to brain delivery, decreasing the bioavailability of drugs in the brain tumor tissue [1]. Thus, nanoparticles (NPs) for brain drug delivery able to cross the BBB were proposed in this work.

Poly (lactic-co-glycolic acid) (PLGA) NPs were prepared for the co-encapsulation of TMZ and bortezomib (BTZ). In clinical trials, BTZ proved to be able to downregulate MGMT expression in GBM patients, increasing TMZ´s therapeutic efficacy [2].

BTZ+TMZ-loaded PLGA NPs were prepared using the single-emulsion solvent evaporation method. The effect of different experimental parameters (amount of polymer, surfactant concentration and sonication time) on the NPs´ psychochemical properties was studied. Several formulations were prepared, varying different experimental conditions such as the type of solvent used, surfactant concentration and the number of sonication cycles. The NPs best candidates exhibited suitable properties for brain delivery, monodisperse with mean sizes smaller than 200 nm and negative zeta potential. Future work includes NPs´ surface functionalization with transferrin to increase the brain tumor targeting ability, and the evaluation of their antitumor activity in vitro using human GBM cells.

References

1. Tan, Aaron C, et al. CA: a cancer journal for clinicians 70.4 (2020): 299-312. https://doi.org/10.3322/caac.21613

2. Rahman, Mohummad A., et al. Immunity, Inflammation and Disease 8.3 (2020): 342-359. https://doi.org/10.1002/iid3.315

Optimization of Spectroscopic Tests of Fundamental Physics: from ESPRESSO to the ELT

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Abstract

Extremely large telescopes allow us a huge advance in knowledge in the field of Astrophysics, leading not only to better images of our cosmos but also to a deeper expertise of it.

Noted as "the world´s biggest eye on the sky", the European Southern Observatory (ESO) Extremely Large Telescope (ELT) is under construction in the Chile´s Atacama Desert. This optical/near-infrared telescope is designed to cover a wide range of scientific possibilities. In particular, the study of the dark universe and fundamental physics using one of its instruments, the ArmazoNes high Dispersion Echelle Spectrograph (ANDES).

Bearing in mind that instruments are designed with specific scientific goals, but subject to various technical and financial limitations, an instrument of this caliber requires a high level of planning both in its design and construction. This work focuses on the development of computational tools that can optimize the scientific return of fundamental physics astrophysical tests (including measurements of redshift drift and fine-structure constant) using ANDES and for its various possible configurations. In detail, it focuses on the quantification of the scientific impact of the different configurations and the consequent identification of key parameters for the respective scientific trade-offs.

This is an important outcome of the ANDES Phase B studies, and it will ultimately lead to the definition of an optimized observational strategy, which in turn will be the starting point for the subsequent planning of the scientific exploitation of the telescope and instrument.

Weight status, lifestyles and food insecurity among children from the municipality of Gondomar: the impact of the COVID-19 pandemic

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Abstract

Introduction: Recent estimates report an increase in the prevalence of children with pre-obesity (PO) and obesity (OB) worldwide. The COVID-19 pandemic had repercussions on children's eating habits and physical activity, which might have exacerbated the risk of developing OB and other chronic diseases. As a reflection of the pandemic, the prevalence of Food Insecurity (FI) may also increase.

Objectives: The aims of this study were: to characterize the weight status of children in basic education (preschool and first cycle) in the Municipality of Gondomar (MG), to identify FI in households, and to study the perception of the effects of COVID-19 in children´s lifestyle and food habits.

Methodology: Application of a self-administered questionnaire to the caregivers of children from ten schools from two different school clusters in the MG, followed by anthropometric assessment of height, weight and waist circumference. Data from 172 children were collected.

Results: A total of 42.9% of children aged 3 to 4 years and 44.1% aged 5 to 10 years were overweight (OW). Most caregivers reported worst lifestyles due to the COVID-19 pandemic, with 73.7% reporting a decrease in the level of physical activity and 61.1% an increase in screen time. Regarding eating habits, changes in the company (40.6%) and in the location of meals (36.7%) stand out. The overall prevalence of FI was 24.8%.

Conclusion: The pandemic seems to have had an impact on children's lifestyles in a way that may increase OW. The establishment of political measures is essential to combat OB and FI, especially considering the context of the COVID-19 pandemic.

Love and strip: the management of romantic relationships by women who perform striptease

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Abstract

Women who perform striptease, whilst working as sex workers, face the stigma associated to their profession which in turn affects their private lives. In this context, the present study intends to examine the romantic relations´ management of these women. In light of the emergence of Covid-19, it is considered especially important to analyse the repercussions of this pandemic in the life and work of these women. A phenomenological approach, based on a qualitative methodology was chosen, with the use of semi-structured interviews aiming to access the individual experiences of the nine women stripteasers. The data was subjected to an Interpretative Phenomenological Analysis which resulted in four superordinate topics: Stigma, Separation of Professional and Personal Life, Striptease and Romantic Relations, and Impact of the Covid-19 Pandemic. It was concluded that there is awareness of the stigma experienced and the need, almost generalized, to separate professional from private lives. It was verified that no consensus exists when considering compatibility of striptease performance and maintenance in romantic relationships. Intimate partner selection strategies can be adopted to enable relational and labour requirements management, however, even with the implementation of these strategies, despite some accounts of well succeeded relationships, partners may show jealous and possessive attitudes, which, in some cases, culminate in violence. It was confirmed that the consequences of the pandemic are felt especially at a professional level, with the loss of income. The purpose of this study is to contribute to the humanization of sex workers, in the eyes of the scientific community and society, emphasizing the importance of listening to their perspectives on the phenomena they experience.

Keywords: Striptease, romantic relationships, intimate partners, stigma, Covid-19.

Effects of an online pilates method exercise program on balance, trunk strength and stability in the elderly

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Abstract

Introduction: Aging comes with it a series of physiological changes that lead to physical and cognitive decline. In the musculoskeletal system, the decrease of bone mineral mass and muscle mass are common, leading to osteoporosis and sarcopenia that are frequent causes of imbalances and increased risk of falls. Some studies have been carried out to evaluate the Pilates Method to delay or minimize these losses in the elderly population, but conclusive results have not yet been possible. Objectives: Our study aimed to investigate whether an online Mat Pilates exercise program is effective in increasing balance, strength and stability of the trunk muscles.
Methods: fourteen participants with a mean age 75.9 years (SD 5.8) were recruited into an online Pilates program. The program lasted five months, with two weekly sessions of approximately eighty minutes each, moderate intensity. Participants in the Pilates Group performed exercises from the method repertoire with the respective adaptations for this population. All of them were tested before and after the intervention with one leg stance, 1 min sit up and 1 min plank test. For statistical analysis, we used IBM SPSS software - version 26 and the test applied was the paired samples t-test.
Results: At the end of thirty-eight sessions, there was a difference in abdominal strength evaluated by the Sit Up Test in 1 min between pre test (M=28.8 rep, SD= 7.39) and post test (M= 38.8 rep, SD= 8.50), p = 0.003; resistance and stability of the trunk by the Plank Test between pre test (M= 45.5 s, SD= 17.3), and post test (M= 60 s, SD= 0), p= 0.014 and static balance by the Single Leg Test between pre test (M= 29.9 s, SD= 16.1) and post test (M=38 s, SD 11.18), p= 0.019.
Conclusion: This study suggests that an online Mat Pilates exercise program can be used for improvement of trunk strength and stability, as well as for balance in the elderly population.

Impact of a simulation-based interprofessional workshop in medical and nursing students' perception of roles and competencies in effective teamwork: a pilot study

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Abstract

Introduction: Collaboration and communication among healthcare team members are critical components for high-quality patient care therefore Interprofessional (IP) learning should be included in healthcare curricula. There is a scarcity of simulation-based interprofessional education (IPE), especially in the undergraduate education. Considering the above educational need, a simulation-based workshop targeting interprofessional teams of healthcare students (medicine and nursing) was created, aiming the development of IP team perception (understanding of roles and competencies) and the use of Non-Technical-Skills (NTS) to promote effective IP teamwork.

Material and Methods: A total of twenty-three final year students (6th year medical and 4th year nursing students) were invited to participate in the workshop. Teams of three or four elements (medical and nursing students) were exposed to two critical patient management simulation scenarios. To assess the impact of the workshop three validated surveys (ATTITUDES, JSAPNC, and IPEC) were applied before and after the workshop.

Results: Student awareness of interprofessional learning and self-competency in IP practice improved. Statistically significant differences were found when comparing the overall pre- and post- scores, for both medical and nursing students, in the three surveys. The largest increase was observed in the medical students´ perception of IP interaction and value (IPEC survey) and in the nursing students´ perception of IP interaction (IPEC survey).

Discussion and Conclusions: These findings scientifically corroborate the need for simulation-based IP programs, integrated in the undergraduate curricula, promoting clinical interactions of different professional groups. In the Portuguese setting, as in many countries across Europe, such novel program is needed and is expected to be well received.

Keywords: Interprofessional education, Simulation Training, Students, Nursing, Students, Medical.

Understanding voting behavior in the Portuguese general elections from 2002 to 2019: a machine learning approach

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Abstract

This work aims to understand the Portuguese voting behavior in general elections through Machine Learning, considering two outcomes: turnout (participation) and decision (party or coallition). The data used consists of six post-electoral surveys performed by Instituto de Ciências Sociais da Universidade de Lisboa, between 2002 and 2019. Six Bayesian Networks algorithms were applied (Bayesian Search, Naïve Bayes, Greedy Thick Thinning, PC, Augmented Naïve Bayes e Tree Augmented Naïve Bayes) to predict 2015 and 2019 election outcomes, using past data. These models were then compared through performance evaluation measures (Accuracy, Precision, Recall, Sensitivity, Specificity, F-score e Area Under the ROC curve), statistical tests (Friedman and Nemenyi) and the calculation of the Critical Difference between them. The best predictive model for each outcome was explored. For turnout, the chosen model was Augmented Naïve Bayes. The variables that most influenced the target variable were Party proximity, Political interest, Frequency of attending religious services, and Frequency of consulting news through papers. Regarding decision the best predictor was the model using Greedy Thick Thinning. The variables that showed the most effect were Party proximity and Syndicate membership.

Interlinguistics in the 21st century, analysis of typological classification systems in light of artificial languages with goals other than international communication and the conlang movement

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Abstract

Both interlinguistics and its main subject matter, the artificial language, suffer from a lack of a clear definition and taxonomic standards, leading to what some scholars call "terminological chaos".

In this work, we first present some of the proposed definitions for the discipline and its subject matter along a brief historical contextualization of language construction, with an emphasis on projects with differing goals. Aiming to test proposed standards and to infer solutions that will help in dealing with an exponentially increasing number of language projects, we then applied established taxonomic and typological referentials to a sample of 200 artificial languages in order to ascertain how such classification systems behave. Each entry in our sample was thus classified according to: i) the source of its lexicon, based on the classic distinction between a priori and a posteriori language; ii) its function or purported goal, of which we defined three (auxiliary, artistic and engineered) further subdivided into three subfunctions each; iii) its development level, according to criteria first proposed by Detlev Blanke and further refined by Federico Gobbo. This third approach bore the brunt of our attention as it ascribes a numerical rating by which an entry should be described as a "language", a "semi-language" or a "language project", thereby conveying a hierarchical notion of relevancy. By analysing the results, we found that auxiliary languages received on average higher ratings than either artistic or engineered languages and composed the overwhelming majority of the highest-rated projects, despite numbering under 25% of the total sample. Similar conclusions may be drawn regarding a preference for a posteriori language, which were on average rated higher than those a priori. As such, we hope to have revealed inherent biases in these systems which we believe to be symptomatic of larger unresolved issues within the discipline.

The Relationship between School Engagement, School Climate and Youth Externalizing Behaviours: Direct and Indirect Effects of Parenting Practices

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Abstract

In recent decades, children and youth externalizing behaviour problems have been considered a priority issue and a major public health concern. Thus, the need for detailed and rigorous studies of risk factors underlying the onset of these behaviours and protective factors that might help preventing them have become mandatory. Therefore, this research aimed to explore the direct and indirect effects of students´ school engagement, school climate and parenting practices on youth´s externalizing behaviours. To do so, the current study employed a quantitative methodology and used a sample of 183 Portuguese students, aged between 11 and 16 years old. Specifically, the data was gathered using a self-report questionnaire that integrates Students´ Engagement in School: A Four-Dimensional Scale, an adapted version of Delaware School Climate Survey-Student, Alabama Parenting Questionnaire - Child Form, and externalizing scales from Youth Self-Report. Among others, the main results suggested that lower levels of school engagement and negative school climate predicted youth´s externalizing behaviours. Also, poor parental supervision, inconsistent discipline and corporal punishment were positively related with externalizing behaviours, contrary to parental involvement and positive parenting that were associated with better results when it comes to externalizing behaviours. It was also found that, as opposed to positive, negative parenting practices were associated with lower levels of school engagement. Additionally, the results indicated that parenting practices might influence youth´s externalizing behaviours through school engagement. It should be noted that, not only this research reinforces the need for a deepen study of the influence school and family factors play in the development of youth´s behavioural problems, but also it emphasizes the need for multidimensional, comprehensive prevention strategies, that considered both family and school risk and protective factors.

Kinetics and thermodynamics of reactions involving fullerenes

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Abstract

Fullerenes are molecules with a wide variety of applications and potential uses. Fullerenes can be functionalized via chemical reactions to obtain derivatives with the desired physical and chemical properties for increased applicability. In this work we study the reactivity of fullerenes C60 and C70 towards Diels-Alder addition with two conjugated dienes: anthracene and 9,10-dimethylanthracene. The reactions were studied in solution, using UV-Vis spectroscopy. The kinetics of the reactions with anthracene were studied by monitoring the change in absorbance as the reaction occurs. This was done for various temperatures, and the activation enthalpy and activation entropy for the direct and reverse reactions determined from Arrhenius plots. The thermodynamics of the reaction with 9,10-dimethylanthracene was determined from the equilibrium absorbances at various temperatures, and the enthalpy change and entropy change of the reaction obtained. The thermodynamic parameters were found to be similar for anthracene and 9,10-dimethylanthracene, for both fullerenes. The enthalpy and entropy changes of the reactions obtained were negative, as expected from a Diels-Alder reaction. The addition to C70 was found to be more exothermic than to C60, though this is compensated by a bigger loss of entropy. The activation enthalpy for the direct Diels-Alder reaction with anthracene was found to be lower for C60 - it has a smaller activation barrier than C70. The activation entropy obtained was more negative for C60. The same is true for the reverse Diels-Alder activation parameters.

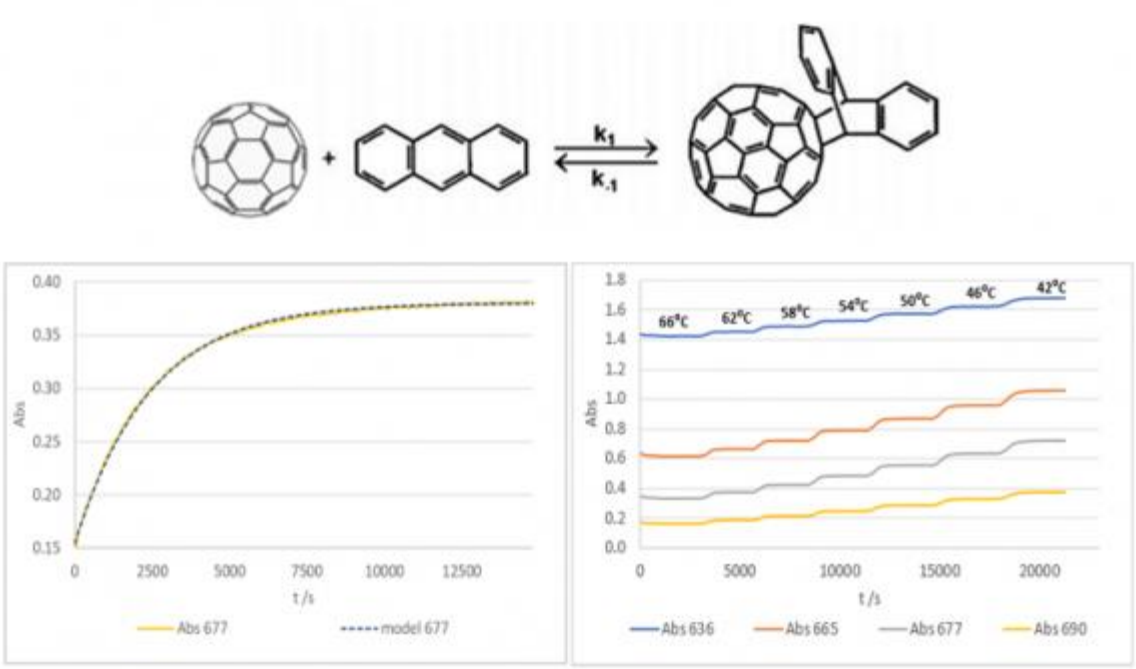

Figure 1. On the left side, the time evolution of 677 nm absorbance for C70 + anthracene solution, at 82ºC; on the right side, equilibrium absorbances for various temperatures for C70 + 9,10-dimethylanthracene solution.

Continuities and transformations: two frames of vertical dwelling experimentation in São Paulo

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Abstract

At the end of the 1920s, in São Paulo, Brazil, the first vertical apartment buildings began to emerge, although, at the time an absolute innovation, it did not have great acceptance. After decades of vertiginous population growth associated with an intense verticalization process, a recent study found that, for the first time, the city has a predominance of vertical housing typologies. This new factor emphasizes the relevance of the paper´s subject: vertical dwelling I São Paulo. The research considers two frames: from 1940s to 1950s, in Higienópolis neighborhood; and from 2000s, in Vila Madalena.

The first frame stands out with the consolidation of the modern movement and the presence of an important group of architects working in the residential real estate market. In this context, Higienópolis became the stage for many vertical dwellings with architectural interest, with a positive impact by their architectural language and relation with the city.

Nevertheless, in 1970s, due to several factors, many architects moved away from the real estate market and the verticalization process started to be driven by constructions without design quality or urban relation. In contrast, from the early 2000s, small initiatives that seek to resume the dialogue between architecture and housing real estate production have gained strength, and began to emerge, in Vila Madalena, buildings with architectural concern and greater urban integration.

The paper presents the analysis of representative study cases, in order to understand their design options, compositional themes and draw parallel guidelines. Thus, we intend to contribute to the understanding of São Paulo´s architecture within the ways of living debate. This study is part of a master thesis in FAUP´s MIArq Course 2020/21, under the supervision of Helder Casal Ribeiro.

Medical photography usage amongst doctors at a Portuguese hospital

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Abstract

Background: Technological developments have made it possible to create high-quality medical photographs using only smartphones, unleashing medical professionals´ ability to document a patient´s clinical progression, diagnose a pathology, ask for a second opinion, and teach others more effectively. It is important to obtain informed consent from their patients, confirm image quality and ensure that these medical images are stored correctly to guarantee the security of the patient data. This study aims to find if medical professionals at a tertiary academic hospital are making use of medical photography and how the content is obtained, stored, transferred, and used.

Methods: A 30-question survey was distributed across 29 medical departments at Centro Hospitalar Universitário de São João (CHUSJ), Porto, Portugal, with approximately 900 medical professionals. Statistical methods were used to analyse survey responses.

Results and discussion: There were a total of 257 respondents, with 93% using medical photography. Of these, 70% use the obtained images to request a second opinion, 70% to document a patient´s medical progress, 68% to show at medical conferences, 65% for investigation and publication, and 56% for teaching. Of the 93% who use medical photography, 33% use it on a weekly basis, 36% monthly, and 71% of respondents always ask for patients´ consent before taking a photo. Doctors aged 20-40 years use photography more often than doctors over 40 years of age to document a patient´s clinical progress (77.4% and 52%, respectively; $p=0.01$) and to ask for a second opinion (78% and 52%, respectively; $p<0.001$).

Conclusion: Our study shows that medical photography is widely used amongst doctors, and appropriate procedures need to be made to obtain patients´ consent, store images, and ensure the security of patient data.

Synthesis Of Marine-Derived Xanthone Analogues and in silico Studies on Inhibition Of Cyclooxygenase Enzymes

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Abstract

The xanthone derivatives (XDs) are a family of molecules that possesses a substantial richness of chemical properties and, consequently, interesting biological and pharmacological activities. The LQOF/CIIMAR research group has a vast experience with the synthesis and the activity evaluation of XDs, including the anti-inflammatory activity [1]. Recently, we have reported the potential anti-inflammatory activity of marine-derived XDs by in vitro and in silico inhibition of the cyclooxygenase enzymes [2]. In another study conducted by our group, other XDs, including carboxylated xanthone derivatives (XCars), were reported to decrease the concentration of the pro-inflammatory cytokine IL-6 on lipopolysaccharide stimulated macrophages [3].

In this study, the total synthesis of one promising XCar for future screening of the anti-inflammatory activity is described. Its structure elucidation was established by spectroscopic methods (1H NMR, 13C NMR, and IR). Additionally, molecular docking studies were conducted, for a library of XCars and some diaryl ether analogues, using cyclooxygenase enzymes as biotargets and higher binding affinities were achieved, in comparation with well-known nonsteroidal anti-inflammatory drugs (NSAIDs). A potential selective anti-inflammatory lead-candidate was also reported.

Acknowledgements

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References

[1] M.M.M. Pinto, et al. Molecules 2021, 26, 431.
[2] C. Fernandes, et al. Pharmaceuticals, 2017, 10, 50.
[3] D.R.P Loureiro, et al. ChemMedChem 2020, 15, 749-755.

The role of data visualization in science communication: design patterns and scientific literacy

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Abstract

Scientists and researchers use different channels to communicate their research findings to colleagues, students, and the general audience. With the information overload we are currently witnessing, especially on online platforms, and with such a diverse audience that perceives and understands science in different ways, it is necessary to understand the usefulness of data visualization in science communication as a process of exploration, discovery (Fisher and Meyer, 2018) and understanding (Kirk, 2019).

Science communication is an essential process for the sustainability of the scientific system, it contributes to the recognition of the value of science and the increase of scientific literacy (Fiolhais, 2011). This study aims to identify and present a set of design patterns and publish a user guide to assist communicators whose role is to disseminate science through data visualization. Data visualization allows complex information to be reorganized and contributes to the understanding and interpretation of the content being communicated that would otherwise not be accessible to the reader.

To understand the role of data visualization a voluntary survey was distributed to scientists and researchers from Portuguese R&D units funded by Fundação para a Ciência e Tecnologia, from which a sample of 39 participants was collected. Based on these results, fieldwork was developed with a group of scientists to identify the common problems in the process of data visualization in science communication.

It is concluded that it is essential to know how to identify and use the appropriate data visualization tools in the science communication process in order to analyze data, discover new layers of information, engage the audience, and increase scientific literacy.

Keywords: data visualization, design patterns, science communication, scientific literacy.

Eco-conscious use of white grape pomace as a source of extracts with strong antibiotics potentiation effects against *Staphylococcus aureus* biofilms

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Abstract

Surgical site infections (SSIs) are common postoperative occurrences due to bacterial contamination, often linked to biofilm formation. Biofilm-associated SSIs are extremely recalcitrant to conventional antibiotherapy due to several tolerance mechanisms provided by the multidrug-resistant bacteria. Biofilm-forming bacteria survival and the emergence of new resistant bacterial infections pose a serious threat to the healthcare system. Moved by this serious situation and the urge for novel and alternative antimicrobial/antibiofilm strategies, the main goal of this study was to promote the valorization of winemaking industry residues like pomace as antibiotics adjuvants. For this purpose, aqueous and hydroethanolic white grape pomace extracts from SOGRAPE VINHOS S.A (Vila-Real) were obtained and tested for their antimicrobial and biofilm removal potential against *Staphylococcus aureus*, and the ability to enhance the activity of selected topical antibiotics. Firstly, the antimicrobial/antibiotic potentiation action of aqueous and hydroethanolic (50:50 v/v-ET50; 70:30 v/v-ET70) extracts was determined by microdilution and well diffusion methods, respectively. The extracts/extract-antibiotic combinations were analyzed on pre-established biofilms in terms of mass removal (BMR), metabolic activity reduction (BMAR), and cells´ culturability (log colony-forming units (CFU)/cm2 reduction). Interesting results were obtained for combinations that included the antibiotic oxacillin (OX; 0.5 µg/mL) and the hydroethanolic extracts (at 100 mg/mL), namely OX+ET50 (BMAR=71.5%) and OX+ET70 (BMAR=64.5%). In addition, both combinations of gentamicin (GE; 0.5 µg/mL) and OX with the hydroethanolic extracts resulted in total log CFU/cm2 reduction (4.78).

The overall results allowed to conclude that white grape pomace hydroethanolic extracts can be clinically projected to potentiate the activity of antibiotics (e.g. GE/OX), even suggesting the presence of higher bioactive compounds content.

Negative polarity words in positive expressions in Brazilian Portuguese

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Abstract

This paper aims at analysing the usage of words of negative polarity combined with words of neutral or positive polarities in Brazilian Portuguese (BP) in the context of sentiment analysis. The objectives of this study are: to evaluate the occurrence of these constructions; to qualify the contexts of use of these expressions; to examine their sentiment value by native speakers. We have divided our research into two parts: a corpus-based study and an empirical study with BP speakers. For the first part, we adopted a methodology based on the authors analysing the texts (all of which are related to economics) considering the theories of Trnavac (2015) & Taboada (2016). For the second part, native BP speakers participate in a text-based study that addresses the sentiment interpretation of three pairs of sentences relevant to the study. The results obtained lead to a better understanding of the use of words of negative polarity in the expression of phrases of positive polarity in BP, especially concerning the productivity of the use of negative polarity adverbs associated with neutral or positive polarity words, as well as the restriction of this use to more informal speech contexts. Firstly, this usage was related in all of the texts to sentences containing intensifying adverbs: in 10 of the 12 examples, these adverbs, which isolated served as negative words, reinforced the positive context of the sentence. Another important conclusion based on the specific results of the study was that the constructions studied are observed in BP only with the association of negative-polarity words with positive or neutral-polarity words. Combinations of negative-polarity with other negative-polarity words do not result in the same effect. The study was mainly limited in regards to the extension of the corpus: further studies in the same area would profit from working with more texts and samples from native speakers.

Preventing exposure to cytotoxic drugs by analysing cyclophosphamide residues in the manipulation areas of a northern Portuguese hospital

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Abstract

The manipulation of cytotoxic agents has been increasing as chemotherapy remains the first line treatment for several malignant diseases of growing incidence. However, cytotoxic agents such as cyclophosphamide do not specifically target cancer cells, being therefore able to harm the professionals that prepare them. To prevent occupational exposure, an adequate monitoring of the working environment is warranted. The present study aimed at validating an analytical method for the evaluation of the presence of cyclophosphamide in the surface of three different rooms of a northern Portuguese hospital, in which cytotoxic drugs are received or manipulated. The extraction procedure consisted of wiping with a 100cm2 gauze moistened with ethyl-acetate followed by mixing with 15mL methanol: acetonitrile: water (25:10:65) and filtration with a PTFE 0.2µm filter. The samples were then analysed by HPLC-DAD (205nm), with the separation being obtained with a C18 column. The analytical method was validated regarding linearity, intra-day (92-98%) and inter-day (91-98%) precision, accuracy (80-106%), recovery (97-114%) and sensibility (LOD = 0.089 µg/cm2; LOQ = 0.269 µg/cm2). A total of 50 real samples were analysed and all of them presented values below the LOD. Despite using analytical methods with lower sensibility than the one herein presented, previous published studies about the presence of cytotoxic drugs on surfaces of other Portuguese hospitals revealed severe contamination in the manipulation areas. These negative results likely indicate that in this hospital the preparation protocols efficiently limit exposure, further evidencing the importance of complying with the guidelines. By adopting these procedures, it is possible to eliminate or at least greatly limit the occupational exposure to cytotoxic drugs, by nurses, pharmacy technicians and pharmaceutics. Analytical tools that efficiently monitor contamination are a helpful tool to monitor and prevent hazardous exposure.

The work of Mário Abreu. An aproach

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Abstract

This research seeks to increase the knowledge of Mário Abreu's work, a graduated architect from Escola de Belas Artes, in Porto, between 1921 and 1930, who lived between 1908 and 1996. He is the author of a vast constructed work, which is essentially located in the city of Porto.

In Mário Abreu's journey we find works with different architectural expressions, differences sometimes so striking that, for this reason, we wouldn't attribute, at first, his authorship to the same person. The different languages of his works are not a product of a disengagement with the different circumstances at all, but rather the result of an ability of adapting to them, as a consequence of their time, their training and their diverse taste, where he analyzes issues such as the place, the customer, the program, the scale and also the desired plastic result. In order to understand his work, it is necessary to walk through several periods of the architectural history.

This investigation comes with a double purpose. At first, to collect and to systematize the documentation related to the object of study, with the aim of promoting a deeper knowledge of the work and its author, little studied so far. In a second moment, supported by the collected and systematized information, through examples that we believe to raise relevant questions and themes, prepare a possible reading on their course and work, reflecting also about their working method.

Keywords: Mário Abreu; Portuguese architecture; Project; Circumstance; Architectural expression.

Landslides associated with precipitation events in Cabeceiras de Basto: the case study of Arosa site

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Abstract

In Portugal, the landslides registered in the last decades have given greater scientific, social and economic relevance to the subject. The municipality of Cabeceiras de Basto and, more specifically, the locality of Arosa (parish of Cavez), was affected at least twice by a damaging event, causing heavy material losses and even lives.

This study aims to: 1) identify instabilities in the territory of Cabeceiras de Basto to build a landslide database; 2) evaluate the morphological and hydroclimatic characteristics of the locality of Arosa; 3) evaluate the relationship between extreme precipitation events and the occurrence of the Arosa landslide.

The main source of data comes from the fieldwork carried out in the municipality, through the collection of points and images of instabilities, location, classification, and characterization of the events. The rainfall data available in the "SNIRH" platform were used to understand the climatic and morphological behaviour.

Some areas were identified as being more prone to landslides in relation to the results obtained. It was possible to establish a correspondence between intense periods of precipitation and instability of slopes. All the inventoried occurrences were preceded by a rainy event, resulting in soil saturation and subsequent instability of slopes and talus. The case study of Arosa proved this reality, being possible to identify the set of days with the most significant influence on the landslide.

Spatio-temporal distribution of free geotagged images (Flickr) into natural protected areas of Portugal

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Abstract

The use of social media in protected area monitoring, although recent, has been prominent in the study of visitor behaviour patterns. Researchers see potential in using user-generated information for spatial and temporal analysis of visitors. This study used georeferenced photographs from the Flickr platform to analyse "visitors" temporal and spatial distribution in mainland Portugal's fourteen selected protected areas. Using the Flickr API and following the methodology of Barros et al. (2019), a sample of 2097 uniquely identified photographs and related metadata that were located within protected areas was collected and processed. The metadata provided information from 1972 to 2021 that were subject to yearly, weekly, and daily comparative statistical analysis, as well as cartographic representations. The results show that the larger protected areas contain more photos but a lower photo density than small areas. On a temporal level, a similar pattern was observed among the protected areas, i.e., many photographs in the warmer months, and at weekends, except for Ria Formosa, Vale do Guadiana and Sapal de Castro Marim. Spatial analysis showed a dispersed distribution with some hotspots in the larger protected areas and more concentrated in the smaller areas. The case of Peneda-Gerês showed several photographic hotspots corresponding to geosites and sites of particular interest located near the roads. With the results obtained, the protected area of Vale do Guadiana showed to be the most attractive by the number of photos arising from the Pulo do Lobo waterfall and its cultural elements. Following the previous elements, the protected areas showed a distribution influenced by the accesses, avifauna, natural conditions, and beaches. Given the results obtained, we conclude that this type of user-generated information can be a viable source for gaining insight into visitor behaviour in protected areas.

Waterfalls in Peneda-Gerês National Park: distribution and tourist significance

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Abstract

The strategies and programmes for enhancing natural heritage and geoconservation must be supported by good practices of geotourism and nature tourism. These types of tourism directed to nature and extreme sports elect natural areas as a target, having waterfalls as a special place. This research aims to investigate how the distribution of waterfalls can influence the tourism offer in Peneda-Gerês National Park (PNPG), considering the northern sector of Lima River.

The goals of this study are: 1) to identify the main waterfalls of the PNPG; 2) to characterise geologically and geomorphologically the river with the highest number of marked waterfalls (Adrão); 3) to show the influence of the waterfalls in the distribution of tourist sites of the PNPG. The study is based on a spatial database with the main waterfalls of PNPG. A deeper analysis of the area with the most significant number of waterfalls was elaborated, using a longitudinal profile. Subsequently, it was analysed the waterfalls disclosed by sites associated with the PNPG, i.e., local authorities, tourist activity companies in the area, among others.

The results gave a database of 26 significant waterfalls. It was possible to ascertain that the Adrão River hotspot is justified by the erosion wave of the Lima River and its tributaries seeking balance. Only seven waterfalls were marked by online research, being mentioned 18 times by the consulted WEB sites. It was verified a little dissemination and visibility of the waterfalls and was noted that the most divulged waterfalls on the WEB are the most significant points in each sector. Compared to promoting other protected areas, the PNPG is unquestionably low for a protected area. Thus, it is essential to increase the visibility, boost and develop geotourism in the area, to improve the economy and tourism of the adjacent localities.

Inhibition of glutamine cellular uptake by xanthohumol results in a cytotoxic effect in MDA-MB-231 cells

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Abstract

Introduction: To support high proliferation rates, cancer cells can have an altered glutamine metabolism, as it becomes an indispensable nutrient that these cells must obtain from external sources by overexpressing its main transporters. ASCT2 is the main sodium-dependent glutamine transporter in breast cancer cells. Our group previously showed that polyphenols can interfere with nutrient transport in breast cancer cells.

Experimental: The effect of xanthohumol, a prenylated chalcone polyphenol, upon glutamine (3H-GLN) uptake by the triple negative breast adenocarcinoma cell line, MDA-MB-231, was assessed and further characterized. A comparative study with the non-tumorigenic human breast cell line, MCF-12A, was also performed.

Results: 3H-GLN uptake was mainly sodium-dependent; Xanthohumol (10 µM) decreased total and sodium-dependent 3H-GLN uptake, and decreased cell viability, proliferation, and culture growth; Xanthohumol decreased Vmax and Km of sodium-dependent uptake, suggesting an uncompetitive type inhibition; Xanthohumol didn´t change the inhibitory effect of GPNA, upon total- and sodium-dependent 3H-GLN uptake, and didn´t interfere with the inhibitory effect of GPNA upon cell viability and proliferation; ASCT2 gene silencing showed that xanthohumol inhibits ASCT2-dependent and independent 3H-GLN uptake and that its antiproliferative effect is ASCT2-independent; Xanthohumol increased sodium-independent 3H-GLN uptake and cell viability, and decreased proliferation of MCF-12A cells; and the combination of xanthohumol and doxorubicin exerted higher antiproliferative effects than the compounds alone, but seemed to attenuate doxorubicin´s cytotoxic activity in a non-oxidative stress relief related manner.

Conclusions: Xanthohumol proved to inhibit glutamine uptake by MDA-MB-231 cells, which related to its cytotoxic activity, proving that targeting glutamine uptake might constitute a potential strategy for triple-negative breast cancer therapy.

Design and Development a Route Planner to Encourage the Use of Public Transport Services in a Pandemic Context

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Abstract

Public transport services play a key role in the mobility of the population in urban centers, allowing the alleviation of chronic congestion phenomena and a commitment to environmental prevention. However, the advent of the COVID-19 pandemic raised several questions about the future sustainability of cities after a significant decrease in the number of trips on public transport around the world. As never before, mechanisms to bring the population closer to public transport services and tools to make them feel safe and comfortable in their use are essential for the continuity of the work done for more sustainable mobility.

This project presents a route planning system for public transport that meets the needs of passengers regarding their protection, safety, and comfort, establishing the objective of rebuilding the population's confidence in mobility using public transport services.

Given the interactive nature of the route planner presented, a User-Centered Design approach was followed during its design and development, comprising three phases: (i) Requirements Elicitation, (ii) Prototyping and (iii) Evaluation.

The knowledge obtained from the systematic review of the existing literature combined with a set of focus group sessions with public transport passengers allowed the initial route planning system's requirements elicitation. The prototyping phase incorporated a process into two iterations of the route planner, the first being a low-fidelity prototype and the second a high-fidelity prototype based on user feedback, which was submitted to an evaluation by potential users through usability tests. The results obtained are a good indicator of the system's functionality and ease of use and corroborate that the route planner meets the main protection, safety, and comfort concerns of travelers.

As an outcome, it was possible to conclude that the route planning system presented is understood as relevant in promoting the use of public transport as a means of mobility.

Simulations of triboelectric nanogenerators and performance optimization

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Abstract

The triboelectric nanogenerator (TENG) is a promising and environmentally friendly energy harvester. This nanogenerator can convert mechanical energy into electrical energy using the contact, sliding, single electrode or freestanding layer mode. In this work, we will focus on the contact mode TENG that can be viewed as a parallel plate capacitor with two electrodes, an air gap with a variable distance and one or two triboelectric materials depending if contact is made between a metal and a polymer or two polymers. The aim of this work is to optimize the energy generation of the TENG by performing simulations using a finite method to better understand the performance of the polymer-polymer contact mode TENG. Optimization parameters include the TENG area, the thickness and permittivity of the triboelectric materials. To analyze the variation of the parameters, the open circuit voltage, short-circuit current and the optimum resistance were used. The results obtained agree with the existent models for the contact mode TENG for the case of the short circuit current. To be more specific, the short circuit current increases (decreases) with the increase of the area of the TENG (thickness of the material). The optimum resistance increases with the increase of the thickness of the material and decrease with the area of the TENG which is also in agreement with the contact mode TENG model. As for the open circuit voltage, only the permittivity results agree with the contact mode TENG model predictions. Possible explanations will be given for the disagreeing results.

Allotment gardens in the urban landscape: historical evolution and relevance in the Covid-19 pandemic

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Abstract

Urban allotment gardens and community gardens have always been present in the urban landscape throughout the evolution of cities, playing a crucial role in periods of crisis. This research aimed to build a narrative about the role of urban allotment gardens in social, political, economic and environmental aspects in different historical periods, namely in the dawn of the Industrial Revolution, in the two World Wars, in the economic depressions, and in the modern economic and environmental crises, culminating in the current crisis caused by the Covid-19 pandemic.

The method used in this research was a narrative bibliographic review, in which scientific and informative materials on the subject were investigated, including a brief analysis of internet search trends, in some European countries, on urban allotment gardens during the pandemic, in order to identify a possible increase in interest in this topic. Results showed that urban allotment gardens have great historical importance in terms of food security and physical and mental well-being. At the end of 18th century and in the 19th century, these spaces were highlighted in several proposals for an ideal urban model. Urban allotment gardens surpassed the importance of public parks on the public agenda during the two World Wars and the Great Depression, when they became fundamental in providing food and emotional support to the population in several countries, reaching political relevance and numbers never seen before. With the subsequent resumption of economic growth, they spent a long period being associated with misery. Since the 1980s, its potential has been recognised, resulting in a growing interest from the population across Europe. Recent studies show that, as in the past, urban gardens have increased their relevance in the current Covid 19 pandemic. This situation could be perceived in this study, namely by the detection of a sudden increase in internet searches for this topic during the Covid-19 crisis.

The Egas Moniz House in Avanca: A Communication Perspective of This Architectural Heritage

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Abstract

The building known as «Casa-Museu Egas Moniz» was the family home of the Portuguese physician Egas Moniz.

The present paper has, as its main goal, the study and analysis of the building Casa Egas Moniz having, as primary source, a documentary present on RTP Archive entitled «Casa-Museu Egas Moniz». Methodologically, the course of work was complex, not limited to the analysis of this source but relying heavily on the analysis, and interpretation, of architectural plans.

The analysis was based on the intersection of several methodological approaches such as: visits to the building in close relation with the memories book of Egas Moniz ('A Nossa Casa'), as well as readings and varied studies, through textual and iconographic sources and bibliographic references.

This building, `Casa do Marinheiro´, as it is also known was, in 1915, according to a project by Ernesto Korrodi, subject to a major renovation in order to preserve the remainings from ruin. A modern construction was built there, related with a chalet architecture, according with two lines of action: the conservation of what was possible to maintain from the primitive family house, of an earlier but unknown chronology; the construction, on the foundations of the old house, of new parts that constitute the current building, in close relation with the landscape that surrounds it.

The present study allowed the development of a renovated perspective of analysis of the present architecture, resulting in an alternative and different communication product from the one presented by the documentary, focused on the museum and its patron. We created, therefore, an alternative narrative layer for the images of the documentary, allowing a better understanding of the architectural forms and their meanings. Consequently, we also emphasized their patrimonial value and the necessity of knowledge that ensures a better recognition, protection, and fruition of the object.

“Exotic” collections: a preliminary analysis of a neglected set of vascular plants from the INA herbarium

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Abstract

Until our days, Instituto Nun´Alvres (INA), a college located near Santo Tirso (northern Portugal), has a substantial collection of herbarium specimens, although poorly studied, containing important plants and other data so far little explored. It is composed of almost 3000 specimens collected not only by Jesuit priests who lived and worked in the school, but also by many contemporary botanists from across Portugal, with a great number of collection sites, and collection dates spanning the entire twentieth century.

The present study was set to explore the collection specimens labeled as "Exotic", which consisted of two folders. We came to understand that exotic included "foreign" sensu lato. With this in mind, we tried to evaluate the collector's definition of "exotic", reviewing it in light of the current concept, considering them either "foreign" (not from Continental Portugal), "exotic" or "invasive", "ornamental"/ "cultivated". We began by doing the standard curatorship work, which involved numbering and creating a database with the metadata of each specimen, but also mounting and arranging them. Thereafter we carried out a taxonomic and ecological revision, listing them and reviewing their current taxonomic name, in order to later compare the represented species´ presence with the current data.

The "exotic" group comprises a set of 63 specimens, collected by 7 collectors, the main of which is the Jesuit priest Alphonse Luisier, with places of collection all over mainland Portugal, Azores, and even Switzerland, where Luisier was born. The main affiliations of collectors are as follows: Estação Agronómica Nacional - Herbário, Herbário do Colégio de Campolide, Herbario do Instituto Nun'Alvres - Caldas da Saúde, Jardim Colonial de Lisboa. Dates of collection range between 1896 and 1994 and the two most represented years are 1941 and 1942. The set is composed of 33 families, 45 genus and 48 species, with 3 of these identified only up to the generic level.

Chitosan conjugates: Synthesis and Antitumor Activity

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Abstract

Marine polysaccharides are interesting compounds due to their unique properties, such as biocompatibility, biodegradability and absence of toxicity, and their biological activities, including antitumor [1]. Chitosan, a deacetylated derivative of chitin, is an example of an interesting marine-derived polysaccharide. The functional groups present in this biopolymer enable a wide variety of chemical modifications [2]. Furthermore, chitosan is also a promising chemical substrate to undergo conjugation with other molecules, including bioactive compounds. Both chemical modifications and coupling methods are responsible for improvements in the properties of these compounds, such as solubility, and in their biological activities, expanding the range of applications [3, 4].

In this work, the synthesis of eight conjugates of chitosan is described through a coupling method involving the formation of a Schiff base between chitosan and diverse bioactive small molecules. The structure elucidation of the synthesized conjugates was established by spectroscopic methods, and elemental analysis. The obtained conjugates were tested for the inhibition of the growth of the human tumor cell lines, A375-C5 (melanoma), MCF-7 (breast adenocarcinoma), and NCI-H460 (non-small cell lung cancer). Considering the biological activity evaluation, one conjugate demonstrated promising results, with GI50 values lower than 6.83 ± 0.90 for all cell lines.

Acknowledgements

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References

1. Liu, C. et al. Carbohydr Polym. 2022, 283, 119097.
2. Yu, D. et al. Mar Drugs. 2022, 20(1), 69.

3. Benchamas, G. et al. Trends Food Sci Technol. 2021, 107, 38-44.
4. Dohendou, M. Int J Biol Macromol. 2021, 192, 771-819.

Online sex work using content delivery platforms: an exploratory study

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Abstract

The expansion of the Internet and its use led to transformations at all levels, and the sex industry was no exception with the emergence of online sex work which encompasses several ways of performing it, including online sex work using content delivery platforms. Although this is a growing phenomenon, the scientific literature has not kept up with this trend, leaving this topic unexplored and the voices of its actors unheard. Thus, to contribute to filling the research gap on this topic, especially in the national context, this exploratory study aimed to describe, explore, and understand the use of content delivery platforms for online sex work.

Therefore, we conducted ten semi-structured interviews with women who use content distribution platforms for online sex work and analyzed them using thematic content analysis, from which six themes emerged: characterization of online sex work, trajectories in online sex work, risks and benefits, consequences of performing online sex work, and clients. We concluded that the context of online sex work is characterized by diversity in all its dimensions, influencing the women who perform it in different aspects of their lives. The clients are also described as a heterogeneous group, motivated mainly by the search for authenticity and intimacy. Furthermore, stigma is presented as something that puts intense pressure on people who perform online sex work, affecting them personally, in interpersonal relationships, and regarding employment and education, largely due to the promiscuity-victimization duality through which they are seen.

This study seems to address the lack of knowledge on this emerging phenomenon, understanding how this industry operates and the perceptions and experiences of those who participate in it, seeking to give voice and empower this population. We hope that this work will prompt new research in the area and a reduction of stigma towards those who perform online sex work, reducing its negative influence.

VOC in private dwellings: Levels and risk assessment

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Abstract

As people spend 90% of their time indoors, up to 70% being at home, indoor air quality in these environments is relevant parameter for human health. Volatile organic compounds (VOCs) are an important class of hazardous air pollutants (HAP). They can cause various acute symptoms while exposure to some VOCs can lead to chronic health risks. This study aims to identify VOCs levels in private households and evaluate the associated risks. The sampling was done in 64 homes situated in Porto Metropolitan Area. VOCs were collected during 8 h, simultaneously in various indoor spaces (living room, bedroom) and outdoors, using sorbent tubes (Tenax TA, 60/80 mesh). Automated thermo-desorption combined with gas chromatography (GC-FID) was used for the quantification. VOC concentrations were identified for the total content (TVOCs) and 7 specific compounds: benzene, toluene, trichloroethylene, tetrachloroethylene, pinene, limonene and xylene.

The results showed that TVOCs were 5 times higher indoors, with an average of 219 µg/m3 (range 0.3-1616 µg/m3), then outdoors (43 µg/m3; 5.2-203 µg/m3). Evaluating the seasonality, the highest indoor levels were observed in winter (mean: 388 µg/m3), most likely due to the limited ventilation. In autumn, the concentrations averaged 218 µg/m3 whereas no significant differences were observed between summer and spring (122 µg/m3). The Portuguese limit of 600 µg/m3 (defined as TVOCs air of public buildings) was exceeded in 16% of all examined homes, indicating possible risks for the occupants. Finally, the results showed that limonene was the most abundant compound among the 7 species, with mean of 19 µg/m3 and constituting 9% of TVOCs.

Acknowledgements

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Impact of Adenosine on Sensitivity of Triple Negative Breast Cancer Cells Towards Platin-Derived Chemotherapeutic Drugs

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Abstract

Background: Cancer is one of the leading causes of death worldwide, approximately 7% of deaths were attributed to breast cancer. Triple negative breast cancer (TNBC) - one of the most aggressive breast cancer subtypes - holds poor survival rates [1]. Treatment resistance in tumors has become a serious issue, resulting in decreased drug efficacy [2]. As a result, new therapeutic approaches are an urgent quest. Adenosine (ADE) is a nucleotide present in higher concentrations in the tumor microenvironment and recently has been described to interplay with cisplatin (CIS, as well as Carboplatin, CAR, chemotherapeutic drug used in the clinical practice) sensibility in ovarian cancer [3].
Aims: This work aims at evaluating the effects of ADE in TNBC resistance.
Methods: The effects of preincubation of ADE with CIS or CAR were studied in triple-negative breast cancer sensitive (MDA-MB-231-S) and cisplatin-resistant (MDA-MB-231-R) cells using the LionheartFX automated microscope. Data were analyzed with One-way Anova test.
Results: The antiproliferative effects elicited by CIS and CAR on MDA-MB-231-S and MDA-MB-231-R was higher in sensitive than in resistant cells (IC50 are at least 10 times higher for CIS, while CAR was dependent on exposure, peaking at 72h). Preincubation of ADE (300-1000 µM) with CIS revealed a reduced resistance in MDA-MB-231-R with IC50 decreasing and approaching those of CIS in MDA-MB-231-S.
Conclusions: Adenosine contributes to an increased antiproliferative activity exerted by cisplatin in MDAMB231R, presenting a novel option for combination drug treatments using a compound naturally found it the body.

Acknowledgements

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References

1-Ferlay, J., et al., Cancer statistics for the year 2020: An overview. 2021
2-Vasan, N., et al., A view on drug resistance in cancer. Nature, 2019. 575(7782): 299-309
3-Sureechatchaiyan, P., et al., Adenosine enhances cisplatin sensitivity in human ovarian cancer cells. Purinergic Signal, 2018. 14(4): 395-408

Psychostimulant induced-neuroinflammation: clarifying the astrocyte-microglia crosstalk under IL-10

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Abstract

Methamphetamine (Meth) is a highly addictive psychostimulant. The classic hallmarks of Meth-exposure are usually associated with disruption of the dopaminergic/glutamatergic systems. However, Meth is now also recognized for causing glial reactivity. In this context, our lab has recently demonstrated that microglia reactivity under Meth-exposure is mediated by astrocytic release of glutamate in a TNF-dependent manner. Therefore, resort to successful ways of counterbalancing this reactivity may be protective against Meth. In our preliminary data we demonstrated that an in vivo overexpression of IL-10, an anti-inflammatory cytokine, leads to protection against Meth induced effects, namely behavioral alteration and microgliosis. Here, we aim to clearly determine the role of IL-10 overexpression for each cell population, namely microglia and astrocytes. We intend to dissect the nature of the crosstalk between such cells with Meth under increased doses of IL-10. To do so, primary cultures of astrocytes were treated with Meth and recombinant IL-10. In these cells, we intend to assess the release and production of TNF-alfa and glutamate. In primary microglia cells, treated with Meth and IL-10, we investigated if IL-10 could prevent ROS, iNOS and pro-inflammatory cytokines increased expression. We also aim to explore how IL-10 affects microglial phagocytic activity upon Meth administration. So far, our results showed that in microglia exposed to Meth, IL-10 increased levels could prevent microglial phagocytic activity, a hallmark of microglia reactivity. Based on the results obtained this far, we predict that manipulating IL-10 under Meth exposure will prove to be a successful and innovative approach to devise treatment strategies for substance abuse disorders.

Assessing invasive dune vegetation through multispectral imagery: a Northern-Portuguese case study on Carpobrotus edulis

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Abstract

Sand dunes are important natural habitats that provide coastal protection against wave and wind impacts. Their integrity and preservation are intrinsically connected with dune vegetation. However, dune ecosystems face numerous threats, with dune plants being susceptible to disturbance and heavily affected by human activity, invasive species, and changes in ecosystem functioning.

An abundant invasive species in Northern Portuguese dunes is the ice plant *Carpobrotus edulis*. This perennial creeping subshrub, with fleshy leaves and large pink or yellow flowers, was introduced as an ornamental plant and planted to stabilise slopes. However, it presents a threat. It is fast-growing, taking water, light, nutrients, and space away from native species.

The present work aims to develop and test a remote-sensing methodology for (i) identification of *C. edulis* based on its spectral signature and (ii) determination of *C. edulis* cover and biomass in sandy dunes. Dune areas with patches of *C. edulis* were surveyed simultaneously in-situ and with a multispectral camera mounted on a UAV. Invaded areas were identified on the ground, and quadrat frames were placed and georeferenced with a precision GNSS for remote-sensing image classification and *C. edulis* aboveground biomass collection. Dry biomass was subsequently measured in the lab for the plants' living (green) and dead parts. Several spectral band combinations and indices were tested for their ability to estimate *C. edulis* cover. Regression models were used to relate the biomass collected in the field with the indices obtained by the spectral images. The different spectral band combinations/indices models were compared in terms of performance (explained variance and error) and accuracy to appoint the most suited approach for *C. edulis* biomass estimation. The proposed methodology may support future research in remote sensing and facilitate monitoring this invasive species' expansion and dynamics.

Physical, chemical and environmental characterization of soils and sediments potentially affected by the tailings of the Ribeiro da Serra mine

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Abstract

The North of Portugal is particularly rich in metallic and non-metallic mineral resources. Mining wastes resulting from the exploration and processing of these resources have been deposited near the mines and, in many cases, remain until today without any recovery or maintenance.
The main objective of this work is to characterize the environmental impacts resulting from the processes of mobilization of harmful elements, originated from the activities of the former mine Ribeiro da Serra in Valongo, Porto.
The methodology is the physical characterization of the samples (density and porosity, granulometry, terminal velocity of particles in water), chemical characterization (elemental, mineralogy, pH) and environmental characterization (carbons, natural leaching tests, chemical composition of the residues, acid generation tests, BOD soils).
The preliminary results showed the present of several heavy metals and metalloids (Pb, Zn, Mn, As, etc) and an average pH of 4. Several laboratory characterization tests are still on going.
These results cover the identification and quantification of hazardous elements, allowing the comparison of the pollutants concentrations in the soils and waste piles with the applicable legislation limits and other literature case studies. It was concluded that there is the contamination by several metals, decreasing the pH of the soil, in the surrounding mining area.

Acknowledgments

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The role of epithelial glycosylation in colorectal cancer immunosurveillance

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Abstracts

Colorectal cancer (CRC) is the third most common cancer worldwide and the second leading cause of death. Around 20-35% of CRC cases arise from the alternative serrated pathway, characterized by sessile serrated adenomas as precursor lesions. These lesions easily escape clinical examination, being detected in advanced cancer stages. Moreover, despite this pathway presenting a high immune infiltrate, patients do not respond to the existing immunotherapies, constituting a major clinical concern. Thus, it is crucial to study this pathway to find an effective therapeutic strategy.

Glycans form a dense layer on the surface of all cells (glycocalyx) being involved in several key molecular processes, including tumor immunoediting (Pinho&Reis, Nat Rev Cancer 2015). Recently, our group described the association between aberrant expression of complex branched N-glycans with tumor progression and immune evasion in sporadic CRC (Silva&Fernandes et al. Cancer Immuno Res, 2020). The removal of branched N-glycans in CRC cells was found to potentiate immune recognition.

In this study, we aim to characterize the epithelial glycoprofile of tumor cells along CRC carcinogenesis, focusing on serrated premalignant lesions. We have characterized the epithelial glycoprofile of serrated lesions (adenomas and derived CRC) from patients´ paraffin samples by histochemistry. Our data showed a gradual increased expression of branched N-glycans along CRC carcinogenesis that was accompanied with a decreased expression of the immune recognition by glycan-binding receptors on immune cells. Moreover, we demonstrated that in vitro glycoengineering of 2 CRC cell lines (MC38/CT26), promoting an altered glycosignature towards simple/non-branched N-glycans, had impact in the modulation of immune response. Overall, our results highlight the key role of the epithelial glycoprofile at premalignant stages and reveal the potential of its modulation as a novel immunotherapeutic strategy.

Barriers and facilitators of the notification by General Practitioner Doctors of cases of Domestic Violence

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Abstract

Introduction: Domestic Violence (DV) is a serious, prevalent public health problem with devastating consequences for victims and families. To combat this problem, DV became a public crime in Portugal. This implies that the reporting of DV cases is a duty and, in some cases, mandatory, particularly for health care professionals. General practice doctors are in a privileged position to detect and report DV cases to the authorities. However, little is known about what motivates these professionals to file (or not) a complaint.

Objectives: The main aim of this study is to determine the opinion of general practice doctors regarding DV and which factors constitute barriers or facilitators to reporting cases to the authorities.

Methodology: Semi-structured interviews were conducted with doctors from Portugal's Regional Health Administrations. These interviews were audio-recorded for later analysis using thematic analysis techniques.

Results: Four themes were identified. One of the main themes, "Position towards the law," reveals a marked dichotomy in its sub-themes, since most doctors seem to agree with the reporting requirement for the general population, but a subgroup has the opposite view when this obligation is particularized to health professionals. This dichotomy extends to the remaining themes "Role of the Physician," "Barriers to Reporting," and "Reporting Facilitators." Some of the principal sub-themes that constitute barriers to reporting seem to be "Respect for the victim's autonomy," "Fear of recurrence/escalation of violence," and "Medical secrecy." The main reporting facilitators include the perception of "Imminent Life Danger" and "Involvement of a fragile person.

Conclusions: There is a scarcity of studies that analyze the effectiveness of mandatory reporting laws of DV. The themes and sub-themes identified in this study constitute many of the concerns and opinions expressed by both victims and health professionals internationally.

Fostering chemical sustainability in HIV drug research

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Abstract

The human immunodeficiency virus (HIV) is a retrovirus that infects CD4+ cells, such as T helper cells and macrophages. Over time, HIV infection results in a very significant decrease in CD4+ cells and, if left untreated, can lead to the development of acquired immunodeficiency syndrome (AIDS). Highly active antiretroviral therapy (HAART) is the most effective therapy currently available for patients with HIV as it successfully suppresses the replication of the virus, resulting in reduced morbidity and mortality associated with HIV infection, as well as improving the lifespan of patients.

Protease inhibitors (PIs), such as Amprenavir and Darunavir, are a class of antiretroviral drugs used in HAART that prevent the formation of infectious HIV by inhibiting the viral enzyme protease and thus hindering the maturation of the viral particles. However, the crescent use of PIs in chronic therapy induces mutations in HIV and results in the development of drug-resistant strands. Therefore, there is a constant necessity for the discovery of novel antiretroviral pharmaceuticals as a means to fight resistant strands of the virus. A common research approach in this regard is the design and synthesis of Amprenavir/Darunavir analogues by the replacement of the P2 group, conserving the (R)-(hydroxyethyl) sulfonamide structural motif (P1, P1´, and P2´ sites), which is relevant for the pharmacological properties of these compounds (Figure 1).

In this work, a new practical and more sustainable method for the synthesis of the (R)-(hydroxyethyl) sulfonamides is disclosed and compared to other approaches reported in the literature. This method is expected to improve HIV drug research as an effective and reproducible synthetic route for Amprenavir/Darunavir and structure-related analogues.

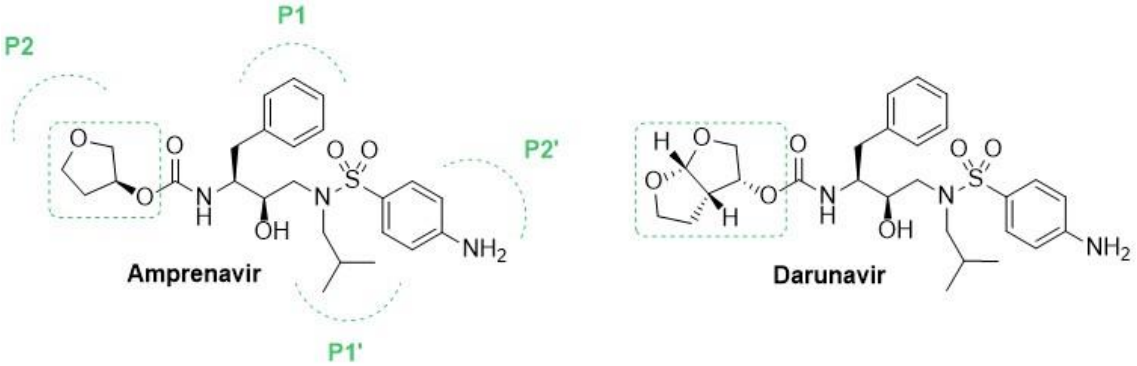

Figure 1. Structures of highly active HIV protease inhibitors Amprenavir and Darunavir, demonstrating the conserved structural motif (P1, P1', and P2' sites).

Context and Morphology of the body-text page model in books for extended reading

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Abstract

Books are objects made up of a structure rich in details and hierarchies of information which exceed the main body-text of the literary work. Those pieces of information, named paratexts, can be of pragmatic, semantic, and aesthetic-literary nature, and contribute to the editorial object as to the reading of its content (Genette, 1987). Within the scope of the editorial design, the study of paratexts reveals some shortcomings in their morphological definition as well as the need for their synthesis and contextualization. In this article, we address these issues by using one of the most common paratexts as a case study: the main body-text page of a book for extensive reading, focusing on its various neighboring elements (eg. page number, notes and running titles).

This study intends to make a historical contextualization and definition of those elements. Afterward, we expand on further critical thinking about the page model of the main body-text. Using a literature review and adapting its historical context to its current use, we propose to compile it from a meta-analysis methodology into a morphological compendium.

Dive into the blow microbiome: exploring microbial diversity of the respiratory tract in free-ranging cetaceans

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Abstract

Cetaceans are key species and sentinels of the marine ecosystems and ocean health, being a strategic group to evaluate the well-being of aquatic ecosystems and to detect harmful environmental trends. Respiratory disease is one of the main causes of death in these animals. Characterizing microbiomes related with their respiratory tracts may constitute a suitable indication of health. For that, the study of microbiomes presents in their exhaled breath condensates (EBCs), or blows, has been proposed as a biomarker for assessing respiratory health. In the present study, the short-finned pilot whale (*Globicephala macrorhynchus*) was used as a model species to explore the microbial diversity of the respiratory tract. A total of 22 EBC samples collected in 2018, along with seawater controls, were analyzed from individuals of Madeira Island. Further, 1 sample of a sperm whale (*Physeter macrocephalus*) EBC was investigated. The DNA was extracted from samples and then sequenced to amplify V3-V4/V4-V5 hypervariable regions of 16S rRNA. Until now, we analyzed 13 blow and 9 water samples targeting V4-V5 using DADA2 bioinformatic pipeline. Preliminary results show that the composition of the bacterial community of the respiratory tract differs from seawater controls and are mainly composed of 4 major phyla: Proteobacteria, Firmicutes, Bacteroidetes, and Actinobacteria.

In-depth taxonomic description of the blow microbiomes will provide commonalities and differences among the samples, providing a detailed description of the blow microbiome and the presence of potential pathogens. The next steps will include a comprehensive comparison of different 16S rRNA primer sets to select the most suitable 16S rRNA target region to investigate microbiomes in the EBCs and seawater. This study will provide a network of consistent core taxa from the blow of short-finned pilot whale microbiome to ultimately develop an innovative non-invasive methodology for cetacean health monitoring.

A cardio-oncology study in AC16 cardiac cells involving the new targeted therapies, imatinib, sorafenib and pazopanib

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Abstract

A major shift in cancer treatment occurred with the development of molecular-targeted drug therapies, but cardiac complications are still the second cause of mortality in cancer-treated patients. Cardiotoxicity of anticancer drugs was mainly attributed to non-specific cytotoxic drugs but it has recently become clear that targeted therapies present numerous cardiac adverse effects. To Therefore, the objective of this study was to assess if new targeted therapies (imatinib, pazopanib and sorafenib) cause cardiotoxicity in vitro at clinically relevant concentrations.

All drugs were tested in differentiated human AC16 cells as the cardiac in vitro model, at concentrations lower than 100µM. Two time-points were tested (24 and 48h) and two cytotoxicity assays were performed: the lysosomal neutral red (NR) uptake assay and the MTT reduction assay. Furthermore, an autophagy inhibitor, 3-methyladenine was also tested to determine its role on the cytotoxicity assessed at 24h. Mitochondrial potential was also determined using the JC-1 probe.

In both assays used, while sorafenib and imatinib presented dose and time-dependent cytotoxicity, pazopanib led to time-dependent toxicity, with no clear dose dependence. While in most conditions 3-methyladenine gave no protection towards the tested drugs, it provided a small but meaningful protection towards sorafenib (20µM) in the NR uptake assay at 24h. Moreover, mitochondrial depolarization was found at 24h for imatinib (50µM), pazopanib (10, 20 or 50µM) and sorafenib (5, 10, 20µM), being especially marked in the latter drug.

To conclude the anticancer targeted drugs are cytotoxic at relevant clinical concentrations. The cardiotoxic profile of the tested drugs was dissimilar, being sorafenib the most cardiotoxic. Autophagy and mitochondria dysfunction were possibly involved in the cytotoxic effects, according to the preliminary data gathered so far but evaluation of proteins involved in apoptosis and autophagy is presently underway.

Phosphorus Removal Using Biochars Produced from Cork Dust

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Abstract

Phosphorus (P) is a mineral nutrient that is indispensable and crucial for supporting life on Earth. Its incorporation and subsequent assimilation by plants is essential for their development, which is why the application of phosphorus as a fertilizer is imposed from early on as common practice to maximize agronomic gains [1]. However, given the finite reserves, it is imperative to ensure effective management of its application and consequent recovery in order to optimize its sustainable development.

Adsorption using biochars is an attractive alternative for the recovery of low concentrations of P. This process has a high selectivity and is characterised by a rapid adsorption rate [2]. However, given the low aqueous P adsorption capacity of conventional biochars, there is a need to modify their physical and chemical properties. The use of cork as biomass to produce biochars for the removal and recovery of P is a pioneering approach; the dominant position of Portugal's producing and transforming industry in the global panorama makes its adoption an economic and environmental approach worthy of analysis [3].

Therefore, based on a fractional factorial experimental design, 8 biochars were produced that differ in 6 factors: impregnated metal, duration of impregnation, as well as the pyrolysis ramp, temperature, duration and gas.

It was possible to confirm the efficiency of the procedure adopted, where the adsorption capacity of the best biochar was fixed at 10.33 mg/g; Mg cemented its position as a preferred metal, whose biochars retained between 37% and 51% of the P in solution.

Acknowledgements

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References

[1] Greenpeace International, Tech. Report, (2012)
[2] Diaz, R. J. et al., Science., 321, (2008) 926
[3] Muñoz-Adalia, E. J. et al., New For., 52, (2021), 863.

Visual Communication in the dissemination of Architectural Knowlegde

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Abstract

Communication is an investigation field present in a variety of disciplinary areas and, in the case of architecture, visual communication stands out, as we can see by the architects´ interest in the design of architecture books since many centuries ago.

Architecture excels as an imagery art and visuality is a concept present in its different phases, from design, to production and communication. However, this was not always the case.

We consider three crucial moments in the history of architecture´s visual communication which will have a huge impact on its conception and dissemination. They are the possibility of mechanical reproduction of images, the rise of a mass culture and the digital revolution of the 20th century.

The present investigation seeks to explore, on one hand, the role of visual communication in the dissemination of architectural knowledge, and, on the other hand, the architect's participation in it, communicating architectural works and projects to a wide and anonymous public non-specialized in this field.

Knowing that architecture has a common root with the other arts, the condition of forms´ creator and spaces´ organizer, inherent to the architect, can be transposed to various disciplinary fields, such as communication design. In this context, it seems relevant to address how the both subjects share basic concepts, such as scale, structure, proportion, shape and composition, since the layout of a spread is also known as graphic architecture.

The present abstract is part of a research project Schools: Complexity and Interpretation (CEAU-FAUP) and the development of the architecture master's thesis (MIArq) supervised by Profº André Santos and Profº Emanuel Barbosa.

The communication materials of this project constitute the case studies that will be developed in the approach of this theme. How do we communicate architecture?

Parabens removal from wastewaters by microalgae – effects of carbon levels in bioremediation

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Abstract

Parabens are emerging contaminants for which the conventional methods for wastewater treatment are not effective for their removal. To overcome this limitation, bioremediation using microalgae is regarded as a reliable solution. However, considering parabens as carbon source for microalga growth in mixotrophy, their removal can suffer an interference due to the competition of alternative carbon sources present in the wastewaters - diauxic growth.

The main objective of the present work was to evaluate the effects of wastewater composition, specifically carbon source concentration, as glucose, on the ability of the microalga *Chlorella vulgaris* to remove methylparaben (MetP) at 0.796 and 7.96 mg/L (10 and 100 times higher than the maximum value found in wastewater). For this, the composition of a synthetic wastewater (SWW) was manipulated to have a glucose concentration of 0, 3, 30 or 300 mg/L. The effects of MetP on microalgae were evaluated in terms of microalga growth, removal of nitrogen, phosphorus and MetP, as well as the production of photosynthetic pigments (chlorophyll a, chlorophyll b and carotenoids). Based on the results obtained, it was possible to conclude that higher concentrations of glucose decrease the microalga growth, reducing the specific growth rate, as well as the production of photosynthetic pigments. Moreover, C. vulgaris was found to be efficient in the removal of nitrogen and phosphorous in the presence of MetP. It was also verified that the presence of MetP in SWW did not affect the microalga growth for the concentrations studied. The microalga was able to completely remove MetP (over 90%) from SWW. However, for the highest glucose concentration, the constant rate of degradation decreased and the half-life time of MetP increased, taking longer to degrade the contaminant.

Keywords: *Chlorella vulgaris*, methylparaben, microalgae bioremediation, wastewater.

Plant extracts as biopesticides: chemistry, bioactivity and nanoencapsulation

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Abstract

The potential of plant extracts as bioinsecticides has been described as a promising field of agricultural development. In this work, the extracts of *Punica granatum* (pomegranate), *Phytolacca americana* (American pokeweed), *Glandora prostrata* (shrubby gromwell), *Ulex europaeus* (gorse), *Tagetes patula* (French marigold), *Camellia japonica red* (camellia*), Ruta graveolens* (rue or herb-of-grace) were obtained, purified, and their activity against *Spodoptera frugiperda* (Sf9) insect cells was investigated. From the pool of over twenty extracts obtained, comprising different polarities and vegetable materials, less polar samples were shown to be more toxic towards the insect cell line Sf9. Among these, a dichloromethane extract of *R. graveolens* was capable of causing a loss of viability of over 50%, exceeding the effect of the commercial insecticide chlorpyrifos. This extract elicited chromatin condensation and the fragmentation in treated cells. Nanoencapsulation assays of the cytotoxic plant extracts in soybean liposomes and chitosan nanostructures were carried out. The nanosystems exhibited sizes lower or around 200 nm, low polydispersity, and generally high encapsulation efficiencies. Release assays showed that chitosan nanoemulsions provide a fast and total extract release, while liposome-based systems are suitable for a more delayed release. These results represent a proof-of-concept for the future development of bioinsecticide nanoformulations based on the cytotoxic plant extracts.

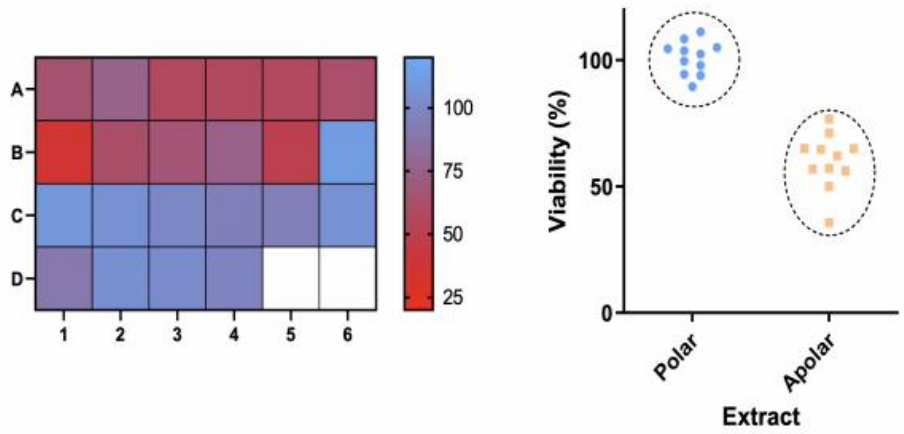

Figure 1. Left: Results of the viability (%) of insect cells after treatment with the indicated samples. Right: Comparison of the viability of cells treated with non-polar (A1–B5) vs. polar (B6–C4) extracts.

Communication about Hereditary Cancer Risk to Offspring: A Systematic Review of Children''s Perspective

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Abstract

Objective: The present work aims to gather research that listens to the voice of children growing up in a family affected by hereditary cancer syndrome.
Methods: Searches for studies between 1990 and 2020 on MEDLINE and EBSCO were undertaken, and fifteen studies met the inclusion criteria. The findings informed: (1) how, when and what is discussed about hereditary cancer risk in the family; (2) how does family communication about hereditary cancer risk impact children on psychosocial and behavioral outcomes; (3) what are the child´s preferences regarding hereditary cancer risk communication within the family.
Results: Findings showed that disclosure is done mostly by both parents or mothers only, and children reported agreeing with that process. Children suggested that it would be helpful to meet with a genetic counselor and receive written materials. Feelings, such as being frightened or disturbed, surprised with the information, feeling scared or unhappy surrounding the event, and concern about the increased risk of cancer were described. Children realized the potential implications of the risk through their parents´ experiences. Offspring valued open communication and the opportunity to bring up the topic of genetic risk comfortably with a parent.
Conclusions: Findings suggest that offspring may be open to, and have a need for greater choice in how information concerning their potential risk may be provided prior to the age of their involvement in testing as pointed out by the current guidelines. Genetic counselors can support communication within the family system to further support the primary recipient in their plans and process of disclosure.

Keywords: Child, Family, Genetic Predisposition to Disease, Communication.

Psychological Barriers to Pro-climatic action in Portugal

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Abstract

The importance of individual behavioural change has been increasingly recognized for combating climate change. However, being concerned about climate problems and knowing the importance of individual actions in combating them is not enough for greater adherence to a more sustainable lifestyle. In this project, we examine psychological factors such as (1) lack of knowledge; (2) conflicting goals; (3) social influences; (4) external accountability; (5) finding the change unnecessary; and (6) tokenism, that can act as barriers to more pro-climate action in individuals concerned and aware of climate issues. A preliminary sample of Portuguese respondents (n=438) revealed that, in general, there is a high awareness of the harmful human impact on the climate and concerns related to the consequences that climate problems can have on nature and humans. Furthermore, behaviours like reducing the use of personal transport, consuming less meat, and sustainable purchases are performed less frequently than environmental behaviours with a lower potential for reducing the carbon footprint, such as recycling or saving energy and water. For these behaviours, the lack of knowledge, other conflicting life goals and external accountability in the face of climate problems act as the primary psychological barriers.

Public space under review. From pedestrian's accessibility and mobility design towards a qualified, sustainable, and inclusive city

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Abstract

By recognizing the major role of architecture and research by design as a discipline and instrument for the study and the framing of urban space, architects become major actors in the definition of urban shape, allowing a diversity of uses and appropriations, seeking to provide a qualified, sustainable, and inclusive urban life.

With the research undergoing we seek to approach the design of the city through public space. By focusing our analysis through the lens of the accessibility and mobility of pedestrians we aim to determine the guiding lines that define a good and contemporary design for public space. The study will focus on the practical aspect of the re-design of pre-existing public spaces and public infrastructure pursuing the best possible solution considering the specific circumstances at hand. The goal is to understand how mechanisms behind the regeneration of deprived urban areas can happen through a new solution of public space that must privilege a qualified environment that we which to be safe, inclusive, and which to be able to generate a pleasant community life. It is about rethinking the accessibility and mobility at a human scale, infusing the problems from the current city and its design, as well as rethinking the relation with those who inhabit it.

Several issues arise about the city and the people who inhabit it, which call both for urban planning and sociology field approaches. From the study of theories, ideas, and projects of the past, we seek to confront them with contemporary theories, ideas, and projects. Basically, it is about finding practical answers to questions such as: What is the 'city for all' today? What is the 'ideal city'? How can we take advantage of the infrastructure that already exists and promote equal conditions of access and mobility, as well as qualified and equity conditions for the whole of society?

This research integrates an integrated master thesis being developed under the supervision of Professor Raquel Paulino.

Screening of *Candida albicans* urinary tract infections by electronic nose

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Abstract

Fungus caused urinary tract infections (UTIs) are often misdiagnosed. Since culturing procedures are time-consuming, practitioners prophylactically prescribe antibiotics, which are ineffective. Hence, there is a need for reliable methods to detect infectious concentrations of fungi in urine. Since Candida spp is the main responsible for mycological UTI, this study focuses on the detection of candiduria by analysing volatile compounds (VOCs) profiles released by the fungus´ metabolic activity in urine.

The aim of this study was to develop and internally validate a detection algorithm for identifying the presence of pathological levels of *Candida albicans* in urine, using an electronic nose.

To identify the VOCs profiles, the Cyranose 320 (Sensigent, USA) eNose, composed of 32 conducting polymer sensors, was used. Firstly, to optimize the eNose settings, urinary VOCs emissions were tested in terms of substrate heating temperature, as well as acquisition and purging times. Subsequently, 10 glass assay tubes containing urine from a healthy donor and 10 tubes containing urine inoculated with infectious levels (2.3 x 10^7 CFU/mL) of *Candida albicans* were analysed, in duplicate, with the eNose and resulting data were used to build the detection algorithm through recursive partitioning regression trees. The algorithm was then internally validated and efficacy measurements were retrieved. The Mann-Whitney test was then used to study the hypothesis of sensor 6 (S6) response between the groups.

There was clear differentiation between healthy and infected urine samples (Figure 1). The algorithm reported optimal discrimination of samples using S6 with a cut-off sensor response of 239 x10^-6, with a sensitivity of 85.0%, a specificity of 90.0% and an accuracy of 87.5%. The S6 response was significantly different between groups ($p<0.001$).

In conclusion, this study is promising and, in the future, with further validation using real UTI patients, it may contribute for better diagnosis.

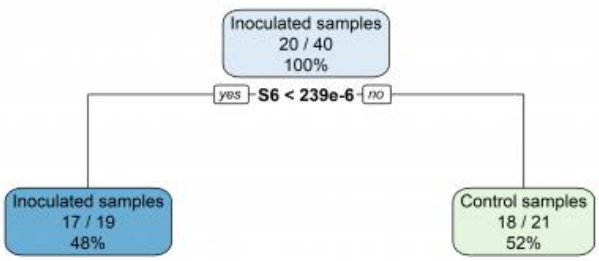

Figure 1

Harnessing speckle patterns for an optical extreme learning machine

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Abstract

Deep neural networks are now more than ever an important tool of science and technology, with applications in the most diverse areas of knowledge. Yet, the performance of neural networks (NNs) is intrinsically tied to its scalability, and with Moore´s law reaching a plateau, emerges a need to continue performance scaling. In recent years, the focus has been to achieve this through electronic hardware specialization, and artificial intelligence gains from improved performance, reduced latency, and cost of deployment of machine learning based applications.

On a theoretical perspective, significant performance gains can be achieved by substituting electronics with photonics. Indeed, optics constitute a natural choice for such applications due to its intrinsic parallelism, high bandwidth, common linear operations through propagation and low energy consumption.

While a photonic-based von Neumann architecture is still unreachable, the recent advances in neural networks algorithms and its parallel with analogic computing has fostered a renewed interest in all-optical hardware implementations of computing hardware, in particular by exploring the concept of Extreme learning machines (ELM). In short, ELMs are an artificial intelligence framework based on a network of hidden neurons with random fixed weights and biases, that generate a complex behavior in response to an input. The values at the output layer can be used to train a linear transformation to solve a particular computational task, with significant reduction of the energetic cost and time spent during training by bypassing the need to train every single weight of the network.

In this work, we present an experimental implementation of an optical ELM based on the complex dynamics of optically diffuse media. Using a spatial light modulator as the optical encoder we demonstrate that the system is capable of good performance under standard regression and classification tasks.

Phthalates and adipates in beers commercialized in Portugal

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Abstract

Plastic is one of the most common materials used nowadays, transversal to all industries, leading to a rising exposure to the toxicity of its components. Phthalates and adipates are added to plastics in order to increase its plasticity and workability; however, because these compounds are not chemically bonded with polymer base, leaching and migration to food products are possible. Several studies have documented the harmful health effects of these compounds, such as endocrine disruption in humans.

Beer is one of the most consumed beverages worldwide and, due to its production process and different types of packaging, can be a source of phthalate exposure in humans. This study aimed to optimise and validate a method based on dispersive liquid-liquid microextraction (DLLME) coupled to gas chromatography with mass spectrometry (GC-MS) analysis for the simultaneous determination of six phthalates and one adipate in commercial beer samples.

The developed method showed good linearity ($r > 0.96$), low limits of detection (0.3-1.5 µg/L) and quantification (1-5 µg/L) and good intraday (<20%) and interday (<13%) precision. Matrix suppression effects were surpassed using matrix-matched calibration curves. Five out of six phthalates and the adipate were present in the commercial beer samples, with concentrations ranging from 1.77 to 205.40 µg/L. There was a correlation between the presence of the analytes and alcohol content, type of packaging and production origin, where samples with alcohol content between 5-6%, packed in aluminium cans from industrial production presented higher levels of contamination.

Keywords: beer, quality control, phthalates, DLLME, GC-MS.

Using Remote Sensing data to analyze the Urban Heat Island in Bragança, Portugal

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Abstract

Urban Heat Island (UHI) is an effect related to anthropic changes that results in the increase of temperatures in the urban areas when compared to surrounding rural areas and is more intense after sunset. To understand the UHI, it is necessary to analyze the Land Use and Land Cover of the site, albedo, impermeability, etc. Urban Climate Zones (UCZ) is a way to classify the urban landscape considering its main attributes. The objective of this work was to analyze the UHI in Bragança - Portugal, in seven UCZs, applying data with different scales (spatial, radiometric, and spectral) and origins, namely: i) Land Surface Temperature (LST), from Landsat 8 data (summer and winter, between 2013-2021); ii) LST - thermal camera, collected in four visits (three in summer and one in spring, between 2020-2021), in the morning and evening (10-12h/13-15h (UCT), respectively); iii) air temperature - measured by a network of 23 fixed sensors with data loggers (between 2013-2021). The UHI Intensity (UHIint) was calculated considering the difference between the average temperature in rural areas UCZ (ZRE) and the temperature in others UCZs, this metric was used for both LST (Landsat 8) and air temperature. Google Earth Engine was used to calculate the LST (Landsat 8), providing agility with less computational processing. The seasonal thermal behavior was identified in LST maps: the highest temperatures were in summer. The timing of the satellite overpass (11h15 (UCT)) compromised the identification of the UHI. Instead, the Urban Cold Island, a complementary effect of UHI, that corresponds to lower temperatures in urban areas in the early morning hours compared to rural areas without obstacles for electromagnetic energy penetration, was found. "Strong" and "Very strong" correlation was identified between the LST (Landsat 8) and air temperature, considering all data (without separation by seasonality), which corroborates the efficiency of remote sensing data to analyze thermal effects.

Sexual Function and Marital Satisfaction differences between Reproductive Status

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Abstract

Introduction: There´s a lack of knowledge about definite involuntary childlessness. Investigations with this population focus mostly on people who sought treatment, but it is estimated that 45% of childless people do not seek medical help. The present research tries to fill this gap, including women who did and who did not undergo fertility treatments. Aiming to know if definite involuntary childlessness is a risk factor for sexual function and marital satisfaction, we compare this group (G1) with infertile women trying to conceive (G2) and presumably fertile women (G3).
Methodology: We recruited 207 women (n=60 in G1, n=78 in G2, n=69 in G3) via social networks and fertility centers, who completed a self-report questionnaire with sociodemographic and clinic questions, and the Female Sexual Function Index (FSFI) and Relationship Assessment Scale (RAS).
Results: One-way ANOVA analyses showed that involuntary definite childless women significantly differ from infertile and presumably fertile women in sexual function and marital satisfaction. Sexual function and marital satisfaction were statistically lower in G1 than in G2 and G3. G2 and G3 do not differ in any measure.
Conclusions: This study suggests that involuntary childlessness is a risk factor for women´s well-being. Our analyses showed that despite returning to recreative sex, the levels of sexual function of definite childless are significantly lower than those of infertile women trying to conceive. Previous studies showed that there is a martial benefit in couples trying to reach parenthood, so we hypothesized that this would last after this period. However, our results suggest that when women are confronted with a definite childless lifestyle, marital satisfaction gets worse. Clinical practitioners need to attend to these factors when consulting involuntary definite childless women.

Architecture and Virtuality. The design of the immaterial

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Abstract

We´ve witnessed over the last decades a digitalisation that has affected many aspects of life, including the field of Architecture. The development of tools of extended reality in particular - this includes virtual reality, augmented reality, and mixed reality - has been very fast, the accessibility to them fast-growing, and their advantages ever more pertinent to architects. In a practical sense, these tools are easily adapted to the architect´s work, which suggests their generalised implementation and pervasive impact.

In the light of a pandemic that forced us to find alternatives to physical spaces, the development and adherence to digital and virtual technologies was furthermore catalysed. On the premise that new technologies bring forth new behaviours and values, the dissertation proposed to investigate possible futures for the evolution of the relationship between Architecture and extended realities.

In order to substantiate the hypothetical aspect of this investigation, a historical context of the emergence of these technologies was established; a documentation of the present ways of integration of these tools in architectural practice was also essential. An understanding of how these technologies work made firstly possible an investigation on the meanings attributed to space, an evaluation on the components that qualify the experience of both virtual and physical space, and lastly, a comparison between these two experiences. This allowed for a conceptual investigation on the possibility that the predominance of the virtual jeopardises our traditional definitions of Architecture by introducing the idea of Virtual Architecture.

This dissertation proposes an exploration of the relationship between extended realities and Architecture, raising a discussion about how Architecture will adapt to these technologies, and what practical and theoretical consequences may come from this evolution towards the immaterial.

Involvement in decision-making about health data sharing, access, use and reuse in research: the views of rare diseases patients and carers

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Abstract

Only 5% of all known rare diseases have treatment. Fostering needs-driven research on rare diseases is thus of critical importance. However, mounting reports of data breaches have generated public concern with privacy loss, undisclosed surveillance and discrimination, which can reduce people´s willingness to share their data for research. Involving lay members of the public in health data governance can help to address this problem. This study assesses the views of rare disease patients and their informal carers about involvement in decision-making concerning health data sharing, access, use and reuse in research.

An observational cross-sectional study with 162 patients and 489 informal carers followed at two rare diseases reference centers in a hospital centre in Porto (June 2019-March 2020) was conducted. Participants rated the importance of being involved in decisions concerning health data sharing, access, use, and reuse from "not important" to "very important". Its association with sociodemographic characteristics, social trust and the importance of trust in science was tested.

Most participants considered involvement in decision-making about data sharing (85.1%), access (87.1%), use (85%) and reuse (79.9%) to be important or very important. Participants who attributed a high degree of importance to trust in research institutions were significantly more likely to value involvement in such decisions. A similar position was expressed for data sharing, access, and use by participants who valued trust in research teams. Participants with low levels of trust in national and international institutions and with lower levels of education attributed less importance to being involved in decisions about data use.

The importance attributed by participants to involvement in individual-level health data governance stresses the need to broaden opportunities for public participation in decision-making about data, namely by introducing more dynamic approaches to consent.

Influence of a longer tennis point duration in dominant shoulder functionality and muscular balance

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Abstract

Tennis is a multifactorial sport, where the forehand action success depends on the interaction of accuracy and ball speed. In longer points/games there is a higher influence from peripheral fatigue, reducing stroke functionality and changing the movement kinematics. In addition, tennis systematic actions negatively affect body joints, leading to unilateral musculoskeletal imbalances. We aimed to analyse the influence of a longer tennis point in dominant shoulder functionality and muscular balance. Fifteen male adolescent and young adult's competitive tennis players voluntarily performed 10 external/internal shoulder rotation repetitions of both upper limbs at 180º/s on an isokinetic dynamometer before and after 10 forehand actions (using a ball launcher defined at 72 km·h-1). Paired samples t-test was used for the comparisons before (M1) and after (M2) the played point considering strength related variables ($p<0.05$). The dominant upper limb presented a decrease in average power (M1:35.2±10.4 vs M2:32.9±9.2 and M1:81.4±30.1 vs M2:76.4±31.5 W) and total work (M1:293.0±67.3 vs M2:271.4±67.3 and M1:663.2±226.6 vs M2:618.6±243.4 J) in shoulder external and internal rotation (respectively). In addition, similar peak torque/body weight (M1:47.3±9.7 vs M2:46.7±8.3 and M1:68.1±14.0 vs M2:65.1±15.6%) in shoulder external and internal rotation (respectively), and external/internal ratio (M1:70.6±12.9 vs M2:74.1±13.7%) were observed. Lastly, only two tennis players presented peak torque symmetry indexes < 10% between upper limbs during shoulder internal rotation before and after 10 forehands (ranging from 0.3-62.7 and 2.4-60.8%, respectively). We conclude that, after 10 forehands, there is a significant decrease in the power and work of internal and external rotation. Concomitantly, the peak torque alterations affect the balance of muscular function, added to the fact that 86% (13/15) of the sample presented asymmetry between the dominant and non-dominant upper limbs.

Breathing frequency behavior in front crawl swimming along the intensity domains

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Abstract

The respiratory variables assessment during swimming using a portable gas analyser requires wearing a respiratory snorkel. This allows swimmers to select their breathing pattern, probably changing the relationship between breathing frequency and stroke rate. Our main purpose was to evaluate the front crawl breathing frequency behaviour along different intensity domains and analyse its relationship with stroke rate and length. A comparison of the obtained breathing frequency with and without snorkel was also accomplished (using the specialized literature). Thirty-four swimmers performed 7 x 200 m front crawl (with 0.05 m·s-1 increments and 30 s intervals) using a portable gas analyser and a snorkel for respiratory variables assessment. Blood lactate concentrations were measured in-between steps and at the final using a portable lactate analyser. Repeated measures ANOVA, independent measures t-test and Pearson correlation coefficient were used as statistical procedures (α = 5%). When using the respiratory snorkel, the velocity raise implied a breathing frequency (25.4 ± 5.2, 31.5 ± 7.3, 39.9 ± 7.1 and 45.0 ± 7.0 r·min-1), stroke rate (24.5 ± 2.8, 27.4 ± 3.2, 31.2 ± 3.7 and 34.8 ± 4.0 cycles·min-1) and breathing frequency/stroke rate ratio 1.05 ± 0.23, 1.16 ± 0.26, 1.27 ± 0.26 and 1.32 ± 0.29 breaths·cycles-1) increase, and a stroke length (2.33 ± 0.3, 2.33 ± 0.3, 2.23 ± 0.3 and 2.12 ± 0.2 m·cycle-1) decrease for the low, moderate, heavy and severe intensities (respectively). Without snorkel, breathing frequency also increased with the intensity increments, but presenting lower values than stroke rate. We concluded that breathing frequency always increases with swim velocity, independently of the breathing condition, but the snorkel use leads to breathing pattern alterations. This raise in the breathing frequency and stroke rate ratio is particularly noted at intensities higher than the moderate domain.

Church of the Convent of San Francis of Bragança: Reading a Building in Time

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Abstract

The Church of the Convent of San Francis of Bragança (Portugal) is a historical and architectural object whose history dates back to the 13th century. The investigation focused on the franciscan building understands that, during the period of almost 800 years that preceded its foundation, the object was, and still is, part of multiple wholes. Thus, in order to study the historical and architectural narrative of the Church of San Francis of Bragança, the investigation recognizes that the aforementioned Christian temple is a piece shaped over the centuries to be able to fit simultaneously in several "puzzles".

The "puzzles" are of different natures and dimensions; the architectural and historical narrative of the Church is affected by the architecture and history of political entities (such as Portugal, Castile and Galicia), religious entities (such as the Order of San Francis, the Archdiocese of Braga and the Diocese of Bragança-Miranda), and urban entities (such as Bragança).

The research methodology was guided by the intertwining between visits to the site and the lecture of various documents of various natures and periods (documents related to all the mentioned "puzzles"). From the described process, the study identified the "life periods" that defined (and still do) the narrative of the Church of San Francis of Bragança as an architectural and historical object. Thus, the mentioned "life periods" are as follows: the medieval Church; the Church drawn by Duarte de Armas; the Church subjected to modern reforms; and the Church as seen today. As written before, in the study of the "life periods" of the Church the investigation never forgets the idea that San Francis of Bragança is the piece of multiple puzzles - the mentioned political, religious and urban entities in which the Church of San Francisco is integrated.

Relationship between Sociodemographic factors and the adherence to Mediterranean Dietary Pattern

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Abstract

The goal of our work was to study the relationship between sociodemographic factors - sex, age and education level - and the adherence to the Mediterranean Dietary Pattern (MDP). After measuring this relationship, we aimed to find out which aspects of the PREDIMED questions had to be encouraged to consume, and in each of the sociodemographic factors analyzed as well. We used to IAN-F (2017) and the Adherence to de Mediterranean Dietary Pattern study (DGS-2020) to compare our results to.

As methodology we used the PREDIMED questionary that consists in 14 questions, to categorize as high or low adherence to MDP (0-14 points), and analyzed our data using SPSS.

We reach the conclusion that there is no significant differences between sexes in the adherence to the MDP, contrary to the DGS study where women have a higher adherence, and the IAN-F reach the opposite conclusion. Regarding the relationship between age and the adherence to MDP, we concluded that it raises as the age raises, the same conclusion as the IAN-F, and opposite to the DGS one. Finally, the relationship between the education level and the adherence to the MDP, we didn´t find any relation between the two, and there was no data in IAN-F, but DGS found that the adherence raises with higher levels of education.

We found the aspects to promote were the ingestion of olive oil, nuts, fruits and wine (taking into consideration the age and moderate ingestion), and we had in common with DGS the fruits and nuts, and with IAN-F the fruits.

We then analyzed the relationship between these 4 aspects and the 3 sociodemographic factors. We found that we need to encourage the consumption of fruits in men, in younger people, and that it hadn´t any relationship with education level.

As to nuts, there is a need to encourage the consumption in women, in adults, and as the education level is higher.

As to wine, encourage the moderate consumption in adults.

From the essence of Place to Compositional Harmony: Casa al Parco, Ignazio Gardella

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Abstract

"My kind of architecture adapts itself to each place and situation (...) from my point of view, architecture must be thought in harmony with the essence of the place and destination through most spontaneous and natural forms". Ignazio Gardella

Casa al Parco is one of the most iconic buildings from the modern Milanese architecture era and a landmark in Ignazio Gardella´s portfolio. Its design process began in 1947 in which Gardella clearly willed to set a strong dialogue between Casa al Parco, which is an isolated building, and Sempione Park. This premise leaded to a very complex development process with many interesting particularities.

Through the establishment of a relationship of mutual contamination, the project allows itself to be moulded according to the architectural framework, based on the contemporary Milan scene assessing the relationships between its interior and exterior, seeking to design a unique atmosphere inside the house. It is the characteristics of the place that suggests the typological definition of Casa al Parco, as well as the figurative differentiation of the building. Starting from a harmonic scale, it provides a compositional whole in which the various elements complement each other, proposing a principle that explores the relationship between the pillar and the beam which mirrors the relationship of permeability with the landscape. These elements do not only grant a constructive solution of the building, but also became part of its identity.

This investigation intends to understand and interpret the evolution of the design process of Casa al Parco which has as main premise the characteristics of the place where it is integrated, as well as its compositional principle. This study is part of an ongoing dissertation, in the Master's Degree in Architecture, at FAUP, 2021/2022, under the guidance of Hélder Casal Ribeiro and Angelo Lorenzi. It is our purpose to showcase the importance of Modern architecture in the contemporary narratives.

The art of building the transformation. Within four walls, four houses with Álvaro Siza.

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Abstract

Building on the built has always been a constant reality of the architect´s work. However, demands such as sustainability, circular economy and resource efficiency have been dictating a renewed interest in the study of strategies, methodologies and intervention practices.

The need to explore strategies for the conservation project of a four-walled family house near Peso da Régua was the moto of this investigation on theories and practices of intervention in preexisting buildings.

Álvaro Siza, the most awarded Portuguese architect and leading figure of the `School of Porto´, has a vast body of work around the world. However, design projects that involve the intervention on pre-existing built structures are less likely to be published or discussed. Moreover, the documentation of these projects is often insufficient with drawings of the different stages lacking, as well as written information, constructive details and before and after comparing elements.

This research aims at providing new insights on Álvaro Siza´s work, adopting a crossed methodology analysis of written and drawn documentation in confrontation with built works, using drawing as a privileged research tool. Four houses are selected because of its representativeness in Siza´s career, and a comparative analysis is delivered under three main topics - i) Landscape, Place, Pre-existence; ii) Design Strategy; iii) Tectonics, Materials and Detail.

Following Siza´s lesson, this research intends to provide the design process narrative and to find answers on how the architectural program, pre-existences and local context can be incorporated or condition the adopted solution and on how to embody built heritage and local memory within the contemporary needs of the client and the broader environmental and contextual demands.

This investigation is integrated within `SIZA ATLAS: filling the gaps for World Heritage´ FCT´s research project and is being developed as a master´s degree dissertation in Architecture.

Exploring wine industry by-products for targeting *Staphylococcus aureus* in diabetic foot infections

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Abstract

Diabetic foot infections are a serious complication associated with diabetes mellitus disease. They are usually polymicrobial infections, being *Staphylococcus aureus* the most frequent microorganism. This microorganism has several resistance mechanisms and virulence factors, leading to high resistance to antibiotics. The main goal of this study was the valorisation of winemaking industry residues as antibiotic adjuvants, motivated by this serious situation and the need for alternative antimicrobial strategies. For that, firstly, extracts of red grape pomace (RPE) were prepared from different red grape varieties provided by SOGRAPE VINHOS SA, obtaining extraction yields from 4 to 30%. After that, the antimicrobial activity and the mode of action of the RPE aqueous and hydroethanolic (50:50 v/v-ET50;70:30 v/v-ET70) were studied by microdilution and modified disc-diffusion methods; and by an evaluation of propidium iodine (PI) absorption, intracellular potassium (K+) leakage and virulence factors production, respectively. Additionally, the antioxidant potential of the RPE was also tested. The antibacterial activity against S. aureus was confirmed once MIC values of 25 mg/mL and 50 mg/mL were obtained for the S. aureus strains under study (CECT976 and RN4220). However, the MBC value of 25 mg/mL was obtained only for the S. aureus CECT976 strain. Preliminary tests to analyse the synergic potential of RPE with antibiotics showed a potentiation effect in different combinations. An antioxidant effect was detected for the ET50 and not detectable for the ET70. After exposure to the RPE, S. aureus showed permeabilization to PI, leakage of intracellular K+ for RN4220 strain, but not for CECT976. Regarding RPE effect on proteases and gelatinases production, no conclusions were obtained, and for the production of siderophores it was possible to verify an increase when RPE were present. Overall, RPE's antibacterial and antioxidant effects were found to be promising.

A Physiological Validation of the Null Effect of Negative Emotion on Visual Working Memory

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Abstract

It is presumed that even brief negative emotional reactions can impact the way in which information is processed and retained in memory. However, previous studies assessing the impact of negative emotion induction on visual working memory (VWM) had inconsistent findings. One important limitation of these studies was that emotion induction was only assessed via self-report, which could have been affected by social desirability. Accordingly, this study aims to replicate these studies including physiological measurements such as electrocardiography (ECG) and electrodermal activity (EDA) to further corroborate self-reports of emotionality. Forty-one participants completed an 1-hour cognitive task, consisting of baseline physiological measurements, followed by 240 trials of a continuous orientation-reproduction VWM task in which ECG and EDA were recorded. On each VWM trial, either a negative or neutral image was presented for 4 s, and participants rated the emotion induced by it on a valence scale from 1 (negative) to 9 (positive). Next, the orientation of five isosceles triangles was memorized. After a brief delay, one triangle was probed and participants reproduced its memorized orientation by rotating it with the mouse. Replicating previous findings, self-rated emotion was commensurate with the valence category of the image, indicating that the two conditions (neutral and negative) induced the corresponding emotions. Yet, there was no statistically significant difference in the reproduction error on the VWM task between the neutral and negative valence conditions, supporting the lack of emotion effect on VWM. In this presentation, we will discuss the correlations between self-report and the physiological measures, and the degree in which they modulate the effect of brief fluctuations of emotion on memory. This will help to address an important confound that may have prevented the detection of emotion-cognition interactions.

Public policies to fight against racial discrimination and xenophobia in Portugal

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Abstract

The present work aims to analyze public policies to fight against racial discrimination and xenophobia in Portugal, in particular the Law nº 93/2017, which establishes guidelines to prevent, prohibit and combat discrimination based on race, ethnicity, color, nationality, ancestry and place of origin. In order to achieve this, we are going to analyze the evaluation phase of this policy, from the Commission´s report for equality and against racial discrimination that records these complaints in Portugal, and the implementation of the law from the legislation that advocate equality and non-discrimination.

As a result of the analysis, we have the CICDR report (2020) that points to an improvement in public policy through the implementation of the complaints digital platform as an information collection tool. In addition to act as a systematic and effective monitoring tool of the policy. The public debate is another relevant factor of the analyses, since it influences their respective evaluation and re(formulation).

Keywords: public policies, racism, Portugal, prevention and fight.

Perceptions of elite futsal coaches on the construction of professional competence

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Abstract

The aim of this study was to examine the perceptions of elite Brazilian futsal coaches on the construction of coaching professional competence. A qualitative, exploratory and interpretive study was carried out with ten elite futsal coaches purposely selected. Data collection was done through semi-structured interviews in a telematic way. A consent form was signed by coaches, according to the code of ethics of the University of Porto. Content analysis and categorical analysis were used to analyze the data in a semi-inductive process. Categories were both partially define apriori and adjusted to the situatedness of the data. Most of the coaches valued the importance of applying professional, interpersonal and intrapersonal knowledge altogether in coaching practice and the knowledge about athlete development. Their views of professional knowledge included coaching decision-making (four coaches) and game reading (three coaches), performance analysis tools, and instructional strategies (five-pointed feedback, two questioning and individual interviewing) as critical for successful coaching. Key interpersonal knowledge components included positive leadership and people management (highlighted by seven coaches), support to athlete development (three coaches), open relationships, and setting performance goals for athletes (seven coaches). Dedication to coaching (three coaches), self-evaluation (five coaches), and continual professional development investment (four coaches) were central intrapersonal knowledge factors. Most of the coaches valued technical, tactical, cognitive, psychological as key elements of athlete development and their investment in extending relationships and concern for athletes to outside the coaching context. Coach education programs should structure their programs considering the most pressing training needs of futsal coaches identified in this study.

Perceptions of swimming coaches on talent development in youth athletes

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Abstract

The aim of this study was to understand the perceptions of swimming coaches of youth swimmers about the coach's role in the process of talent development. Ten coaches participated in a semi-structured interview that intended to understand: 1) the criteria used for the selection of talented swimmers, and 2) the conceptualization of talent in sport. Regarding the criteria for the selection of talented swimmers, the following were mentioned: 1) admission without a previous evaluation, justified by the importance of giving the opportunity to a largest number of swimmers to develop the swimmer throughout of time; 2) admission through analysis of results already achieved, justified by the large supply of swimmers being observed and prioritized by some clubs, with a particular focus on the choice of swimmers who have already presented expressive results in national championships; and finally, 3) the automatic transfer from the previous level when there is a large supply of swimmers within the club. Regarding the concept of talent in sport, the vast majority of participants believe that talent is composed by innate characteristics, which are enhanced with the proper training process. They mentioned, however, that if these characteristics are not well developed do not guarantee the success of a young swimmer's career. Participants also considered that talent development in sport is a complex and plural process, but swimmers´ sensitivity to water and skills related to emotional intelligence seem to be always present in young swimmers who excel in the children's level.

Public perceptions of hate crime: an empirical study in the portuguese context

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Abstract

The topic of hate crimes is particularly relevant since these acts motivated by prejudice and bias affect, annually, a significant part of the population and have consequences both for the direct victims, their communities and society as a whole. Consequently, the perceptions of hate crimes also constitute an important object of study, since they can influence the development and implementation of public policies, namely in the police and criminal justice system. Furthermore, it is important to understand these perceptions because they influence social norms regarding behaviours towards different social groups. Nevertheless, in the Portuguese context, little is known about what factors influence the perceptions of severity and punitiveness of hate crimes compared to common offenses. This study aims to understand the public perceptions regarding hate crimes in Portugal, namely severity, punitiveness, impact of the victimization experience and blaming of the victim and compare them with perception of the non-hate crimes. In order to achieve these goals, a survey using 4 hypothetical crime scenarios (one for non-hate crime and three for hate crimes - motivated by racial prejudice, sexual orientation-based prejudice and religious prejudice) was administered to 549 participants (female= 64.5%). The results showed that crimes motivated by prejudice are perceived as more serious than non-hate crimes, like demonstrated by previous studies (e.g., Lyons, 2008). In addition, the results indicate that there are significant differences between males and females, with females perceiving hate crimes as more serious than males. However, age was not a significative predictor of perceiving hate crimes as more serious than non-hate crimes. Additionally, the results suggest that participants that identify with left political views assign more seriousness to hate crimes than participants that identify with right political views. The results of this study will be further discussed.

Impact of polycyclic aromatic hydrocarbons (PAHs) isolated or in mixture on the metabolome of hepatocytes isolated from seabass

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Abstracts

Polycyclic Aromatic Hydrocarbons (PAHs) are ubiquitous environmental pollutants that are widely distributed in the environment. The environmental quality guidelines for PAHs are consistently developed for single substances, neglecting their combination effects, and therefore compromising the risk assessment. Hence, this work aimed at studying the effect of exposure to phenanthrene (Phe) and benzo[a]pyrene (B[a]P), individually and in different binary mixtures, on the metabolic profile of primary seabass hepatocytes. Hepatocytes of healthy subadult *Dicentrarchus labrax* were isolated from freshly harvested livers through the pancreatin digestion method and were cultured overnight. Primary seabass cells were then exposed for 48h to the individual compounds and their mixtures (Phe:BaP 1:1, Phe:BaP 1:2 and Phe:BaP 2:1) at 0.1 µM, 10 µM and 50 µM. Intracellular metabolic profiles of hepatocytes were then analysed through an untargeted metabolomics approach by gas chromatography-mass spectrometry (GC-MS). Alterations on the levels of metabolites were investigated through univariate analysis [Kruskal-Wallis analysis of variance (ANOVA)]. After exposure to PAHs, individually and/or in the binary mixtures, the levels of 12 metabolites were found significantly altered. Metabolite classes included organic acids (e.g., propanoic acid, lactic acid, succinic acid, oxalic acid), amino acids (e.g., tyrosine, threonine), lipids (e.g., cholesterol), and carbohydrates (galactose). The individual exposure to B[a]P and Phe unveiled a perturbation of phenylalanine, tyrosine, and tryptophan biosynthesis. On the other hand, the combined exposure to Phe and B[a]P may have an impact in aminoacyl-tRNA biosynthesis, galactose metabolism, tricarboxylic acid cycle (TCA), and steroid biosynthesis. These findings unveiled that the effects on intracellular metabolome of hepatocytes caused by the exposure to the binary mixtures of PAHs are different from those induced by the individual compounds.

Effects of Metformin, Edaravone, and Perampanel in a preterm hypoxia-ischemia model (in vitro and in vivo)

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Abstract

Preterm birth is one of the major health problems regarding infants, and is associated with high mortality and morbidity. The neurologic and psychiatric deficits found in preterm humans are globally explained by encephalopathy of prematurity, which is characterized by different lesions that result from combined acquired insults. Hypoxia-ischemia is an insult that plays an important role in its pathophysiology. Since brain injury during hypoxia-ischemia is an evolving process, it creates a window of opportunity for treatment.

Therefore, this work aims to repurpose three drugs to test if they have potential beneficial effects in preterm hypoxia-ischemia models, and also to better understand the alterations in the preterm brain, induced by this model. Metformin, Perampanel, and Edaravone are repurposed drugs, already used in other pathologies, that were chosen due to their main characteristics.

Firstly, these drugs were tested in the hippocampal neuronal cell line, HT-22. After that, these cells were submitted to hypoxia conditions, with a hypoxia incubator chamber, and treated with the mentioned drugs. Cell viability and morphology were assessed, in both conditions, and then compared at different time points.

After the achievement of the most efficient drug and concentration, we tested its effects in an in vivo hypoxia-ischemia model, using pregnant Wistar rats that were submitted to transient occlusion of uterine arteries, for 60 minutes. Then, neonatal developmental milestones were tested in those rat pups.

These studies will give light on the possibility to reuse these drugs to reduce brain lesions and on the pathophysiology associated with prematurity. Moreover, it will provide understanding regarding brain alterations in the preterm brain.

Online Identity Theft fear and victimization: an empirical analysis before and after Covid-19 in the Portuguese context

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Abstract

The development of technology and internet have changed the forms of interaction, leading to the practice of new online crimes such as online identity theft (OIT). Moreover, due to the Covid-19 global pandemic individuals became even more depend of cyberspace to realize their daily routines such as online banking, working and leisure. With this displacement to the Internet, it is expectable that offenders look for criminal opportunities in the cyberspace. Thus, online crime, and especially online identity theft deserves scientific attention since it is considered one of the fastest growing crimes with several negative impacts to victims. The present research intends to compare the levels of victimization and fear of online identity theft before and after Covid-19 pandemic. Furthermore, using the routine activities (RAT) framework this study will also understand what factors are related to increase likelihood of being victimized of OIT and experience more fear of this crime. In addition, we try to uncover the influence of sociodemographic variables (e.g., gender, age, socio-economic status, educational levels), general fear of crime and computer skills. The data was collected from a self-reported online survey administered to 730 individuals (female= 71.4% and M age= 27.13) The results shows that victimization of OIT in the last 12 months registered a significant increase because 8.5% of the individuals reported have been a victim of OIT against the 5.8% registered in the pre-covid sample. The results also suggest that during the Covid-19 pandemic online exposure increased; even though people reported to adopt less avoiding and protective online behaviors, they invested more in education and formation about cybercrime. Additionally, individuals interacted more with strangers, clicked less in unknown links, and visited less dubious websites. Finally, the fear of OIT victimization did not increase during the pandemic. The results will be further discussed.

Circulating miR-146a: a potential biomarker of left cardiac remodelling in canine myxomatous mitral valve disease?

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Abstract

Myxomatous mitral valve disease (MMVD) is the most common cardiac disease in dogs. Although echocardiography is the gold-standard for the diagnosis of cardiovascular diseases, circulating miRNAs are promising novel biomarkers for their diagnosis and prognosis. So, the aim of the present study was to evaluate the potential of circulating miR-146a as a biomarker of cardiac remodelling in dogs with MMVD.

This study included 24 dogs (9 males and 15 females), with a median age and body weight of 12 years and 10.050 Kg, respectively. The animals were divided in groups according to the disease severity [control, stage B1, stage B2 or stage C] and the presence or absence of left cardiac remodelling [normal left atrium (LA), LA enlargement (LAE), normal left ventricle (LV), LV enlargement (LVE), normal LA+LV or LAE+LVE]. Total RNA was extracted from plasma samples, and reverse transcription and qRT-PCR were performed to estimate relative miR-146a levels.

We found that, in dogs with MMVD, the expression of miR-146a was significantly elevated ($p < 0.001$) in LVE and LAE+LVE groups as compared to normal LV and normal LA+LV groups, respectively. Left ventricle enlargement positively correlated ($p < 0.05$) with plasma expression levels of miR-146a.

These preliminary results suggest that miR-146a is involved in LV remodelling in canine MMVD. However, these results must be further validated, regarding the role of miR-146a as a diagnostic biomarker, or potential therapeutic target, in dogs with MMVD-related cardiac remodelling.

The performance of Sign Language Translators and Interpreters in Higher Education: dialogue between Portugal and Brazil

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Abstract

This study concerns a Sandwich PhD research realized in Portugal and Brazil, in 2021. This research was funded by the National Council for Scientific and Technological Development (CNPq) and took place from September to November 2021, at the Faculty of Psychology and Education Sciences of University of Porto (FPCEUP). The research originated from the issue: what are the discourses of Translators and Interpreters of Portuguese Sign Language (PSL) about their performance in universities in Portugal? The general objective was to analyze the discourses of PSL Translators and Interpreters about their performance in higher education in Portugal. Specifically, we intended to: a) investigate the legal texts related to the profession of PSL Translators and Interpreters; b) verify where and how PSL Translators and Interpreters are trained; c) analyze the particularities of the performance of Translators and Interpreters in the context of deaf education in Portugal and Brazil. In the research, we analyzed, initially, two documents from Portugal and Brazil, respectively: law 89/1999 and law 12319/2010. Then we interviewed 02 (two) PSL Translators and Interpreters. The research data points out the similarities and differences on the professional trajectory of PSL and Brazilian Sign Language (Libras) Translators and Interpreters at the historical, legal and academic levels. The research highlighted the urgent need to create effective spaces for the training of PSL Translators and Interpreters. It also showed the importance of inclusion supporters centres as places that deal with equity and inclusion in higher education in Portugal. We concluded that the performance of Translators and Interpreters of PSL and Brazilian Sign Language, both in Portugal and Brazil, contributes significantly to the teaching and learning of deaf students and strengthens interpersonal relationships between teachers and students in university spaces in both countries.

Castro de Alvarelhos: Chrono-stratigraphic analysis of newfound archeological evidence

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Abstract

The "Castro Culture" identified in the northwestern Iberian Peninsula, dating back to the Late Bronze Age, constitutes a valuable case study. The assorted nuances resulting from local and regional diversity related to this cultural phenomenon (both material and immaterial) and the practices associated with the exploration of available natural resources on various geographical scales, are being enriched by the individual and collective studies of numerous archaeological sites, therefore displaying an evolving academic paradigm. Settled within the geographical center of the "Castro" " cultural movement, the Castro de Alvarelhos´ archaeological site (Trofa, Porto district) showcases a long history of archaeological interventions and studies. The site has a long-lasting and diverse history of human occupation, ranging from the Bronze Age to a prosper Roman town, whose economy took advantage of the newly implanted road system throughout the I and II centuries CE, as well as a medieval small church and necropolis. Yet, its transition between the pre-Roman and Roman settlements remained relatively unknown, hidden beneath successive building interventions that took place until the V century CE. The CAESAR - Castro de Alvarelhos (Trofa). Estudo científico do registo arqueológico, a project started in 2020, shed new light onto the occupation of this archaeological station all along those periods. After two archaeological campaigns, the data and materials identified are diverse, both in nature and chronology, increasing the scientific knowledge of the site's occupation and the indigenous transition into the Roman occupation of the northwestern Iberian Peninsula. This presentation intends to briefly highlight some of the new data regarding the CAESAR.02 survey, resulting from the diverse and multidisciplinary archaeological study of the site and the revaluation of previous interpretations regarding some archaeological materials.

Thermodynamic Study of Neocuproine

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Abstract

Neocuproine is an important chelating agent with potential application as a "smart material". This communication reports experimental and computational thermochemical studies of this nitrogen heterocyclic compound.

The thermal behaviour of neocuproine has been studied using differential scanning calorimetry. This has been one of the first steps, along with the analysis of the sample by gas chromatography and water content by Karl-Fisher titration, to check its purity.

It is possible to derive the gas-phase standard enthalpy of formation, at 298.15 K from the experimental studies of the enthalpy of sublimation and of the enthalpy of formation in the crystalline phase. The former properties were determined using the Knudsen effusion method and bomb combustion calorimetry, respectively.

Using the G4MP2 composite method, the optimal geometry of Neocuproine has been determined along with the theoretical enthalpy of formation. Using hypothetical gas-phase reactions, the gas-phase molar enthalpy of formation of neocuproine was also calculated. This parameter allows a comparison with the value obtained from the experimental results.

Acknowledgements

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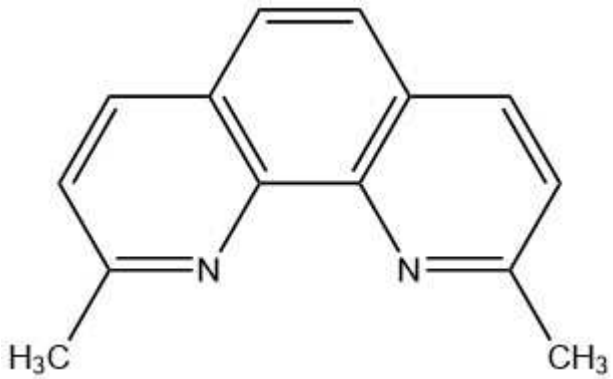

Figure 1. Structural Formula of Neocuproine

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Building the lives of the others, Portraits of a reality

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Abstract

Through an inversion of the usual way of an architectural analysis, where the object is the building as a result, this work intends to build a project idea based on the study of the relationship between architecture and the perception of its inhabitants. In other words, the intention is to listen to those who appropriate the space so that, through their words, reflect on the practice of architecture.

An exercise that, from the particular to the general, questions eight inhabitants of different buildings, based on a set of opportunities without a foreseen result, seeks in these dialogues for a concrete interpretation of architecture, based on the relationship between the formal manifestation of buildings and their human reality.

This work results in eight essays that do not aim to represent models of living or particular cases, but the search for heterodoxy. A representation of the complexity that this profession submits itself to, along the development of the project work. With both positive and negative expressions, that raise elementary questions about its practice, as well as about beauty, art, form or even about furniture, which is interwoven between architecture and daily life.

The confrontation between these two worlds, of formal expressive interest, based on the masters of a school and a singular perception of a concrete experience, sets up the basis of the conflict in which this discipline was born: Between the simplicity of human need and the relationship with its design, path, reason, struggle and interest, translated into architecture.

Study of an epigraphic monument from the 2nd century CE: Contribution to a better understanding of the cult of the deity Nabia

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Abstract

The “Ara de Marecos” is a stone votive altar showcasing inscriptions on all its sides, commissioned around the 2nd century CE and currently on display at the Penafiel Municipal Museum. Through its epigraphs we learn about a set of animal sacrifices dedicated to various deities: Nabia (a widely spread Iberian deity), Jupiter (the chief deity of the classical Roman pantheon) and three other potential local deities, previously unknown. This monument offers a remarkable mention to the goddess Nabia, on a unique predominance in comparison amongst the others, by appearing in first place and receiving the greatest sacrifices, the only one recalled with several qualificative designations. From others monuments and toponymy, which appear throughout the northwest region of the Iberian Peninsula, researchers assume she was primarily associated with water currents and their healing properties. However, her particular placement in this votive altar, in what seems to be an event to welcome Spring and fertility, suggests another attribute beyond that role, or at least, gives her water-related feature a previously unknown facet. Moreover, this interpretation of Nabia can also help us to discuss the possible roles of two other native deities, who are not mentioned anywhere else other than on this altar. Through photographic records, bibliographical references and comparison of different interpretations by several authors, this presentation aims to contribute to the knowledge about the cult of the deity Nabia, thus gaining a better insight into the pantheon of divinities worshipped in the current territory of the Iberian Peninsula.

Sharks in pre-agricultural diets

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Abstract

The transition from Pleistocene to Holocene is most notoriously marked by the development of agriculture by the southwest Asian societies, a pivotal moment in Human history. However, this innovation took time to spread and reach the entire Eurasian continent. The area of the Tagus River was the stage of a rich ecosystem for the subsistence of late hunter-gatherer communities. In Muge (a small parish of the district of Santarém) several shellmiddens, dated to the Mesolithic, store dozens of faunistic remains of aquatic animals. Of special interest was the study of the faunistic remains that belonged to various Selachii, commonly referred to as sharks. Therefore, this project aimed to identify those remains in order to better understand the importance of these animals in the lives of the hunter-gatherer peoples on the area, more specifically in the hunter-fisher-gatherer community. The analyzed materials consisted in fifteen shark vertebrae centra and one tooth. Although small, these samples give us an idea of the various shark taxonomic groups present in the diet of these human paleo-communities. The materials where characterized based on their physical features, according to the methodology proposed by Fitzgerald and Kozuch (1989), the terminology used by Morales and Rosemund (1979) and the classification system of Compagno (1984). This evaluation allowed us to identify with relative confidence the shark taxonomic group whom the vertebrae centra belonged to up to the Family. It also gave us space to hypothesize the genus of the specimens, as well as the minimum size of our sample. These results provide an interesting perspective on the relationship of the hunter-fisher-gatherers with the surrounding aquatic fauna. The further study of the interactions between the pre-agriculture societies and their environment will be of great anthropological and archeological value, showing a better picture of the day-to-day behaviour of our ancestors.

Once upon a time... The role of Architecture in Disneyland and Portugal dos Pequenitos

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Abstract

Why compare Portugal dos Pequenitos and Disneyland? At first glance, nothing brings the two projects together, apart from their generic classification as theme parks. Disneyland develops from an American idea, based on a continental country; Portugal dos Pequenitos is the reflection of a small country on a world scale, but whose project tended to be grandiose.

However, a theme park is a complex project, as these two examples amply prove. Buildings, attractions, shows, stages, paths, services and technical facilities. Lights, colours, music and lots of movement. Large and complex enclosures, filled with different areas, with the most varied themes, scales, shapes and architectural programs. Backdrops, facades, props and many decorations, which culminate in a paraphernalia of objects and visitors. It is, after all, an urban essay of an uninhabited city, solely and exclusively dedicated to leisure.

Recognizing the historical thread, and taking Disneyland and Portugal dos Pequenitos as case studies, "Once upon a time... The role of Architecture in Disneyland and Portugal dos Pequenitos" seeks to understand the proximities and divergences between these projects, temporally close, but apparently distant in ideological terms.

Although both are ways of looking at architecture at the service of entertainment, Portugal dos Pequenitos remained a unique case at a national level, while Disneyland developed a business model on a global scale. To understand them, and as if it were a puzzle, the theme park is dismantled, identifying its different constituents and recognizing its basic rules.

Comparing Disneyland with Portugal dos Pequenitos may seem like a distant imaginary exercise. But the truth is that the matrix of the two projects have points of convergence, the most evident being the principle that guides them: once upon a time...

Figure 1. Once upon a time...

Identification of Potentially Bioactive Peptides in a Commercial Squid Meal Targeted as a Premium Dog Food Supplement

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Abstract

Pet Food market has been expanding, particularly the Premium segment. The importance of nutrition to promote animal health and wellbeing is being recognized by pet owners, who are increasingly looking for functional foods with advantageous nutraceutical properties. In this context, the role of oligopeptides in providing immunomodulatory, anti-inflammatory, anti-oxidant, and anti-microbial protection has been documented. Aiming at an "affordable Premium" concept, we are searching for bioactive peptides to be used in dog food.

Herein, we report peptide identifications in a batch of commercial squid meal (original), subjected to the industrial processes involved in pet food manufacturing (processed), and processed sample enzymatically digested in vitro (digested). In the original and processed samples, peptide identification was performed after aqueous extraction under mild acidic conditions. Peptides were identified by mass spectrometry.

156 peptides were identified in the digested sample, 23 in the original meal and 17 in the processed meal. 12 peptides were unique to non-digested meals. In all samples, the most representative peptides belong to structural fibrillar proteins, mainly actin, collagen, and myosin. In the digested sample, the most abundant peptide was VAPEEHPV, an actin-1 fragment. The anti-oxidant and anti-microbial activity of the identified peptides will be evaluated and those with a better bioactive profile will be tested as supplements in dog food.

Acknowledgements

This research work is part of the project "TIDES4DOGS - pepTIDES as nutraceutical ingredients of accessible premium formulae FOR DOGS" supported by Soja de Portugal through the IJUP Empresas program. A.I.F. and R.A. thank IJUP-Empresas and Soja de Portugal for their research grants. Funding from Fundação para a Ciência e a Tecnologia (FCT) and Soja de Portugal to J.G.F. (PD/BDE/150527/2019), and from FCT to M.R.G.M. (DL 57/2016-Norma transitória) and LAQV-REQUIMTE (UIDB/50006/2020) is acknowledged.

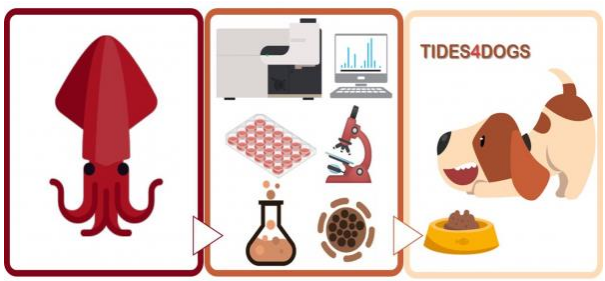

Figure 1. TIDES4DOGS - pepTIDES as nutraceutical ingredients of accessible premium formulae FOR DOGS

Women's Beliefs as the Highest Predictor of Dyadic Remarital Adjustment

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Abstract

Remarriage is understood as the marriage of two individuals when at least one of the two has already been married. In 2019, out of all the celebrated unions in Portugal, only 66.3% were first unions (INE, 2019), proving the epidemiologic significance of remarriage in today's society. Reasons leading to remarriage vary immensely through literature, revealing the need for further characterization and deeper research. The layers of complexity that compose these families are also noteworthy. There seems to be no universal factor within the literature that guarantees satisfaction within the context of remarriage, but like any other family structure, that is what they seek. Given the intricacy at stake, the authors aimed to foster an understanding of these dynamics by focusing on the beliefs system of these families and especially on how these beliefs relate to the remarital adjustment of these families.

A sample of 96 couples was studied using a dyadic validated questionnaire. The beliefs system was evaluated through the Portuguese version of RMBI (Inventory of Beliefs on Remarriage) and EAD-R (Revised Scale of Dyadic Adjustment) was utilized to inquire about remarital adjustment within these couples.

Primary results of our study show that women´s beliefs are at the center of both their adjustment and their partners, within the context of remarriage. The way women postulate on success and specifically on how successful their ideals of remarriage to be also has a significant negative effect on their adjustment and their partners. When elaborating further, it was found that women´s idealization of their partners also negatively impacts their adjustment within remarriage.

The outcomes show that interventions focusing on women could potentially be crucial for the adjustment of these families, although the authors understand that manifestly, there is a need for many more studies in this area.

Ageing in place: qualification of social housing in Porto for the greater age

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Abstract

In Portugal, a demographically aged country, it is urgent to debate about the fate of our seniors. Usually, the third age faces the drastic change of routine - from a working life to retirement -, and along the fourth age some challenges gradually come up in different aspects of our lives, being in a physical, mental or emotional level. Some of the greatest obstacles the elderly may find are loss of activity, social seclusion and physical and mental fragility.

Assisted living establishments are innumerous times a chosen resource by those who feel too lonely or dependent in their homes, sacrificing their own will of ageing in place. However, there is a great number of people in nursing homes that end up suffering from learned helplessness and accelerated (muscular and/or mental) deterioration, in addition to the disruption every new resident feels with home moving. The investment in assisted and specialized living is, even so, relevant. Nonetheless, many of these matters would be avoided if the traditional house was adaptable to the spatial necessities of the elderly, allowing ageing in their own residency.

In this context, this research is about ageing in place, aiming to study the promotion of an active and healthy ageing through the qualification of social housing. By identifying solutions already applied in numerous buildings for the elderly, one can understand and activate the role of architecture in creating a safe, comfortable, autonomous and social habitat.

The demographic data of the municipality of Porto mirrors the national reality, and a great percentage of elderly reside in its public housing. Finding here the relevance of the study together with the added challenge of buildings with lesser areas and resources, one explores the adaptability of social housing in Porto for the greater age.

This investigation is taking place within the thesis on Master´s Degree in Architecture at FAUP, under the supervision of the Professor Marta Rocha.

Climate adaptations and Co-Evolution: Floristic Endemism in the Carboniferous Douro Basin

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Abstract

The Douro Carboniferous Basin (DCB) is an intramontane basin that is part of the Douro-Beiras Carboniferous Trough (DBCT), a pull-apart basin with a strike slip component.

Lesleya ceriacoi sp. nov. is a primitive gymnosperm from the DCB (lower Gzhelian, Upper Pennsylvanian; NW Portugal), which was rediscovered in the Porto Herbarium's historical collections. Long, narrow, broadly dissected (lacerated) leaves with a serrate apex distinguish L. ceriacoi from the other 11 known species of the genus. These are specialized adaptations to drier conditions that occurred following the end of the late Paleozoic Gondwana Ice Age in the Gzhelian (ca. 304-299 Ma) during a period of wet to dry climatic change. These xeromorphic features provide evidence of evolutionary adaptations to environmental and climatic change in intramontane basins in central tropical Pangea, as well as a hint that the genus was more diversified than previously thought.

Phyllotheca douroensis sp. nov. is a new equisetalean from the Early Stephanian C. It exhibits close relationships with the Gondwanan Phyllotheca etheridgei Arber from New South Wales, Australia. The new species P. douroensis sp. nov. is thought to be the result of convergent evolution between Euramerican and Gondwanan flora.

Antioxidant Properties of Pomace Extracts Directed for Chronic Wound Healing

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Abstract

The winemaking industry generates a vast number of residues, such as grape pomace (GP), which is an undervalued product usually discarded into the environment. Therefore, there is an urgent need to make the winemaking process more ecological and sustainable by seeking innovative applications for the residues and adding value to the wine production chain. Considering that GP is rich in phenolic compounds that are recognized for their antioxidant properties, they can be significant for the development of new alternatives for wound treatment, since antioxidant activity plays an important role in the wound healing process. In this way, this study aimed to test the GP antioxidant potential from red and white grape pomace (RGP and WGP) varieties. For this, a mixture of skins and seeds or stalks, dehydrated by lyophilization, were used to conduct a solid-liquid extraction using different solvents (water; ethanol 50:50 v/v and 70:30 v/v; acetone 50:50 v/v and 70:30 v/v). Extraction yields of 3-17% for RGP and 23-41% for WGP were obtained. Then, different types of GP extracts were evaluated for their total phenolic content (TPC), total flavonoid content (TFC), and antioxidant activity through ABTS and DPPH assays. The RGP extracts demonstrated higher values of TPC and TFC (165.5-295.0 mg of GAE/g extract and 0.258-1.397 mg of CE/g extract, respectively) than the WGP extracts (24.9-216.9 mg of GAE/g extract and 0.191-0.790 mg of CE/g extract, respectively). Even though all the samples showed high antioxidant activity, WGP extracts presented higher results (1.519-1.647 mg TE/g extract for ABTS and 0.364-1.792 mg TE/g extract for DPPH) than RGP extracts (0-1.615 mg TE/g extract for ABTS and 0-1.671 mg TE/g extract for DPPH). Overall, the results demonstrated that GP extracts, especially the ones from WGP ethanolic varieties extracted with 70:30 v/v, are promising for the development of new wound dressing alternatives.

Choreographies of The Domestic Space

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Abstract

Although the relationship between Dance and Architecture is not evident, both use similar terms and strategies to deal with the body in its existence in space as well as its relationship with time. Dance is produced from the movement of bodies. In turn, Architecture is created and designed so that flowing movements and its interruptions can exist in it. If we look at Architecture from a choreographic perspective, we understand that as the traditional role of the choreographer diminishes, there is a close relationship between the act of dancing and the act of inhabiting.

Within the scope of domestic space, the movement performed varies both according to the architectural project, as well as the way in which the inhabitant lives, which is personalized through their routines and habits. It´s possible to understand that the movements proposed by the architect, through the architectural project, are not always in tune with the daily movements of the user. This leads to questions such as: what are the contributions of daily choreography in the domestic space? How can the inhabitants´ movement help to guide, organize or study the creation of a housing project? Would it be possible to intentionally customize the inhabitant's daily movement through the architectural project?

Bearing these questions in mind, the target of the investigation is the study of the domestic space through observation, choreography and dance of the daily movement of the inhabitants. Symbiosis is achieved in the conception and choreographic recording of domestic scenes, for a better perception of what movements are present, what is their nature and in which moments they occur. This methodology is not intended to lead to the obtaining of closed and indisputable answers, but rather an awakening of the mind to questions that are simultaneously so evident and so debatable.

This investigation integrates a master thesis in development under the supervision of Professor Marta Rocha.

The impact of nutritional ketosis in gut microbiome and the cardiovascular function in a rat model of heart failure with preserved ejection fraction

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Abstract

Purpose: Heart failure with preserved ejection fraction (HFpEF) affects more than half of the patients diagnosed with heart failure. Presently no effective therapeutic options are available for HFpEF. There is growing evidence to support the therapeutic potential of ketones on cardiac diseases, however any beneficial impact of the ketogenic diet remains highly controversial. In this study, we aim to characterize the impact of a ketogenic diet on the gut microbiome and cardiac function of a HFpEF model.

Methods: Twelve-weeks old age-matched lean (CT) and obese (HFpEF) male ZSF1 rats were randomly allocated to receive the recommended control diet (CT), ketogenic diet (KD) or ketone salts diet supplementation (KS). The animals were subjected to a variety of tests, including assessment of glycaemia, ketonemia, insulin resistance (IR) and oral glucose tolerance tests. By their thirty-weeks of age, faecal samples were collected, the microbial DNA extracted and 16S V4 rRNA microbiome was sequenced on Illumina Miseq. The targeted microbiome sequences were processed and analysed using R.

Results: Both KD and KS were able to reduce glycemia by as much as 48% in HFpEF while KD alone significantly increased ketonemia. Even though IR test showed no difference since these rats are extremely diabetic, a slightly improvement was seen in glucose tolerance with KD on HFpEF rats. Regarding the gut microbiome, we obtained 1659 amplicon sequence variants in 52 samples. In line with the metabolic improvements, CT rats showed more Bacteroidetes while Firmicutes were more abundant in rats under KD. At the family level, KD rats showed an increase of Eggerthellaceae and Erysipelotrichaceae.

Conclusion: The present study demonstrated KD seems to ameliorate some of the metabolic disfunction commonly associated to HFpEF as suggested by changes in glycemia levels and glucose tolerance. Such diet resulted in changes in the gut microbiome, manly in Bacteroidetes and Firmicutes populations.

Internal dialogues, personality and life narrative coherence: An exploratory study with adolescents

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Abstract

Adolescents face the challenge of co-constructing coherent life stories. According to the Dialogical Self Theory, the construction of narratives involves external and internal dialogues, which promote meaning-making and self-development. The purpose of the current study was to explore associations between internal dialogues and life narrative´s coherence in adolescence, as well as its associations with clinical and psychological indicators, and personality dimensions, which also implied to adapt and validate the Internal Dialogical Activity Scale - Revised (IDAS-R; Ole´s et al., 2020) to Portugal. We adapted and validated IDAS-R; and then conducted a correlational mix-method studies with a sample of 49 adolescents, that involved interviews to elicit life narratives, transcribed and coded based on Temporal, Causal-Motivational and Thematic Coherence. Subsequently, we administrated questionnaires to assess clinical and psychological indicators and the big-five personality dimensions. Confirmatory Factor Analysis identified a factorial structure different from the one originally proposed. A model with four subscales - identity dialogues, spontaneous dialogues, social and support dialogues, distressing dialogues - provided a better fit to the data. Contrarily to distressing dialogues, identity dialogues correlated positively with well-being, satisfaction with life and conscientiousness, and negatively with clinical symptomatology. However, internal dialogical activity, particularly distressing dialogues, showed stronger associations with neuroticism. Concerning life narratives, only the spontaneous dialogues showed a low correlation with temporal coherence. Although the negative associations were expected, its existence in a non-clinical sample promotes further questioning about the underlying construct measured by IDAS-R, and the feasibility of assessing such dynamic processes by quantitative methods. We also discuss the results and the potentialities of IDAS-R.

Responses from Portuguese LGBT+ associations towards domestic violence in sexual minorities

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Abstract

Domestic violence (DV) among LGBT+ couples are a highly prevalent phenomenon; however, it is less studied and analyzed than DV among heterosexual couples. This qualitative study developed within the scope of the master's degree in Criminology at FDUP aimed to understand the way in which LGBT+ organizations within Portugal deal with DV against LGBT+ couples. The study was conducted with 10 Portuguese LGBT+ organizations through semi-structured interviews, which took place online. Firstly, a literature review is made about important concepts surrounding the LGBT+ community itself, as well as about the evolution of the rights of this population and the importance of LGBT+ organizations in this trajectory. An intersectional approach was used throughout the work to understand the various axes of oppression that the LGBT+ victim of DV has and, therefore, reflects on specific characteristics that need to be considered when getting in touch with this victim. A literary review is also made on the DV of LGBT+ couples and its distinguishing characteristics are pointed out in relation to that of heterosexual couples, in addition to risk factors, typologies, quantification of the phenomenon, and institutional and social responses. In sequence, the results and discussion of the data collected from the interviews are presented. The thematic analysis of the data was chosen and explored the way in which the interviewees perceive the DV of LGBT+ couples, their impressions about institutions, in addition to how they approach the phenomenon. Through the study, it was possible to notice that most Portuguese LGBT+ organizations are aware of the phenomenon and its particularities in relation to DV against heterosexual couples. Although there are few specific services on LGBT+ domestic violence within the organizations interviewed, the organizations have been discussing the issue, offering peer support to victims, and referring cases that come to them to the competent structures.

Speciation of Mercury in Soils of a Deactivated Mining Area by a Sequential Extraction Procedure

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Abstract

The former Pejão coal mine complex was for many decades one of the most important mines of Portugal. Located in Castelo de Paiva municipality at the Northern Region of Portugal the heap´s waste suffered underground combustion triggered by the forest fires of October of 2017.

This work aims to study the presence and dissemination of potentially toxic elements (PTEs), namely Mercury (Hg), in residues resulting from mining activities that represent a source of pollution to the surrounding soils and aquifers. Thus, the EPA 3200 Sequential Extraction Procedure (SEP) was applied to quantify the different fractions content and assess its availability and mobility to the ecosystem.

The approach relied on the determination of Hg "pseudo-total" concentration, by microwave digestion with aqua-regia (ISO 12914), in samples from the heap and surrounding areas. The extracts obtained were analyzed by Cold Vapor-Atomic Absorption Spectroscopy (CV-AAS). After the comparison of the obtained values with reference values from Agência Portuguesa do Ambiente (APA) for agricultural soils (0.25 mg/kg) and background values, the results indicated that the former Pejão coal mine is possibly contaminated with Hg, thus, requiring studies for Hg fractioning and speciation.

After application of the Hg SEP to the most affected area, the burned heap, we have concluded that Hg is mainly found at the semi-mobile fraction. However, the Hg content at the mobile fraction in some areas is close to APA´s reference value, thus, requiring straight environmental monitoring and control.

Acknowledgements

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Compilation of biodiversity data for the identification of sampling sites

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Abstract

Biodiversity loss is a challenge at a global scale. To prevent it, the evaluation of species distribution is the first step for biodiversity conservation. Species distribution maps (SDMs) are essential to analyse the species´ distribution along study areas and to identify regions with poor species occurrence data. Protected areas such as Montesinho natural park (MNP) (Portugal) aims to ensure biodiversity conservation at a regional scale and maintain, its ecosystem services and cultural values. We are developing an early-warning system, the MontObEO project, for MNP where species´ conservation status is estimated by spatial-temporal trends in species´ habitat suitability indexes from ecological niche models (ENMs). As an initial phase, it is necessary to compile the necessary biodiversity data for the identification of sites needing further sampling. Herein, biodiversity data was compiled for the period 2000-2021 using several data sources such as online databases, distribution atlases, inventory datasets and field-collected data. The data was filtered and corrected for five major taxonomic groups: vascular plants, amphibians, reptiles, birds and mammals. We followed the last accepted taxonomy for each group. To avoid errors when compiling the biodiversity data, we developed an R script to produce standard maps for each taxonomical group and species. The results showed a lower cover area for amphibians (15 sp.) and reptiles (25 sp.) compared to other taxonomic groups. Vascular plants (1209 sp.) and birds (157 sp.) indicated an heterogeneous distribution along the park, with mammals (38 sp.) having a strong presence in the East. Overall, we selected sampling sites to obtain new in-situ species occurrences, namely for amphibians and reptiles. The SDMs represent important tools for the development of ENMs and, thus, estimations of space-temporal extinction factors.

An overview of circulating pulmonary arterial hypertension biomarkers

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Abstract

Introduction: Pulmonary arterial hypertension (PAH), also known as Group 1 Pulmonary Hypertension (PH), is a PH subset characterized by pulmonary vascular remodelling and pulmonary arterial obstruction. It has an estimated incidence of 15 to 50 people per million in the United States and Europe and is associated with high mortality and morbidity, with patients' survival time after diagnosis being only 2.8 years. According to current guidelines, right heart catheterization is the gold standard for diagnostic and prognostic evaluation of PAH patients. However, this technic is highly invasive, so it is not used in routine clinical practice or patient follow-up. Thereby, it is essential to find new non-invasive strategies for evaluating disease progression. Biomarkers can be an effective solution for determining PAH patient prognosis and response to therapy, and aiding in diagnostic efforts, so long as their detection is non-invasive, easy, and objective. This review aims to clarify and describe some of the potential new candidates as circulating biomarkers of PAH.

Results: All biomarkers included in this review were found to be significantly altered in PAH patients of various subtypes, and almost all (except for homocysteine, serotonin, monocyte chemoattracting protein-1, oxidized lipids and CD40/CD49L) were found to be good indicators of disease severity and/or prognosis. Some, like red cell distribution width, endostatin and galectin-3, when added to current risk stratification tools, improved their accuracy and predictive power.

Conclusion: Although no biomarker to date has shown to be ideal, there are some that stand out as independent predictors of disease outcomes, while others can improve the performance of the clinical tools currently in use. However, larger studies providing more high-quality evidence are needed before these novel biomarkers can be introduced into clinical practice.

The Vairãos's Monastery of S. Salvador after the extinction of religious orders

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Abstract

This study aims to understand the Monastery of S. Salvador of Vairão after the extinction of religious orders, namely the new uses of the complex, and the construction of the public cemetery. The construction of the cemetery begun in 1876, since in that decade several parishes around Porto built public cemeteries. The construction was delayed because of other constructions in the parish such as the aqueducts for the managing of water of the public fountain. The cemetery's main door indicates 1878 as its date of completion. The last abbess died in 1891, and from then began the process of integrating assets into the National Treasury. The inventory of all the assets of the churches and chapels of Vairão of July 9 1912 mentions the church with a tower and its dependencies, the chapel of St. John, and the address of houses with backyards, which served as the parish priest's house, as well as several chapels that were incorporated into the National Treasury, along with its objects. The monastery and its dependencies were heavily transformed in 1922, 1944 and 1966 due to renovations and expansions. Those were documented by DGEMN because they were in the protection area of the St. John chapel, classified as of public interest. Having been a Nursery and Vocational School, the monastery is now an inn for pilgrims of Santiago de Compostela, and a holiday center, while the church continues to be used as the parish temple. The appreciation of the monastery's heritage is seen on the PDM provided by the Vila do Conde City Council that informs that the church was proposed to be classified as of Public Interest. The monastery is still surrounded by agricultural land, probably not to the full extent it would have been. This space is not used, except for a small building that serves as the parish headquarters of the Association of Portugal´s Young Farmers.

Keywords: Monastery; extinction of religious orders; cemetery.

DNA Markers for Detection and Genotyping of *Xanthomonas euroxanthea*

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Abstract

Xanthomonas euroxanthea (Xea) is a new bacterial species encompassing both pathogenic and nonpathogenic strains frequently found colonizing the same host plants as the pathogen *Xanthomonas arboricola* (Xa), a species with which Xea is frequently mistaken for. The present study aimed to develop a PCR method to specifically detect Xea strains, and distinguish these from the closely related Xa. Eight Xea-specific DNA markers (XEA1 to XEA8) were selected by comparative genomics, and validated regarding their specificity and genomic context by Blast and in silico approaches prior to lab validation to determine PCR efficiency. No determinants linked to genomic-plasticity, namely transposons, integrases, recombinases were found in the vicinity of any of the markers XEA1 to XEA8. Furthermore, synteny analysis, GC content and CAI/eCAI values suggest that the eight DNA markers are in conserved genomic regions of Xea. Five out of eight DNA markers (XEA4, XEA5, XEA6, XEA7 and XEA8) were unfailingly present in the genome of the studied Xea strains. A multiplex PCR targeting the Xea-specific DNA markers XEA1, XEA5 and XEA8 was shown to be efficient and specific for seven Xea strains analyzed, and able to detect Xea down to 2 ng DNA/PCR reaction. To evaluate the genotyping potential of these DNA markers, maximum-likelihood trees were generated with the concatenated sequences of three Xea-DNA markers (XEA5, XEA6 and XEA8) and four housekeeping genes (gyrB, rpoD, fyuA and acnB) from 11 Xea strains. The topology of both trees underlines the suitability of these DNA markers to detect and simultaneously discriminate Xea lineages. Overall, this data provides a method conciliating detection and genotyping of Xea-strains, contributing to monitor for the presence of Xea in Xa-colonizing habitats.

Radiolucent Positioning System for X-ray Environment

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Abstract

Stress radiography is widely used for an objective analysis of the knee joint laxity. This type of radiography involves knee stress tests, such as valgus and varus stress, and the Lachman test. Despite being an improvement to physical examination, it is still performed manually in healthcare facilities. To avoid exposure of the physician to radiation and to decrease the number of X-ray images rejected due to inadequate positioning of the patient or the presence of artefacts, positioning systems for stress radiography of the knee have been developed. These systems have improved objectivity/reproducibility during stress radiographs, but they have failed either to be radiolucent or to be versatile with a simple set-up. To reduce this gap in the market, a radiolucent positioning system for X-ray environment, capable of assisting knee stress radiographs without the aid of a physician, will be developed. This integrated automated system will be designed and implemented being complete with sensors, including force, position and EMG sensors, control, and actuators. It will fixate the joint in the intended position for the stress examination and will apply stress to the joint, having flexibility in its use and being able to move in different directions to be accessible to all body types. The parts of the system that will be in contact with the patient will be composed of radiolucent, resistant yet comfortable materials (e.g. carbon fibre composites with coated sponges), so they are not seen in the X-ray image whilst still providing comfort for the patient. In addition, we will strive for the positioning system to be of simple set-up, to have versatility in its use, by being able to assess not only the knee but also other joints, and to define a specific force and stress test to be applied depending on the joint condition with the help of a user interface. This new device is expected to have a positive response amongst physicians during clinical trials, becoming available in the market in the near future.

The two-component system RstAB regulates expression of virulence factors in *Photobacterium damselae subsp. piscicida*

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Abstract

Photobacterium damselae subsp. piscicida (Phdp) is a Gram-negative bacterium that infects several marine fish species. The apoptogenic toxin AIP56 and the binary toxin PBT have been implicated in Phdp virulence. Additionally, it has been suggested that the peptidoglycan hydrolase PnpA may confer to Phdp an advantage against putative competitor bacteria. Two component systems (TCSs), which are comprised of a sensor histidine kinase that transmits a signal to a response regulator, regulate the expression of virulence factors and control antibiotic resistance in various bacteria. In particular, the RstAB TCS has been shown to be a master regulator of virulence in *Photobacterium damselae subsp. damselae* and has recently been discovered in Phdp. In this work, the role of RstAB as a regulator of AIP56, PBT and PnpA expression by Phdp was investigated. First, an rstB deletion mutant (KOrstB) and the correspondent complemented strain (KOrstB+pRstB) were produced and the expression of AIP56, PBT and PnpA in the wild type (WT), KOrstB and KOrstB+pRstB strains was compared. RT-qPCR and SDS-PAGE analysis of culture supernatants showed that deletion of rstB led to a strong decrease in the expression of these virulence factors at mRNA and protein levels. Second, the ability of RstA to bind to the promoter regions of aip56, pnpA and pbt was investigated. Electrophoretic Mobility Shift Assays (EMSAs) showed that recombinant RstA directly interacts with these promoter regions. Furthermore, key residues important for this interaction were identified by combining site-directed mutagenesis with EMSA. Altogether, these data suggest that RstAB TCS is a positive regulator aip56, pnpA and pbt expression. To evaluate the in vivo relevance of this regulation, the virulence of the WT, KOrstB and KOrstB+pRstB for sea bass was compared, showing that KOrstB is strongly impaired in virulence, when compared to the WT and complemented strains.

Carbon-supported Catalysts for CO2 Hydrogenation to Methanol

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Abstract

Carbon dioxide (CO2) contributes to the increase of global warming as it is a product of the combustion of fossil fuels. The hydrogenation of CO2 to methanol is an appealing research area since methanol is an alternative to fossil fuels, thus it may enable the decline of CO2 emissions [1].

This study aims to assess the possibility of using Activated Carbon (AC) and Carbon Nanotubes (CNTs) as support for catalysts with copper (Cu) as it active metal phase.

Catalysts, with diverse loadings of Cu and supported on pristine and functionalized AC and CNTs, were prepared by incipient wetness impregnation. The catalysts were evaluated to verify which Cu load offers better results and assess the impact of the different surface functionalities on the performance. AC was doped with Nitrogen (AC-N), oxidized with Nitric Acid (AC-O), and reduced under H2, rising the number of Lewis bases sites (AC-R). CNTs were oxidized (CNTs-O) and then, doped with N (CNTs-O-N) and reduced under H2 (CNTs-O-R). Such treatments were chosen as N-doping and rising the basicity of carbon provides better CO2 adsorption, whereas oxidation treatment offers better adsorption and dispersion of the metal ions in the material surface [2].

All catalysts were characterized by N2 physisorption at -196 °C, Thermogravimetric Analysis, H2 Temperature Programmed Reduction, H2 Chemisorption, X-rays Diffraction, ICP and Elemental Analysis. The catalysts performance was assessed on a Microactivity reactor from PID Eng & Tech and these were deemed selective and active to the reaction.

Acknowledgements

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References

[1] Din, IU, et al. J. CO2 Util., 34, 20-33 (2019)
[2] Gonçalves, L PL, et al. Cat. Sci. Technol., 10,7217 (2020)

Engineering new nanomaterials with classical drugs for evaluation in human cancer cell lines

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Abstract

Over the years, the number of new types of cancer, as well as the mortality rate, has been rising. With the development of technology tools, it has been possible to discover cancer treatments. However, the usual therapies have some issues since they can cause a few secondary effects in the patients, and most of the time, the treatment is not enough. So, an alternative is to combine two or more treatments or apply nanotechnology 1-3.

The main goal of this work is to find a promising cancer treatment, especially in colon (HT-29) and breast cancer (MCF-7), with the purpose of minimizing the number of dead normal human cells and increasing the mortality of cancer cells by using carbon nanotubes (CNT). At first, several CNT samples were prepared with functional groups (-O, -N, -S) and/or mechanical treatment, so it can be possible to compare and identify the best material that complies with the objective. The second part focused on the characterization of the CNT (by elemental and thermogravimetry analysis, size distribution – mechanical treatment influences CNT size which rises the stability – and textural), and the study of the combination with different drugs (Tacrine, Ethionamide and 5-Fluorouracil), qualitative and quantitative levels, individually by HPLC. Finally, milled and oxidized CNT submitted to a thermal treatment at 600 ˚C, which can adsorb a large quantity of drugs, have been applied on colon and breast cells to analyze the cell viability and toxicity.

Acknowledgments

This work was financially supported by LA/P/0045/2020 (ALiCE), UIDB/50020/2020 and UIDP/50020/2020 (LSRE-LCM), funded by national funds through FCT/MCTES (PIDDAC). OSGPS acknowledges FCT funding CEECINST/00049/2018. NV acknowledges funding from CHAIR in Onco-Innovation.

References

1. Z. Cheng, et al., Journal of Hematology and Oncology, (2021), 85, 14 (1);
2. S. Gavas, et al., Nanoscale Research Letters, (2021), 173, 16;
3. Z. Yu et al., Nanoscale Research Letters, (2021), 88, 16 (1).

GNU social v3 and Unbound Actors

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Abstract

GNU social is the eldest free social networking platform for public and private communications used in federated social networks. It is versatile, extensible and privacy-focused.

Historically, after the sudden death of an instance, one could neither target groups hosted at it anymore nor contact the whole followers' collection to let them know of the new house of a particular group. If we always hold absolute knowledge of the complete followers' collection (or good enough), we could automate based, for example, on which instance has more local followers, what server would be the best candidate to become the new house. Another alternative would automatically archive the old group and start again ('Move' semantics) from scratch.

Our FEP-2100, on the other hand, discusses something very different from automatically moving an actor from one server to a different one. It is about collaboration between distinct group or organisation actors to promote a unified experience between the participants of the linked group actors.

To accomplish this, we first approached this issue using ValueFlows ontology (draft 8485). Although it was theoretically interesting, we realised that we weren't expressing much else than ActivityStreams 2.0 'Follow' semantics in a more complex manner. FEP-2100 is simple of implementing as it directly takes advantage of the de facto Group dynamics.

Finally, we have also modernised the existing codebase, ensured inter-operationality defined by the IndieWeb, and developed an improved UI/UX that follows AnyBrowser, A11Y guidelines and does not require JavaScript.

This work received support from the European Commission's Next Generation Internet (NGI) initiative funds from the NLnet NGI Zero Discovery grant.

Modelling the change in physical performance of youth volleyball players: the INEX study

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Abstract

Sport performance, namely its physical and motor domains, are considered as vital to non-invasive team sports, like volleyball. Despite its relevance, the existing literature on this topic remains scarce, with existing studies commonly following cross-sectional analysis. This study aims to fulfil this gap by providing longitudinal information on the physical performance of young volleyball players. Data from players aged between 11 and 13 years-old were recorded during three consecutive years, one collection per year with one observation per year. Following the INEX (In Search of Excellence in Sport) longitudinal-mixed design, the age overlaps between cohorts allowed the elaboration of a development pattern of six consecutive years (11-16 years of age). A multilevel hierarchical linear model was used to analyse performance trajectories. Overall, players´ performance improved systematically over the years, displaying a constant and stable magnitude of change (i.e., increments of the same magnitude over the years). Specifically, linear development trajectories were observed in muscle strength tests (handgrip: ± 4.5 kgf; vertical jump without countermovement: ± 2.5cm; countermovement vertical jump: ± 3cm; and seated medicine ball throw: ± 0.4m), running speed tests (5m and 20m sprint: ± 0.07s; ± 0.16s, respectively) and aerobic performance (Yo-Yo IR1: ± 150m). In contrast, non-linear trajectories were observed in sit-ups, and horizontal jump test as well as in the agility test, which means that despite of improvements in performance over time, such increments differed in terms of magnitude. These results may indicate that, more than a training effect, the increase players physical performance could be related to their physical growth and biological maturation.

Keywords: physical performance, volleyball, youth players, longitudinal analysis.

Enantioselective synthesis of new flavonoids with potential antitumor activity

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Abstract

Currently about 50% of drugs are chiral and marketed as racemates. In recent years there has been a growing incentive for the introduction of drugs in enantiomerically pure form thanks to the improvement of the therapeutic profile [1]. Natural products are a rich source of bioactive compounds such as flavonoids whose multiple structures contribute to their wide range of biological activities, being considered a privileged scaffold for Medicinal Chemistry [2]. In fact, some synthetic chiral flavonoids have been developed by different approaches as promising antitumor agents [3].

This work reports the synthesis of a small library of chiral derivatives of flavonoids (CDF) with eight enantiomeric pairs of amino esters obtained through the coupling reaction with enantiomerically pure building blocks. The success of enantioselective synthesis was proven by liquid chromatography through the obtention of high enantiomeric purity values (above 89%).

The evaluation of their antiproliferative activity on three human tumor cell lines demonstrated that CDF are more active than their precursors and those bearing a Trice scaffold and tryptophan moiety are the most potent, such as TriCe-DTrp with good results on A375-C5 and MCF-7 cell lines (GI50=1.2 µM). Enantioselectivity was also demonstrated especially on TriCe-LTyr/TriCe-DTyr pair, where the L-enantiomer has lower activity than the D-enantiomer against all tested cell lines. The evaluation of the mechanisms underlying the activity of the most promising compounds is ongoing.

Acknowledgements

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References

1. Hancu, G., et al., Pharmaceuticals, 2022. 15(2): p. 240
2. Pone, K.B. et al., Curr Org Synthesis, 2019. 16(7): p. 968-1001
3. Pinto, C. et al., Pharmaceuticals 2021, 14, 1267

Exploring erythroblastic islands in acute myeloid leukemia

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Abstract

Acute myeloid leukemia (AML) is an aggressive blood cancer associated with a poor prognosis. AML patients often present blood cytopenias, including severe anemia. Red blood cells (RBC) originate through the process of erythropoiesis. It is not well understood how RBC are lost in AML. Our group has previously shown that AML patients have increased circulating iron levels due to loss of bone marrow erythroblasts (Ery), which actively uptake iron for hemoglobin synthesis. In this project, we aim to explore how erythropoiesis is affected and Ery lost in AML. To do so, we used the well-established MLL-AF9+ AML mouse model, which recapitulates the human disease. Flow cytometric analysis showed that Ery subpopulations were significantly reduced in the bone marrow. In particular, more differentiated polychromatic and orthochromatic Ery and reticulocytes were lost at very early AML infiltration levels (<15%). In contrast, hematopoietic progenitors, including megakaryocyte-erythrocyte progenitors (MEP), were lost only at high infiltration rates. These results indicate that the decline of Ery is due to modifications that occur downstream of MEP.

The second stage of erythroid differentiation occurs in the erythroblast island (EBI) niche, which is composed by a central macrophage, surrounded by developing Ery. We hypothesized that EBIs were disrupted in AML, leading to loss of Ery. Consistently, we observed a significant reduction of EBI macrophages, even at early stages of the disease. Imaging flow cytometry confirmed that native EBIs were largely lost in AML. We are currently exploring the mechanism by which EBI macrophages are depleted in AML. These studies will have important implications in the understanding of leukemia disease mechanisms and in the management of patients with anemia.

Carbon/ZrO2-supported catalysts for CO2 hydrogenation to CH4

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Abstract

As the years pass it is easy to perceive an increase in energy consumption. Most of the energy in the world is produced from the combustion of coal and natural gas, releasing greenhouse gases to the atmosphere, namely, carbon dioxide, with a weight of 75% in the EU [1,2]. As these emissions are harmful to our planet, mitigation possibilities should be procured.

This work aims to study the catalytic conversion of carbon dioxide (CO2) into methane (CH4) allowing for the possible fulfilment of the world´s energy demands as well as the decrease of greenhouse gases in the atmosphere [1]. The focus will be on choosing the best alternative among several NiFe catalysts supported on activated carbon/ZrO2 composites, considering CO2 conversion and CH4 selectivity, and defining optimal process conditions.

Characterization will be performed by temperature programmed reduction (TPR), H2 chemisorption, thermogravimetric analysis (TG), N2 adsorption isotherms at -196 ºC and X-ray diffraction analysis (XRD) to assess the chemical and textural properties of the developed catalysts. The catalysts´ efficiency was evaluated on a fixed-bed continuous flow reactor (T = 200 to 500 ºC). The catalysts in development are active and selective towards the methanation reaction.

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References

1. eurostat. 2021. "Database". https://ec.europa.eu/eurostat/data/database (accessed 18th of February);
2. Wen X. et al. 2021. Appl. Catal. B: Environm. 297

Genetic profiling of primary and metastatic cutaneous melanoma

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Abstract

Cutaneous melanoma (CM) is the least common but the most lethal form of skin cancer, due to the high propensity to metastasize and the resistance to therapies in advanced stages. CM has one of the highest mutation rates from all types of cancers, mostly acquired by chance, caused by UV exposure. BRAF is the most frequently mutated gene found in CM (~50%), causing the upregulation of the mitogen-activated protein kinase (MAPK) pathway, being a target and the only biomarker of response to treatment used in the clinical practice. Mutations in the NRAS gene, which also leads to the upregulation of the MAPK pathway, represents 15-20% of CM mutations, but are less receptive to treatment options. Additionally, mutations in the promoter of the telomerase reverse transcriptase (TERTp) gene, that synthesizes telomeric DNA, responsible for maintaining telomere length, were already described as being associate with worse CM patients´ prognosis.

This work aims to study frequent genetic alterations found in melanoma patients and to correlate them with the clinic-pathological data, intending to identify possible prognostic and/or therapeutic biomarkers for melanoma.

The molecular analysis was performed by the Sanger method in primary tumors, metastatic lymph nodes and metastases collected at Hospital de Santarém and Hospital dos Capuchos.

The analyzed series harbor a median age of 68 years and a median thickness of 2.3 mm. The majority of the cases (48%) were superficial spreading subtype, followed by nodular subtype (25%). 42% were <=pT2 and 58% were >pT2. So far, 17% of TERTp, 32% of BRAF and 17% of NRAS mutations were found. The occurrence of TERT and BRAF mutations was significantly associated (p=0.04). The work is still ongoing, but our preliminary results suggest that alterations in the studied genes play a role in the progression of CM. The identification of possible prognostic and/or therapeutic biomarkers will contribute to improve prognosis and treatment of melanoma patients.

Cancer-associated short-chain O-GalNAc glycans induce an immunosuppressive bladder cancer phenotype by impairing dendritic cells function

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Abstract

High-grade bladder tumours are characterized by immunosuppressive immune infiltrates, which contribute to tumour progression. Although immunotherapies are approved for muscle-invasive bladder cancer (MIBC), most patients fail to respond, suggesting the need to search alternative immune checkpoints. Aberrant glycosylation of BC cells, namely the generation of truncated O-glycans, such as Tn and STn, has been revealed to contribute to tumour progression. Glycoconjugate signatures in tumour cells are dependent on the tumour microenvironment (TME), and thus the T24 cell line was glycoengineered using CRISPR/Cas9 to reflect stable Tn and STn overexpression. Functional assays revealed that Tn overexpression in BC cells enhanced cell migration, while STn enriched T24 cells were less proliferative and had more migratory and invasive capacity. Envisaging the clarification of the immunomodulatory role of Tn and STn expression in BC, healthy donor human monocyte-derived dendritic cells (DCs) were co-cultured with glycoengineered T24 cells. Both Tn and STn expression in BC cells impaired DCs activation and antigen presentation capacity by downregulating CD86 and HLA-DR molecules. Furthermore, co-cultures demonstrated reduced capability to produce MCP-1 and IL-12, as well as increased expression of IL-8. MIBC tumours and lymph node (LN) metastases were evaluated by immunohistochemistry and immunofluorescence. STn positive MIBC tumours were negative for PD-L1 and presented essentially myeloid immune infiltrate. The STn positive MIBC tumours and LN metastases were CD11c low and had no CD86 expression, while the STn negative were CD11c high and CD86 high. These results suggest that both Tn and STn may inhibit maturation of DCs, while promoting immunosuppressive TME. This work proposes short-chain O-glycans as an alternative mechanism for cancer cells to escape the CTL attack, pointing to the possible therapeutic potential of targeting DCs-associated immune checkpoints.

Individual Factors of Phishing Victimisation: An Empirical Study

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Abstract

The Internet is part of citizens´ routines and has changed the way the world communicates. The dependence generated through it has allowed the emergence of a space without barriers with high flexibility of accessing to information - the cyberspace. Despite these benefits, the cyberspace allows criminal opportunities with relevant impacts for victims. Phishing is one of the most common-use techniques to materialize crimes in the online sphere. While the general empirical research has been considering contextual characteristics that influence victimization, such as online routine activities, little is known about individual aspects that increase the likelihood of victimization of phishing scams. Therefore, the present study, quantitative in nature, seeks to understand what are the variables that increase the likelihood of responding to phishing scams, such as sociodemographic, personality traits and self-control. Moreover, it tries to understand if contextual variables (exposure to internet or preventive measures) are also important to explain phishing victimization. To achieve these goals, an online survey was administered to a Portuguese sample (n=1002), disseminated by the University of Porto but also through social media (female= 65.5%, M age=30.80). The results showed that 74.5% individuals have received phishing solicitations, and among these 38 (3.8%) answered to these, giving their personal data. Moreover, in the last 12 months, 26 individuals reported financial loss due to phishing actions. Comparing victims and non-victims of phishing scams, it was possible to observed that although men and women do not differ in their likelihood of victimization, the effect of age was borderline ($p<.054$), where older individuals where more victims. Moreover, while personality was not a relevant dimension to explain phishing victimization, individuals who adopt more financial risks where more victims of phishing. These results and their implications will be discussed.

Components of essential oils - A promise land to combat methicillin-resistant *Staphylococcus aureus* related diabetic foot wound infections

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Abstract

Diabetic foot ulcers (DFUs) are a complication that often arises in diabetic patients. Treatment of DFUs commonly relies on antibiotics. However, these ulcers are frequently colonized by antibiotic-resistant strains, such as methicillin-resistant *Staphylococcus aureus* (MRSA). Consequently, administering higher concentrations of antibiotics would most likely aggravate the ongoing problem of antimicrobial resistance and lead to cytotoxic effects in patients. Therefore, new alternatives to antibiotics are required. Thus, this work evaluated the role of selected sesquiterpenoids (farnesol, α-bisabolol and nerolidol) in the potentiation of the antimicrobial effect of commercial antibiotics (oxacillin and methicillin).

First, it was evaluated the minimum inhibitory and bactericidal concentrations (MIC and MBC) of the molecules against a MRSA clinical isolate from a diabetic foot wound, and their potentiation effect on oxacillin and methicillin, through the disc diffusion method. Their ability to eradicate pre-established biofilms of the same isolate was also evaluated in terms of biofilm mass removal (% BMR), biofilm metabolic activity reduction (% BAR) and decrease in the culturability of biofilm cells (log CFU/mL reduction).

Results indicate that farnesol was able to restore the effects of both methicillin and oxacillin. Biofilm experiments show that sesquiterpenoids by themselves have a greater effect than the antibiotics. From the perspective of antibiotics, 5 out of 6 combinations led to an increase in the value of % BMR, whereas 4 out of 6 were related to a higher reduction in biofilm metabolic activity. Furthermore, all combinations showed a significant reduction in the values of log CFU/mL. Overall, the combinations between antibiotics and sesquiterpenoids led to an increase in the antimicrobial effect of antibiotics, thus demonstrating the great potential of phytochemicals combined with antibiotics to combat multi-drug resistance wound infections.

Gender-neutral: a study of gender-fair language and of artificial introduction of a neuter gender to European Portuguese

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Abstract

This study aims to explore grammatical gender in relation to social gender and to explain and analyse proposals to avoid the generic use of the masculine (often considered biased) in European Portuguese, both the use of inclusive/ gender-fair language and the artificial introduction of a neuter gender in the language.

In order to understand the aforementioned phenomena, 378 speakers of European Portuguese were asked to answer an inquiry in which they were to describe their perception of the use of gender-fair language and neopronouns by Portuguese speakers, as well as their own use. The answers were then analysed, considering some socio-demographic variables (age, gender, whether the speaker considers themselves to be a "feminist" and whether their social circle was inclusive to queer people).

The gender-fair alternative appeared to be the most common, even if it presents some problems. The neuter, used most in the form of the neopronoun "elu" and agreeing adjetives, tends to be adopted by a specific demographic group of young people who are generally accepting of queer folk and share feminist ideals.

Despite some speaker´s efforts to be inclusive of women and non-binary people in their discourse, European Portuguese remains, for the time being, a heavily gendered language, being the masculine considered the unmarked form (generating, thus, the generic use of the masculine).

It may be worth conducting other similar studies, with larger samples and over the years, so that this (deliberate) change may be better understood, even if the use of inclusive/ gender-fair language and the neuter gender never become the standard forms.

Keywords: grammatical gender, gender-fair language, gender neutral, neuter, neopronouns.

Zinc Deficiency in Fetal Development: A Systematic Review

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Abstract

Overview and Aims: Zinc is an essential micronutrient for many processes in human body. Zinc Deficiency (ZnD) is a prevalent condition and maternal ZnD before and during pregnancy interferes with fetal growth and development. Our aim was to evaluate the effect of maternal ZnD during pregnancy on the development of the fetus.

Study Design, Population and Methods: A systematic review of the published data on the association of maternal ZnD and fetal malformations was carried out by searching on PubMed, Web of Science and Scopus databases. A total of 10 studies were included in this review, eight been animal studies and two human studies.

Results: All the studies reported the association between maternal ZnD and deformed embryos and embryonic growth retardation, but only one provided the cut-off value of normal serum zinc levels. Under ZnD conditions, four studies found smaller fetuses, poor yolk sac circulations, placental abnormalities, and problems in the rotation of the embryos. Five studies reported skeletal, heart and neural tube defects. One study showed the relation between feeding cycles of animals under ZnD diets and the incidence of congenital anomalies. Also, one study reported an increased surface microvilli in ZnD embryos cells, as well as the presence of blebbing.

Conclusions: Prevalence of ZnD varies greatly in the literature due to the absence of standardized ZnD value and to differences existing between countries around the world. Maternal ZnD severely influences the embryofetal development. Nonetheless, further investigation regarding the impact of ZnD in humans would be beneficial to confirm and better comprehend these results.

Keywords: zinc, zinc deficiency, pregnancy, fetal anomalies, congenital malformation.

Gastric cancer extracellular vesicles carry truncated O-glycans

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Abstract

Gastric cancer (GC) is the 5th most common cancer and the 3rd deadliest in Portugal1. The search for biomarkers and clinical approaches to improve patients´ diagnosis and evaluate disease progression is an active research topic. Overexpression of truncated O-glycans is a common feature of GC cells, which has been correlated with poor prognosis of GC patients2,3. Particularly, our group has shown the presence of these glycans in GC extracellular vesicles (EVs)4. Cancer cells secrete high levels of EVs into circulation, which cargo reflects the changes taking place in the cell of origin, representing a valuable source for biomarker application.

The aim of this study was to compare the yield, purity, and glycan content of EVs isolated by two methodologies: differential ultracentrifugation (UC) and UC with size exclusion chromatography (UC+SEC). For that, we used GC cells glycoengineered to synthesize different glycosylation. Also, we assessed the presence and detection of specific O-glycans.

Isolated EVs were characterized through nanoparticle tracking analysis, transmission electron microscopy and western blotting. The detection of truncated O-glycans at EV membrane was assessed by an immunogold labeling technique.

UC+SEC isolated EVs with higher purity, facilitating the detection of EV markers and glycans. Cells expressing specific O-glycans released increased amounts of EVs when compared with cells that do not express these glycans. Also, a higher intensity detection of specific glycans was observed in EVs rather than in the parental cells. Remarkably, we were able to detect truncated O-glycans at EV membrane.

In conclusion, UC+SEC led to purer EVs, which facilitated protein and glycan detection. GC cells displaying truncated O-glycans secreted higher amounts of EVs, which may facilitate its detection in the clinical context. The presence of tumor-associated glycans at EV membrane highlights its potential use as circulating EV biomarkers in gastric cancer.

Potential cosmetical application of *Fucus spiralis*

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Abstract

The cosmetic industry is innovating in response to society's increased awareness and choice for more natural and sustainable products. Thus, seaweeds are becoming more well recognized as a rich natural source of valuable biochemical elements and as prospective sources of active substances. *Fucus spiralis* (Phaeophyceae) is a brown seaweed present along the west coast of continental Portugal abundant in the intertidal zone.

In the context of allowing greater sustainability of resources and minimum generation of waste, four different extracts (water, polysaccharides, ethanol and residues) were obtained with Generally Recognized as Safe (GRAS) solvents, namely water and ethanol, employing a biorefinery process. The extracts were evaluated in terms of biocompounds (phenolic compounds and pigments), antioxidant capacity (ABTSo+, DPPHo, oNO, O2o- and FRAP assays), and anti-hyperpigmentation capacity (tyrosinase inhibition). *F. spiralis* has seasonal characteristics, what can represent different biochemical profile thought the year and therefore two different collections: spring-summer (SS) and autumn-winter (AW) were evaluated.

In terms of biocompounds, the aqueous extract of *F. spiralis* AW had 3.33% phenolic compounds, 1.77% more than SS; while the ethanolic extract of *F. spiralis* SS contained 13.03 ± 0.20 mg gExtract of total chlorophyll and 3.50 ± 0.06 mg gExtract of total carotenoids, 3.57-fold and 4.22-fold higher than *F. spiralis* AW. Results were notable with *F. spiralis* AW (water, polysaccharides and ethanol extracts) in the antioxidant (IC50) and enzyme inhibition assay (IC50), except for the oNO and O2o- assays, in which *F. spiralis* SS (polysaccharides extract) had the best performance.

In conclusion, this study revealed that *F. spiralis* has a great potential to be incorporated in cosmetics products and, moreover, it is important to consider the harvesting period according to the intended bioactive substance.

New antidotes for the L-Amino acid oxidase toxin in the *Viperidae Species*

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Abstract

L-amino acid oxidases (LAAO) are FAD-dependent oxidoreductases enzymes that catalyze the stereospecific oxidative deamination of an L-amino acid. They are present in several organisms like insects, fungi, bacteria and snakes. Studies indicate that LAAO toxins can reach up to 20% of snake venom composition. These toxins are responsible for harmful consequences, such as the induction of apoptosis, edema, aggregation and/or inhibition of platelets. Yet, these proteins exhibit anti-bacterial, antiviral and leishmadicidal activities. Most of the aspects regarding LAAO´s structural dynamics and catalytic mechanism are still unknown.

Using the Bothrops atrox´s LAAO 3D structure (PDB ID. 5TS5) we applied computer aided drug design techniques to:

First, understand the dynamics of the enzyme using molecular dynamics calculations (MDs). The simulations were conducted during 500ns and aimed to shed light on the flexibility of the protein, observe permanent and/or transient cavities that can alberg a ligand and determine the stability of the substrate in the catalytic pocket. Based on RMSD calculations, from the very beginning of trajectories analyzed, we observed high stability of the substrate in the catalytic pocket interacting with the catalytic His and the FAD cofactor.

Second, identify new LAOO inhibitors based on the 3 known inhibitors and performing a virtual screening (VS) ligand based, followed by structure based VS.

Finally, determine the reaction mechanism of the enzyme applying QM/MM calculations. At this point, we used as starting structures the minimized X-ray coordinates and cluster representatives of the MDs obtained at step1. This represents a pivotal point in the design of inhibitors based on the transition state analogous.

Study of the effects of different nanoparticle coatings on zebrafish

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Abstract

The growing interest in nanomaterials (NMs) is related to quantum effects, as the electrical, optical and magnetic properties of matter change at the nanometer scale. Moreover, NMs have a relatively larger surface area compared to the same mass of material produced in a macroscale, making them more chemically reactive. One of the most produced NMs worldwide are the titanium dioxide nanoparticles (TiO2 NPs). These NPs have been used in medicine, information technology, energy or agriculture. The functionalization of TiO2 NPs is reached by adding silane-EDTA or citrate. The citrate is one of the most used coatings of metal NPs. However, the modification of TiO2 NPs with silane coupling agents is the simplest process and its use is becoming more common. Thus, the aim of this work is to study the effects of TiO2 NPs using these two coatings in an aquatic model species, the zebrafish "*Danio rerio*".

To evaluate the effects of 45nm TiO2 NPs combined with different coatings, two "in vivo" embryo toxicity assays were performed: a development assay and Nile red staining assay.

The development assay consists of exposing zebrafish embryos from 0 to 96 hours of post-fertilization (hpf) with different concentrations of TiO2 NPs (OECD guideline nr. 236). In this assay, the mortality, hatching, development and malformations were daily checked, and at the end (96hpf) the length and the heartbeat were measured. The larvae were stored in RNA later to further study the expression of target genes (e.g.: genes related to lipids such as PPAR and FASN).

Then, the Nile Red assay was performed to analyse the effect of TiO2 NPs in lipidic biomolecules, with exposure starting at 48hpf and finishing at 120hpf. The Nile Red dye allows us to tag and obtain imaging and quantify regional adiposity by fluorescence stereomicroscope.

This work will be useful to understand effects of the TiO2 NPs at the molecular level and compare the contribution of each coating on those effects.

A de novo transcriptome of the annelid worm *Hediste diversicolor*

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Abstract

The rapid development of sequencing technologies, the so-called Next-Generation Sequencing (NGS) revolution, has provided an ample impact in biological studies. The capacity to sequence DNA and RNA in an automated, parallel and low-cost way, was a key driver in the generalization of these technical approaches. In this context, the assembly of a transcriptome is vital to decipher the functional components of a genome and disclose the molecular constituents of cells and tissues, as well as to understand disease and development.

Here, we discuss some aspects of the de novo transcriptome construction and how the process unfolds. Furthermore, we will also present the first transcriptome of *Hediste diversicolor*, an annelid worm species belonging to the family Nereididae, that inhabits estuarine and lagoon areas on the Atlantic coasts of Europe and North America. This species has a significant distribution in our coast, being extremely relevant for the ecology of the ecosystem, since it belongs to a vast trophic chain and is used as a reference for toxicity studies in these habitats. Preliminary analysis of the transcriptome assembly shows a BUSCO coverage with 97.7% completed sequences (S: 89.8%; D:7.9%) versus Eukaryota and 96% (S: 88.2%; D: 7.8%) versus Metazoa. The next step will include the annotation stage. Our findings offer a valuable resource for multiple biological studies using this species.

High copper levels detected in biological production soils decrease the Nitrogen Use Efficiency in tomato plants

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Abstract

In plants, Cu is an essential metal involved in several biochemical and physiological processes essential to the well-being of plants and animals such as being a cofactor of numerous metalloproteins responsible for toxicity management within the plant. Its bio-industry uses include fungicides and bactericides used for disease control in various cultures. However, extensive use of such products produces the risk of increased bioavailability of copper in culture soils resulting in detrimental effects in plant growth such as in stoked tomatoes and vineyard cultures. With this, it becomes a priority the study of the effects and toxic roles of copper in various agronomical cultures. In this study, a solution culture experiment was conducted to examine the toxic effect of Cu in tomato plants (*Solanum lycopersicum L.*). In a (1:1) vermiculite: perlite substrate, 15 d old plants were exposed to 8 mg/L of CuSO4 for 30 days in a 10-day cycle alternating with Hoogland 0.5x/1x solution for culture maintenance. Protein extract on leaf samples was conducted as well as photosynthetic pigment quantification (chlorophyll a+b, β-Carotene and Lutein carotenoids) and GS (Glutamine Synthetase) and NR (Nitrate reductase) enzyme activities. Obtained results indicate that exposure to this copper concentration resulted in a significant decrease in all tested photosynthetic pigments with chlorophyll a+b, having the highest decrease of 27.85%, β-Carotene and Lutein of 17.48% and 5.14%, respectively. Both GS and NR enzymes showed a significant reduction in activity by 28,70% and 31.83%, respectively. The results thus suggest that the exposure to 8 mg/L Cu reduced activity of NR and it negatively affected the activity of GS, as low ammonia levels were available for its activity. This, in turn, had as consequent a decrease of organic nitrogen to be used for the synthesis of photosynthesis-related pigments.

Investigating the contributions of BRCA2/BRC-2 for cell proliferation in *Caenorhabditis elegans*

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Abstract

During embryonic development, cells undergo multiple rounds of DNA replication and division to populate different tissues. Integrity of the genome during these processes is ensured by mechanisms that control DNA repair and the correct segregation of chromosomes in mitosis. Malfunction of these safeguarding mechanisms has been associated with severe pathologies, including congenital defects and cancer.

The breast cancer susceptibility gene, BRCA2, has been implicated in several mechanisms to maintain genome integrity at multiple stages of the cell cycle. The best-known function of BRCA2 is in the repair of DNA double-stranded breaks via homologous recombination during the S and G2 cell cycle phases. But other roles for BRCA2 during DNA replication, chromosome segregation and cytokinesis have been described albeit most of these are still poorly understood. Furthermore, the physiological relevance of each BRCA2 cell cycle function is unclear.

We set out to dissect the contribution of each BRCA2 cell cycle function for faithful cell proliferation during animal development. For this, we exploit *Caenorhabditis elegans* genetic tractability to generate an inter-disciplinary tool consisting of a strain expressing its endogenous BRCA2 homolog (BRC-2) fused to an auxin-inducible degron (AID) for functional analysis in a temporal-specific manner, a split-GFP (sGFP) for microscopy analysis in a tissue-specific manner, and a FLAG epitope for biochemical analysis. In particular, this strain in combination with high-resolution microscopy has allowed us to study in detail BRC-2 in vivo localization, intracellular dynamics and functions relative to the cell cycle, tissue specificity, and developmental stage. The results of this work will improve our understanding about the underlying causes of developmental disorders associated with mutations in BRCA2.

Foliar application of Bordeaux mixture decreases the Nitrogen Use Efficiency in tomato plants

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Abstract

Despite copper being an essential micronutrient, its rampant use in agriculture since the late 19th century has led to an accumulation of this heavy metal in the environment. The main driver of this buildup of copper in the soils is its use as an antimicrobial agent, especially by organic farming systems, as this is one of the best forms of pathogen control available to them. In the past, copper-based antimicrobial agents were extensively overused and often misused, causing the accumulation of extremely high levels of copper ions in the environment. Consequently, (tomato) plants may experience phytotoxicity, which can lead to stunted growth and overall losses in productivity. In an attempt to better understand the effects on the plant mechanisms responsible for protecting against copper-induced stress, this work contributes to the knowledge of how *Solanum lycopersicum L*. responds to copper exposure through spraying of Bordeaux mixture. For this purpose, tomato plants were grown in a mixture of vermiculite: perlite (1:1), after 2 weeks these plants were exposed to copper treatments by way of Bordeaux mixture applications every 10 days until an amount proportional to 6 kg/ha/year of copper was applied.

After this treatment the activity of the enzymes that participate in the nitrogen assimilatory pathway: nitrate reductase and glutamine synthetase, were obtained. Furthermore, quantification of photosynthetic pigments in leaves was carried out as well as an assessment of the metal´s adverse effects on plant growth. In plants treated with Bordeaux mixture, a reduction of 27% in mg total Chlorophyll per gram of fresh weight was verified; additionally, a 46.3% decrease in GS activity was also obtained. It is possible that the decrease in Chlorophyl is due to lower levels of organic nitrogen being produced as a consequence of the decreased GS activity registered.

Production of Serum Amyloid A3 protein by *Mycobacterium avium*-infected macrophages drives osteoporosis during infection

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Abstract

A tight regulation between bone formation by osteoblasts and bone degradation by osteoclasts, maintains an adequate bone mass. Dysregulation of bone homeostasis may lead to osteopenia, which increases the risk of low impact fractures. Chronic infections affect bone homeostasis directly by colonizing the bone cells, or indirectly, by the production of mediators that alter the function of bone cells. Mycobacteria mostly cause lung infections but are also able to infect the bone. Our previous results showed that, in a mouse model of chronic *M. avium* infection, bone mass was reduced in a TNFα and IFNγ-dependent manner due to increased bone degradation and decreased bone formation. *M. avium* resided mostly inside macrophages within the bone marrow parenchyma not directly colonizing the bone cells. Furthermore, targeted transcriptomic analysis of the bone during *M. avium* infection showed that the most differentially upregulated gene in the infected bones was Saa3, which codes for the murine acute phase protein SAA3. SAA3, in turn, has been recently implicated in the regulation of bone turnover.

We hypothesized that *M. avium*-infected macrophages are a source of SAA3 in the bone. Using in vitro cultures of bone marrow derived macrophages (BMDM), we found that infected macrophages express Saa3. Moreover, the expression of Saa3 is further increased by TNFα stimulation. When conditioned media from infected BMDM was added to in vitro osteoclast progenitors cultures, increased frequency of cells with more than 20 nuclei and enhanced osteoclast resorptive activity were observed. These results suggest that Saa3 drives osteoclast formation and bone resorption. On the other hand, we studied the effect of murine SAA3 addition to osteoblast cultures, and we found that SAA3 decreased the concentration of mineralized bone matrix, impairing new bone formation. Overall, SAA3 dysregulates bone homeostasis during *M. avium* infection by increasing bone degradation and impairing bone formation.

Electrochemical immunosensor for the quantification of soybean trypsin inhibitor allergen (Gly m TI) in food matrices

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Abstract

Soybean is a food with high functionality and many applications in the food industry. Soybean protein isolates (SPI) are widely used as technological ingredients in bakery (e.g. biscuits) and meat (e.g. sausages) products due to their gelling and aggregating properties. The trypsin inhibitor (Gly m TI) is one of the soybean allergens, which belongs to the family of protease inhibitor "Kunitz" proteins. It is classified as a minor allergen but presents high clinical relevance because it causes severe allergic reactions (anaphylaxis). Accordingly, it is urgent to develop devices with high efficiency and sensitivity for their incorporation into food allergen monitoring systems.

In this work, an immunosensor is under development (optimization stage) to quantify Gly m TI allergen in foods. Pure 3-MPA, 8-MOA, and several stoichiometric mixtures (1:1, 10:1, 20:1), as well as anti-Gly m TI antibody concentrations (50, 100, 150, and 200 µg/mL) were immobilized on the surface of a disposable gold electrode. SPR and square wave voltammetry techniques were used to evaluate the monolayer length/composition and the anti-Gly m TI concentration. The highest sensitivity and lowest limit of detection (LOD) were achieved with shorter thiol 3-MPA, representing the most suitable monolayer for the antibody immobilization. The immunoassay constructed with 200 µg/mL of anti-Gly m TI polyclonal antibody presented the highest sensitivity (14.42 µA decade-1), lower LOD <10 ag/mL and a broader linear dynamic range (1.00 ag/mL and 10 µg/mL). The morphological changes of the electrode surface were assessed by Atomic Force Microscopy analysis in all stages of the assay construction.

The applicability of the immunosensor to real foods is currently being tested in incurred foods containing SPI in doughs/biscuits to evaluate the interference of the matrix and to assess the effect of processing (e.g. baking). The immunosensor is also being validated with an immunochemical platform ELISA.

3D-printing of Magnetic Polycaprolactone/Graphene-Based Scaffolds for Tissue Engineering

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Abstract

The combination of polycaprolactone (PCL) and graphene-based materials (GBM) has been extensively explored as biomaterials for tissue engineering (TE) scaffolds in combination with additive manufacturing (AM) techniques, which has resulted in composite scaffolds with improved mechanical, biological, thermal and electrical properties. Nevertheless, better mimicry of the native tissue´s architecture and control of the mechanical environment is still required. Therefore, here we present the first steps towards graphene nanoparticle (GNP) composite scaffolds, which can be manipulated by external magnetic field. Different grades of graphene nanoparticles (GNP-M, GNP-C) were obtained with sizes of 1 and 2 µm, respectively, and functionalized with iron nanoparticles (45 nm) to produce magnetized GNP (@GNP-C/M) with colloidal stability in aqueous environment. PCL/@GNP-(C/M) composites (0, 2, 10, 15, 20 wt.%) with homogeneous @GNP-(C/M) distribution were produced by melt blending. The incorporation of both @GNP-C and @GNP-M increased PCL´s crystallization temperature by 94%, maximum degradation rate temperature was increased by 10 and 4 %, for PCL/@GNP-C and PCL/GNP-M, respectively. Furthermore, a magnetic saturation of 74 and 79 emu/g was measured for PCL/@GNP-C and PCL/GNP-M, respectively. Finally, hexagonally microstructured PCL/@GNP-C scaffolds with an average fibre diameter of 20 µm were 3D-printed and evaluated for their cell adhesion, proliferation and differentiation using an immortalized myoblastic cell line (C2C12). The new materials presented here can revolutionize the current implant technology status, by providing them active effect abilities after implantation.

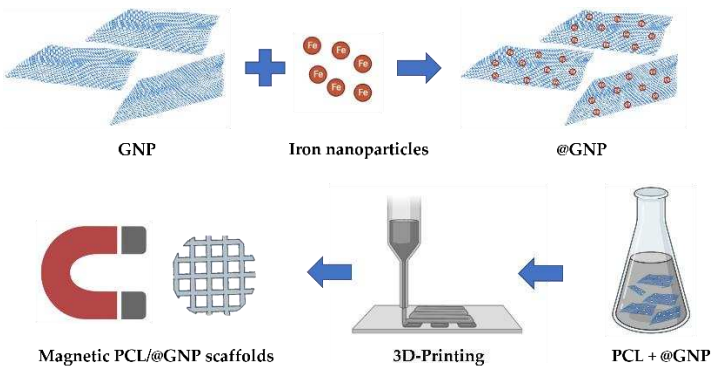

Figure 1. Graphical Abstract

Characterization of CDH1 and its Antisense Gene in Stomach and Breast Normal Cell Lines

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Abstract

Introduction: Antisense transcripts represent a portion of the long non-coding RNAs. Nevertheless, these transcripts can control gene expression (Pelechano & Steinmetz, 2013). CDH1 is an invasion and tumor suppressor gene since it encodes the cell-cell adhesion protein E-Cadherin. Loss of expression of this gene, and consequently loss of E-Cadherin, leads to a more invasive tumor in most epithelial tissues. Although CDH1 expression regulation is being studied, nothing is known regarding the potential regulatory role of its antisense transcript (Berx et al, 1998; Hazan, Qiao et al, 2004; Semb & Christofori, 1998).

Promising studies have already shown the regulatory relationship between sense/anti- sense partners (Dong et al., 2019; Gomes et al., 2019). Our aim is to characterize the expression of CDH1 sense/anti-sense pair in cell lines derived from tissues where CDH1 is important, such as stomach (GES-1), breast (MCF10A) and thyroid (Nthy-ori 3-1). For this, we evaluated both transcripts expression by qRT-PCR, and CDH1 protein levels by immunocytochemistry and flow cytometry.

Results: Supporting GTEx data, Nthy-ori 3-1 normal thyroid cell line expressed both CDH1 sense and antisense (AC099314.1) transcripts. The antisense transcript was neither expressed in MCF10A nor in GES-1 cell lines. MCF10A expresses the CDH1 transcript, but GES-1 does not. At the protein level, MCF10A expresses E-cadherin at the membrane, in a heterogeneous pattern across the cell culture.

Conclusions: The lack of expression of CDH1 sense/anti-sense pair in GES-1 was unexpected and may reflect either the loss of function of these genes in a human embryonic stomach cell line, or a defect in the data provided by GTEx, which used a non-strand-specific RNA-seq strategy to generate the data. This analysis also highlighted that MCF10A is not adequate to explore the role of AC099314.1, and that only the Nthy-ori 3-1 may be used for that purpose in future studies.

The threat in not including: effects of a more inclusive identity on acculturation attitudes towards refugees

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Abstract

With the refugee crisis in 2015 and the recent political crisis in Afghanistan, new debates and concerns have emerged about the reception of refugees from this region and how to avoid possible discriminatory actions in the host country. The present study (N = 104) then seeks to understand how the prevalence of global or national identity may affect the acculturation attitudes of Afghan refugees in Portugal, taking into consideration the perception of symbolic and realistic threat as a possible mediator of this relationship. The results state that symbolic threat mediates the negative relationship between global identity and assimilation attitudes, and the positive relationship between global identity and marginalisation. The higher the salience of global identity, the greater the integration attitudes, and this association is not mediated by the perception of threat. Furthermore, the higher the salience of national identity, the lower the marginalization attitude and the higher the assimilation attitude. There is no relationship between national identity and integration attitudes. The implications of this study include the possibility of interventions that foster global identity and soften the relationship between national identity and the perception of threat towards refugees, in order to reduce discriminatory attitudes.

Transport of nanoparticles in different biological matrices using multiple particle tracking video microscopy

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Abstract

Characterizing the transport of nanoparticles (NPs) in biological matrices provides key hints concerning the potential of such systems for therapeutic use. Multiple particle tracking (MPT) is a microscopy-based technique that analyses the interactions between NPs and surrounding media by assessing their time-resolved trajectories. These studies generate large datasets that require using dedicated processing software in order to extract intelligible results. We recently developed a versatile software, MPTHub, for the purpose of studying the transport of NPs in mucus (DOI: 10.1101/2021.09.15.460434). In the present study, we sought to further validate and explore the technique using different NPs and biological matrices. Fluorescent polystyrene NPs (100 nm) were coated with various surfactants commonly used as colloidal stabilizers during manufacturing, and their mobility in mucus surrogates (mucin in phosphate buffered saline pH 7.4) was studied by MPT. The transport of NPs was also determined in viable MCF-7 breast cancer cell spheroids after 15 min to 4 h incubation and cryosectioning. Results showed that coating with poloxamer (407 or 188), sodium cholate, sodium dodecyl sulfate, cetrimide, polysorbate 80 or polyvinyl alcohol was persistent even after extensive washing and, in most cases, did not impact the diffusive movement of NPs in 3% (w/v) mucin dispersions (Figure 1). Increasing mucin content to 5% (w/v) resulted in considerable transport impairment for bare NPs. However, in the case of poloxamer 407 modification, NPs remained diffusive. Preliminary results with spheroids indicated that MPT can effectively characterize the mobility of NPs at different penetration levels and help distinguish various areas of transport impairment. Overall, MPT studies using the MPTHub software allowed fast and reliable quantitative analysis of NP transport in biologically relevant matrices, which could be helpful for engineering nanosystems for therapeutic use.

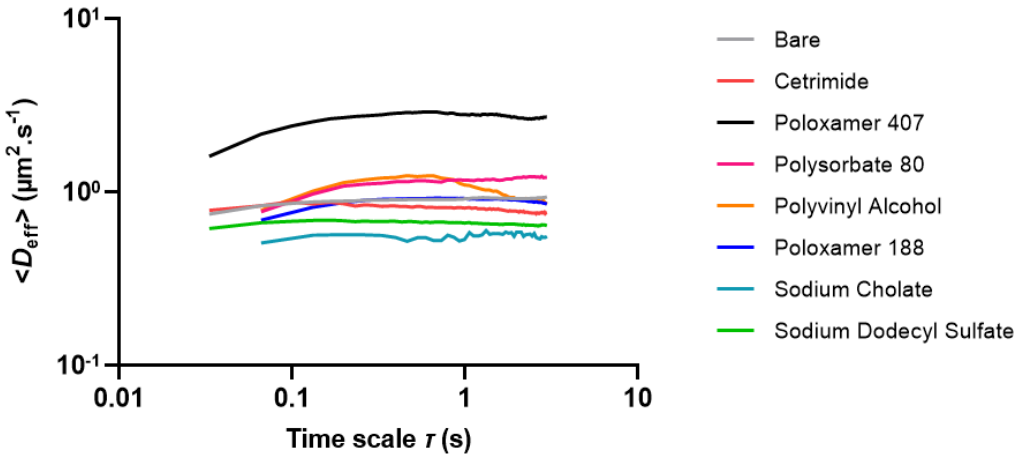

Figure 1. Ensemble effective diffusivity (Deff) of 100 nm polystyrene NPs coated with different surfactants, in mucus surrogate (3% w/v mucin), as a function of time scale (minimum of 24 trajectories were analyzed for each sample).

Rage as a process of transformation - Reflection on the student's position in the learning context

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Abstract

This essay intends to reflect on Rage from the book "The Burnout Society" by Byung-Chul Han, as a transforming agent in the relationship between student and learning, identifying the School as a place of violence. For this reason, this article seeks in Rage a way of resistance in this context and as a way of subsistence to the disciplinary society and productivity reflected in the book.

Defending that all learning is a violent process, the article does not intend to polarize - school into something positive or negative. Instead, it tries to understand how this context can cause a student to create a transformation both in the school system and in the society that it integrates, considering that the learning process can be an instrument of individual self-affirmation towards the world.

Rage, or the principle of disobedience, is the position in which the student can reverberate on the possibility of action, thus feeding their individual growth and shaping a perspective on School: By not considering it as a passive place for the mere transmission of content and as of discipline/production, but as a dynamic platform that creates, shares and provides tools for a reflection on the relationship between the individual and society.

Keywords: Student/School; Rage; Individual/Society; Violence and Learning.

Investigating dynein-2 regulation during intraflagellar transport in cilia

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Abstract

Cilia are microtubule-based organelles that carry out a wide range of critical functions, including the modulation of signaling pathways involved in cell proliferation, differentiation and migration. Ciliogenesis and ciliary signaling are mediated by a bidirectional transport process termed Intraflagellar Transport (IFT), that carries ciliary components in and out of cilia. Kinesin-2 motors carry out anterograde transport of cargoes from the cilium base to the tip, while dynein-2 motors power retrograde transport of cargoes from the cilium tip back to the base.

Recent in vitro work has shown that dynein-2 adopts an autoinhibitory conformation when it is transported into cilia by kinesin-2. It has been hypothesized that this mechanism serves to avoid tug-of-war between the two opposing motors, thus facilitating the anterograde transport of dynein-2 to the tip of the cilium. However, this remains to be tested in vivo.

Here, we evaluate the in vivo importance of the dynein-2 autoinhibitory mechanism in sensory cilia of *Caenorhabditis elegans* neurons. Using CRISPR-Cas9-mediated genome editing, we introduced point mutations in conserved residues of the dynein-2 heavy chain CHE-3, previously shown to disable the autoinhibited conformation of the human dynein-2 in vitro.

By performing high-resolution live imaging of GFP-labeled wild-type and mutant forms of CHE-3, we assessed and compared IFT kinetics and dynein-2 distribution along the cilium. Strikingly, we observed a similar distribution pattern and IFT kinetics for the dynein-2 mutant, with no evidence of tug-of-war between motors during anterograde IFT. These results provide the first experimental evidence that dynein-2 autoinhibition is not the only mechanism in place to facilitate its transport by kinesin. We are currently testing whether disabling this mechanism affects dynein-2 mediated signaling through cilia.

This work improves our understanding of the mechanisms regulating dynein-2 and cilia function.

Differences in force profiles using two different rowing big-blades

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Abstract

Type and shape of rowing blade has an impact on drag force during the propulsive phase of the rowing cycle increasing the boat speed. The addition of a strip of plastic to the top edge of a rowing big-blade (Randall foils) seems to have a positive impact on performance by promoting an optimization of the immersed area of the blade. Our main purpose was to evaluate the force profile of both blades on a tethered rowing test. One highly trained female rower (30 years old, 61.8 kg of weight, 168 cm in height) performed two bouts of 90 s tethered rowing in a 25 m indoor swimming pool with 24 h in between, using big-blades with and without the foils. The force exerted was measured using a load-cell with a measurement capacity of 4.905 N and a recording rate of 200 Hz, coupled to the stern of the boat by a 5 m steel cable. Force and movement analysis were recorded using Qualisys system to assess the beginning and end of the propulsive phase. Data of five rowing cycles (mean±SD) were analyzed using MatLab, peak force, mean force, impulse, and propulsive time were obtained (Table 1). On the selected biomechanical variables, it was observed that Randall foils present higher values except on mean force and the peak force was achieved when the oar was perpendicular to the boat. Previous research already suggested that blades with a larger immersed area generated significantly greater drag coefficients at angles around 90º compared with smaller ones, however in both cases there are energy losses to the flow of water around the blade which might be decreased by the addition of the foil. This data suggest that the use of Randall foils can have a positive impact on performance but considering the dynamic factors that affect rowing propulsion and the interaction between boat-oars-rower, more studies are required to evaluate the expected benefits on boat velocity.

Table 1. Biomechanical mean ± standard deviation values during a test of tethered rowing.

Variables	Randall foils	Big-blades
Peak Force (N)	493.0 ± 95.6	414.0 ± 71.6
Mean Force(N)	233.3 ± 113.7	245.9 ± 89.2
Impulse (m.s)	509.8 ± 52.2	508.3 ± 38.4
Propulsive time (s)	2.21 ± 0.31	2.06 ± 0.09

Lessons on the Individual Space

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Abstract

In 1884, Gottfried Semper used the expression "Raumesindividuum"1 (translated from German, "individual space"), to refer to a spatial organization based on an individual scale. Although there are pontual references from authors who, like Semper, try to define what is the individual space, there is no notice of an investigation dedicated to exposing the diversity of modes, shapes and dimensions that characterize this space, particularly in its architectural dimension.

My research "Atlas of Individual Space: experiments and realizations" focuses on the collection, treatment and analysis of iconographic and bibliographic material in order to understand what it represented and produced in the history of Man, Space and Architecture. Why did mortal sin originate individual space? How did nomads establish horizontal space? How did crinolines delimitate it? Did dance materialize the individual space? These are four of the fifteen questions raised following the selection of almost eighty examples of the realization or experimentation of individual spaces under different pretexts and contexts that constitute an essential basis for the study and contemporary understanding of this space.

Thus, the present investigation dedicates its effort to assemble cases of study and to explore a definition of the individual space, which is understood as a space materialized in the first person singular. Additionally, the relevance of this investigation comes at a time when we are made aware of each one's own space due to the current pandemic situation. The ultimate aim of this exploration is to understand how the diversity of this materialization leads to common principles of creating space for its own.

This research is part of the Master's Dissertation for the conclusion of the Integrated Master in Architecture by the FAUP carried out under the supervision of Professor Marta Rocha.

References

1 SEMPER, Gottfried - Kleine Schriften. Berlin: W. Spemann, 1884, p.422

The Fireplace and the House. A journey through multiple ways and examples on how to design a fireplace

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Abstract

Considered the guardian of fire, the fireplace throughout the years revealed itself as an important element that influenced the design of the house. This architectural element was once the physical and symbolic center of the home. Responding to basic needs, the fireplace played a very important role in the organization of domestic life, its presence created routines and influenced daily life. Moreover, since the construction of the first shelters, fire has been an integral part of the house, becoming a symbol of comfort and reunion. Without a doubt, the discovery of fire was a turning point in the history of mankind and, ultimately, in architecture.

"Histórias do Fogo e da Casa: o desenho da Lareira" is an investigation focused on studying the domestic space from a specific point of view, transforming and focusing our gaze on an architectural element - the fireplace. Coming from a feeling of affection or curiosity for its oblivion, the fireplace reveals itself as a particular point in the home, able to create different relationships, atmospheres and dynamics that influence the design of the house. Thus, the structure of this investigation intended to establish a journey through various themes regarding the fireplace, from its historical context, to construction aspects, to the sensory dimension of fire and the influence of thermal conditions on architecture. The fireplace, as an architectural element, can be associated with different parts and elements of the house, and the goal of this investigation is to explore which relations it establishes and how, trying to show that the fireplace can be designed in multiple ways, creating different environments and sensations. This investigation integrated a master thesis that was developed under the supervision of Professor Marta Rocha Moreira.

Evaluation of mycotoxin exposure on Algerian adults using LC-MS/MS

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Abstract

Mycotoxins are food contaminants produced by some types of fungi which have major economic impacts due to reduced agricultural yield, lower animal productivity, costs associated with their prevention and control, as well as costs regarding their impacts on human and animal health. Algeria is a country with an environment that encourages fungal proliferation, however there is scarce data available and little legislation regarding mycotoxin contamination in food and feed.

In this study, the presence of 11 mycotoxins and metabolites was assessed by a biomarker analysis in the first-morning urine of 45 Algerian workers of a plastics industry. The analytical method was based on QuEChERS (quick, easy, cheap, effective, rugged, and safe) extraction and liquid-chromatography tandem mass spectrometry (LC-MS/MS) quantification. Different sorbents used in dispersive solid-phase extraction (d-SPE) were tested in the cleanup step of QuEChERS. The method was fit-for-purpose and showed good analytical performance in terms of specificity, linearity, precision, and recovery.

All 45 samples were contaminated with at least 2 mycotoxins, being deepoxy-deoxynivalenol (DOM-1) the most prevalent, present in 97.8% of the samples, followed by ochratoxin A (OTA) with 93.3% of positive samples, and toxin-T2 (T2) with 88.9%. Levels of DOM-1 ranged from 17.6 µg/L to 189.1 µg/L, OTA ranged from 0.3 µg/L to 3.5 µg/L and T2 ranged from 0.3 µg/L to 36.3 µg/L.

This was the first study of mycotoxin biomonitoring carried out in the Algerian population. The results obtained support the need of accurate data for better risk assessment and boost the establishment of better legislation for mycotoxin contamination in this country.

Psychosocial risk and protective factors associated with burnout in the police

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Abstract

Background: A growing interest in the theme of burnout in security forces has been emerging which has been reflected on the production of empirical studies throughout the years. However, it is not clear what are the specific factors that may influence burnout levels in police officers.
Objective: To identify the psychosocial risk and protective factors associated with burnout syndrome among police officers.
Methods: A systematic review has been conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA). A protocol was developed and registered in PROSPERO. A search strategy was applied to four databases (Medline via OvidSP, PsycInfo, Scopus and Web of Science). The screening process of the retrieved publications was divided in two phases, conducted by two reviewers and supervised by two others. The quality assessment entailed the use of an adapted version of the Effective Public Health Practice Project (EPHPP) quality assessment tool for quantitative studies. The data was reported through a narrative synthesis.
Results: A total of 904 articles were retrieved in the initial literature search. After removing 267 duplicates, 637 articles were incorporated in the initial title and abstract screening phase. During this phase articles were excluded for not including primary data, not presenting a quantitative design, having mixed populations and being based on specific events. After the application of the exclusion criteria, the remaining articles were assessed for a full-text review. Factors such as work stress, effort-reward imbalance, overcommitment, workload, job control, social support and so forth, were identified as possibly as being linked to burnout.
Conclusions: These preliminary findings help to raise awareness of the psychosocial risk and protective factors associated with burnout syndrome, which can help in the development of interventions that can support the police force.

Phoretic and parasitic organisms associated with *Rhynchophorus ferrugineus Olivier, 1790* in Northern Portugal

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Abstract

The red palm weevil (RPW), *Rhynchophorus ferrugineus Olivier, 1790*, is native to Southeast Asia and has been spread beyond its native habitat, becoming a significant pest of the Canary Island date palm (*Phoenix canariensis*) in Portugal. This weevil is associated with several organisms, such as mites and fungi. Our objective was to document the presence of these organisms, and to detail the species presence and distribution on RPW in Northern Portugal.

RPW specimens were collected via pheromone traps from July 2021 to January 2022 in 4 districts of Northern Portugal. Weevils were dissected and inspected for mites. Also, fungal spores and mycelium from weevils and mites with visible fungal growth were placed in potato dextrose agar plates, and strains were isolated through serial plating. Mites were counted and identified morphologically, and fungal species were identified based on culture morphology and ITS2 rDNA sequences.

Mite prevalence in RPW was 100%. All body parts of the host were associated with mites, but the highest average intensity was found under the elytra with 308 mites per weevil (mpw). We found 7 types of mites: *Centrouropoda sp*., *Curculanoetus rhynchophorus*, *Uroobovella sp., Acarus sp*., *Nenteria sp*., and Mesostigmata type 1, and Mesostigmata type 2. A total of 4 fungal genera were found, i.e. *Scopulariopsis sp*., *Alternaria sp.*, *Fusarium sp*., and *Penicillium sp*.

Our study showed a high parasitic diversity of RPW-associated mites. The high-intensity levels of mpw may also entail fitness costs to RPW. Some mite types have not been described before and could represent new associations with the RPW. The fungi that we isolated from RPW could also be affecting the mites and be pathogenic to other hosts. The latter suggests that these fungi could be acting as biocontrol agents or using the RPW-mite complex as a vector.

2D lipid membrane mimetic models' interactions with molecules with anticancer activity

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Abstract

Tamoxifen (TAM) is a conventional drug used in the treatment of breast cancer and epigallocatechin-3-gallate (EGCG) is a polyphenolic compound with anticancer activity. Although their beneficial health effects are well described, their real mode of action is still unknown. Evidence suggests that both interact with the plasma membrane, and affect its structure. Thus, in this work, the interactions of EGCG and/or TAM with Langmuir monolayers composed of 1,2-dipalmitoyl-sn-glycero-3-phospho-L-serine (DPPS), 1,2-dipalmitoyl-sn-glycero-3-phosphocholine (DPPC), sphingomyelin (SM), and cholesterol (Chol) were investigated. Both π/A isotherms and Brewster angle microscopy (BAM) images were obtained. From the interaction studies with normal cell membranes models (DPPC, SM:Chol (1:1), DPPC:SM:Chol(1:1), pH 7.4), it was shown that both EGCG and TAM intercalate in the monolayers: EGCG, having a strong affinity to DPPC and no affinity to Chol-enriched domains, caused fluidization of the monolayers, while TAM showed affinity to Chol-enriched domains and caused condensation of the monolayers. The strong affinity of EGCG with DPPC-enriched membranes may be the explanation for its pleiotropic effects. The action of TAM on non-tumorigenic membranes may be associated with its side effects. Using cancer cell membrane models (DPPS and DPPS: DPPC (1:1), pH 6.4), TAM also decrease the monolayer fluidity but EGCG did not show significant interaction. From these results, it is possible to infer that the mechanism of action of TAM can be related to the decrease in the cancer cell division, due to membrane condensation. Overall, membrane interaction studies proved to be key tools to unravel unknown mechanisms of action and associated side effects.

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Eugenol and Pulegone as biorational alternatives for *Trioza erytreae* (Hemiptera: Triozidae) control: Nymphal toxicity and applicability on *Citrus limon*

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Abstract

Agricultural activity relies deeply on the usage of synthetic insecticides for pest control; however, the extensive use or misuse of these substances can have negative impacts on the environment, human health and even on agricultural ecological subsystems. Essential oils (EOs) are secondary metabolites synthesized in plant secretory structures that are less hazardous to the environment and safer to handle, with known effectivity against arthropods, thus presenting a viable eco-friendly alternative for typical synthetic insecticides. *Trioza erytreae* is a major threat for citrus production, expanding rapidly throughout the Iberian Peninsula.

To this day, no effective control method to sustainably control *T. erytreae* populations has thus far been obtained and the effects of EOs on this pest have not yet been documented. In this study, the insecticidal potential of EOs active compounds Eugenol, Pulegone and their combination was assessed by determining their toxicity through topical application on *T. erytreae* nymphs and their phytotoxicity on *Citrus limon*. Pulegone was more toxic to *T. erytreae* nymphs than Eugenol, showing the lowest LD50 values both after 24 h and 48 h whereas for the LD90, the combination of both oils was the most toxic both after 24 h and 48 h. On concentrations equal or lower than 3.60%, Eugenol presented the highest phytotoxic effect. In concentrations that did not pose a significant phytotoxic effect on C. limon, the combination of both active compounds exhibited the highest nymphal mortality.

The beneficial integration of both Eugenol and Pulegone in a mixture was shown to be the best approach for utilizing these compounds, but care in their concentrations must be taken, given the possible effects on phytotoxicity. This study presents new insights on the potential effects of EOs on *T. erytreae* and their applicability in citrus crops, thus making an entry way for the development of more sustainable control strategies for this pest control.

In Vitro Neurotoxicity Induced by A Set of Synthetic Cannabinoid Receptor Agonists in Ng108-15 Cells

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Abstract

Introduction: The increasing abuse of Synthetic Cannabinoids (SCs) has become a major public health concern. While information regarding their toxicity mechanisms is scarce, several cases of poisonings and deaths have been reported, the brain being one of the main organs affected. This work explored the in vitro neurotoxicity of 14 SCs from different SC classes, namely AMB-FUBINACA, AB-PINACA, MDMB-CHMICA, AB-CHMINACA, ADB-FUBINACA, 5F-AMB, AB-FUBINACA, BZ-2201, X-PB-22F, 5F-PB22, SDB-006, JWH-122, THJ-2201 and XLR-11.

Methods: Cell viability (determined by the MTT reduction assay), mitochondrial membrane potential (MMP; assessed by the TMRE assay) and caspase-3 activation were tested in NG108-15 neuroblastoma x glioma hybrid cells after 24h exposure to each SC (at 2x10-7–2 mM in the MTT assay; at 1µM and 1nM in the other assays), in the presence or absence of the CB1R antagonist 0.5µM SR141716A. Statistical comparisons among groups were performed by Kruskal-Wallis test followed by uncorrected Dunn´s test.

Results: Metabolic viability was affected in the following order of potency: AB-CHMINACA>ADB-FUBINACA>MDMB-CHMICA>AMB-FUBINACA>X-PB-22F>AB-FUBINACA>JWH-122>AB-PINACA>FUBIMINA>THJ-2201>5F-PB22>XLR-11 (EC50 values ranged from 37.33µM to 1.03mM); no cytotoxicity was observed for 5F-AMB and SDB-006 up to 2mM. 5F-PB22 activated caspase-3($p<0.05$) and increased MMP($p<0.0001$), at 1µM. FUBIMINA($p<0.0001$) and XLR-11($p<0.01$) also increased MMP at 1nM. Effects on MMP were independent of CB1R activation.

Conclusions: The extent to which SCs increased MMP widely varied with the drug and concentration tested. At the selected concentrations, only 5F-PB22 seemed to activate apoptotic pathways. These data could likely explain the heterogeneity of clinical potency observed in intoxication cases following SC abuse. Further investigation is required to explore the mechanisms involved in the elicited neurotoxicity.

Evaluation of the expression of ACE-2, TMPRSS2 and Furin in thyroid lesions

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Abstract

ACE-2, TMPRSS2 and Furin are known to be key players in SARS-CoV-2 host cell entry mechanism. Cases of thyroid dysfunction, such as thyrotoxicosis and subacute thyroiditis, have been reported in patients infected by SARS-CoV-2. However, the expression of these molecules in thyroid tissues remains to be established.

The main aim of this project is to characterize the expression of ACE-2, TMPRSS2 and Furin, in a series composed of normal thyroid tissues, benign and malignant lesions.

We quantified the mRNA expression of these molecules by Real-Time PCR (RT-PCR) in 188 cases encompassing 36 normal thyroids, 74 adenomas and 78 carcinomas.

Our results also show that ACE-2 expression in normal thyroid was high but decreased significantly in adenomas and carcinomas ($p<0.0001$). On the other hand, Furin showed the lowest mRNA levels in normal thyroid when compared with ACE-2 and TMPRSS2 but increased significantly in adenomas ($p<0.0001$) and carcinomas ($p<0.001$).

When compared with ACE-2 and Furin, TMPRSS2 was the molecule expressing the highest mRNA levels in normal thyroid. Nevertheless, no significant differences were observed in TMPRSS2 expression between normal tissues, adenomas, and carcinomas.

Our study shows that the expression of proteins involved in SARS-CoV-2 entry are altered in thyroid neoplastic lesions; ACE-2 is downregulated in thyroid lesions, this finding indicates that inhibition of ACE-2 has a putative role in the tumorigenic process; TMPRSS2 expression seems to be the only one that does not show variation between groups (normal thyroid, benign lesions, and carcinomas); Since we observed a significant increased expression in neoplastic lesions, Furin may also be a player in neoplastic transformation. Further studies are necessary in order to clarify the results.

In future work we will try to see if there is any correlation between mRNA results and protein expression and evaluate its subcellular localization in the different types of thyroid lesions.

P-cadherin as a phenotypic stability factor of the hybrid epithelial/mesenchymal phenotype in breast cancer

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Abstract

Cancer cells harboring the hybrid epithelial-to-mesenchymal transition (EMT) phenotype(hy-phen) plays a crucial role in metastasis, by promoting cellular plasticity, cancer stemness and collective migration. Our group has demonstrated that the expression of the adhesion molecule CDH3/P-cadherin(P-cad) in breast cancer (BC) induces collective cell invasion and migration, stem-like features, and anoikis-resistance in BC cells. Despite the role of P-cad expression in patient's poor prognosis, little is still known about its relevance in EMT. Thus, the aim of this work was to investigate if P-cad expression can act as a PSF (phenotypic stability factor) of an hy-phen in BC cells.

Bioinformatic analysis was performed using CCLE database. CDH3/P-cad expression was appropriately manipulated in BC cell lines, either using RNAi or retrovirally transduction of CDH3. Western Blot was used to evaluate protein expression.

Using bioinformatic analysis, we identified 13 EMT genes significantly correlated with CDH3. Specifically, we observed a positive correlation of CDH3 with Epithelial(E) markers and PSFs, as well as an inverse correlation with EMT transcription factors (TFs) and Mesenchymal(M) markers. Interestingly, when we evaluated the distribution of the EMT markers in the different molecular subtypes of BC, CDH3 was the only transcript differentially overexpressed in Basal A cell lines in comparison to Luminal or Basal B cell lines. Finally, we validate these results by western blot in BC cells, and we observed that P-cad expression promotes the expression of EpCAM, OCLN, ΔNp63 and ZEB2 and leads to a decrease in AMPK, GRHL2 and N-cad expression.

In this work, we demonstrate, for the first time, that P-cad can differentially regulate the expression of EMT markers, by promoting the expression of E markers and TFs, as well as a decrease in the expression of M markers and PSFs. So, we can assume that P-cad has a putative role in the maintenance of the hy-phen in BC cells.

The effect of non-weight bearing exercise and weight bearing physical activity on growth, bone metabolism and muscle mass in male Wistar rats

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Abstract

Introduction: Swimmers can display lower bone mass compared to physically inactive counterparts. However, in animals these results are controversial. Further, few studies have assessed swimmer´s bone microarchitecture.

Aim: Evaluate the impact of swimming on bone remodeling and trabecular (Tb) microarchitecture.

Methods: Male Wistar rats were randomized into: swimming group (SW;n=10) or control group (CG;n=10). Swimming was performed two h/day, five days/week for eight months. Both groups were housed in cages with a running wheel. Body weight (BW), food intake and wheel distance were recorded throughout the experiment. After sacrifice, gastrocnemius and soleus muscle mass (MM), plasma osteocalcin (Oc) and c-terminal telopeptide (CTX) concentrations were measured. Tibia (proximal and midshaft) and lumbar vertebra microarchitecture were analyzed through micro computed tomography, whereas femur diaphysis was assessed by histology. Differences between groups were determined by independent T-test and Mann-Whitney test according to normality.

Results: After sacrifice, CTX concentration were higher in SW [Mean difference (Md)=3.7±0.9ng/mL; p=0.03;d=1.0] but no differences were found in Oc concentration. SW presented lower Tb number [Md=0.55±0.17µm-1; p=0.01;d=1.2] and higher Tb separation [Md=0.16±0.10µm-1; p=0.02;d=1.2] in the proximal tibia. Despite SW showed a higher vertebral Tb number [Md=1.0±0.8µm-1; p<0.01;d=1.4], a lower Tb thickness [Md=0.09±0.1mm; p<0.01;d=0.7] was found. There were no differences between groups in tibia and femur diaphysis cortical thickness, femur cortical area or vertebral Tb separation. Both groups have similar wheel distance and food intake, but SW presented lower BW [Md=71.5±19.7g; p<0.01;d=1.8], and lower MM [SW= 5.94±0.27; CG=6.54±0.47g; p<0.01;d=1.5].

Conclusion: Swimming may have distinct effects in tibia and vertebra Tb microarchitecture indicating a site-dependent responsiveness. Further, CTX levels can indicate a higher bone resorption in SW.

Modelling the change in technical and tactical skills of youth volleyball players: the INEX study

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Abstract

Given its strict sequential and non-invasive structure, volleyball is a highly technical team sport. The inhibition to grab the ball assigns an inherent speed to the game flow, requiring high tactical reading, reaction and adaption skills of players. Therefore, the intertwining of the development of technical and tactical skills are paramount for youth volleyball players. Despite of its relevance, longitudinal evidence regarding technical and tactical evolution of young volleyball players is lacking in the literature. This study aims to address this research gap by collecting longitudinal data regarding technical and tactical performance of youth volleyballers, within the scope of INEX project (In Search of Excellence in Sport). Technical and tactical performance indicators were recorded for 3 consecutive years, one data collection per year. Technical actions (i.e., serving, receiving, spiking, setting) of 105 young volleyball players were analyzed, using an adaptation of a skill evaluation protocol in volleyball. A total of 20 young players were evaluated regarding their tactical performance (i.e., decision making, movement adjustment, efficiency and efficacy of skill execution) in a 3x3 game-form, using an adapted version of Game Performance Assessment Instrument (GPAI) for volleyball. One-way ANOVA was used to test differences among age cohorts. Overall, players became more proficient in all technical skills over the years ($p\eta 2$= [0,01; 0,10]). Specifically, significant differences in technical skills were found between 12-13 and 14-15 years of age. In contrast, few differences were found regarding tactical performance evolution. Despite players have improved over the years, significant differences were only observed in service action ($p\eta 2$ = 0,13) from moment 1 (0.90 ± 0.09) to moment 3 (0.96 ± 0.02). Possibly, this outcome could be due to the standardized nature of GPAI, which may not have been appropriate to assess the advanced levels of practice.

T cell glycosylation at the interface between inflammatory bowel disease and colorectal cancer

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Abstract

Inflammatory bowel disease (IBD) is a chronic inflammatory condition of the gastrointestinal tract that is associated with an increased risk of colorectal cancer (CRC). The complex and multifactorial nature of IBD pathogenesis imposes a significant challenge to the development of effective long-term treatment that can prevent CRC development.

Glycosylation plays key roles in immune regulation and in cancer development. In IBD, changes in the T cell glycome, namely decreased levels of complex N-glycans, were shown to drive pro-inflammatory phenotypes associated with IBD severity (Dias et al., PNAS, 2018). However, the role of glycosylation in the transition for chronic inflammation to cancer remains to be explored. This work aims to define the role of T cell glycosylation in colitis-associated CRC development. Preliminary data from mice treated with the azoxymethane/dextran sodium sulfate (AOM/DSS) model of colitis-associated cancer shows a progressive accumulation of exhausted CD4+, CD8+ and gamma delta colonic T cells throughout the colitis-dysplasia-carcinoma sequence cascade, that was accompanied by an increase in complex N-glycans. In addition, paraffin-embedded colonic samples from IBD patients show a trend increase of complex N-glycans in the stromal compartment throughout this carcinogenic cascade. These results suggest that T cell glycosylation may act as a mediator of T cell dysfunction in the immunopathogenesis of IBD.

Ongoing experiments are further dissecting the role of T cell glycosylation in inflammation-associated carcinogenesis by using intestinal organoids and adoptive T cell transfer approaches. Altogether, this work seeks to provide valuable pre-clinical insight for the development of novel preventive and therapeutic strategies that can leverage glycosylation to enhance immune surveillance in the context of chronic mucosal inflammation.

Limited Risk Assessment: The Amphipod Ecdysone Receptor as an understudied tool for the identification of Endocrine disrupting chemicals

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Abstract

Understanding physiological responses across taxonomic groups is fundamental towards a more complete chemical risk assessment (RA). Nuclear Receptors (NRs) are recognized by several environmental agencies as major tools for risk assessment, and already included in their frameworks. Yet, current knowledge is still insufficient, hindering an accurate inference of adverse outcome mechanisms, especially across metazoans. A prime example within the NR superfamily, is the ligand-induced Ecdysone Receptor (EcR): A transcription factor that triggers moulting as a response to hormonal signals. For long, it was wrongfully considered arthropod specific and thus, greatly exploited for the development of insecticides, labelled safe for non-target organisms. However, a wider presence of EcR orthologues across metazoan lineages is now clear, placing such compounds as potential endocrine disrupting chemicals, known to interact with endogenous hormones or mimic their action, altering signalling pathways and producing adverse effects. In this work, we explored the phylogenetic distribution of metazoan EcRs and elucidated the gaps within their functional characterization, demonstrating this receptor´s potential for RA and the need for the development of more inclusive standardized methodologies. We further aimed to functionally characterize EcRs from two different species of amphipods, organisms extensively used to assess the ecotoxicological status of water bodies, (*Gammarus locusta* and *G. fossarum*) using luciferase-based transactivation assays. Current results display variable transcriptional inductions upon exposure to Ponasterone A, in *G. locusta* and *G. fossarum*. Additionally, co-transfection with the endogenous heterodimeric partner Retinoid X Receptor (RXR) increased the sensitivity towards two diacylhydrazine insecticides, as well as an ecdysteroid used as positive control. This work is supported by the Programme Nationale de Recherche en Environnement-SantéTravail.

Establish biomimetic 3D tumor-immune spheroids as a model to address Triple-negative breast cancer radioresponse

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Abstract

Triple-negative breast cancer (TNBC) is the most aggressive subtype of breast cancer that lacks the expression of therapeutic targets. These tumors are more resistant to conventional therapies, as radiotherapy (RT). As radioresistance cannot be only explained by the genetic characteristics of tumor cells, attention has also to be paid to other elements of the tumor microenvironment, like macrophages, that can promote breast cancer progression.

In this work, we developed a 3D model that mimics the breast tumor microenvironment, to study the impact of macrophages in TNBC radioresistance. To achieve this aim, 3D tumor spheroids of MDA-MB-231 TNBC cells or tumor-immune spheroids with tumor cells and human macrophages, were established using agarose micro-molds. After 3 days, tumor spheroids and tumor-immune spheroids were submitted, or not, to two RT schemes: 2.67 Gy and 5.2 Gy, for one or five cumulative fractions. After 24h, spheroids were dissociated to evaluate the inflammatory profile of macrophages, cancer cells immunogenicity, cell viability and apoptosis by flow cytometry analysis.

After RT, macrophages acquired a more pro-inflammatory phenotype, with enhanced expression of CD86 and CD40, and decreased expression of CD163 and CD206. Despite the acquisition of this phenotype, macrophages protected tumor cells from death caused by irradiation. Furthermore, upon RT, tumor cells acquired a more immunogenic phenotype, with increased expression of HLA-ABC and decreased expression of PD-L1. However, macrophages presence promoted an increase of cancer cells PD-L1 expression, which may favor tumor cells escape from the immune system. In general, no differences between the two RT schemes were found and only five fractions of irradiation had a significant impact on the tumor microenvironment.

Altogether, our findings strongly suggest that macrophages may promote cancer cell radioresistance and highlighted the importance of combining RT with immunotherapy in TNBC patients.

The impact of hypoxia on the communication between multiple myeloma and mesenchymal stem/stromal cells.

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Abstract

Multiple Myeloma (MM) is the second most common hematologic malignancy and it causes lytic bone lesions in 80% of the patients. Bone pain is one of the most prevalent symptoms. Mesenchymal Stem/Stromal Cells (MSCs) are involved in both MM and bone disease.

The aim of this study is to explore the impact of hypoxia in the interplay between MM cells and MSCs.

To achieve this goal, MM.1S cells were cultured in hypoxia (1 % v/v O2) or normoxia for 48 hours. Hypoxic markers were assessed by RT-qPCR and cell cycle was analyzed by flow cytometry. Bone marrow-derived human primary MSCs were isolated and incubated with conditioned media derived from MM.1S cells cultured under hypoxia or normoxia. Next, MSC behavior was evaluated as follows: metabolic activity by resazurin assay; cell cycle by flow cytometry; cell morphology by staining MSCs with DAPI and Introgen´s HCS CellMask Depp Red followed by quantification in the IN Cell Analyzer 2000 microscope; and migration by transwells assays.

Results show that hypoxia increases the expression of VEGF and of two long non-coding RNAs (MALAT1 and TUG1) in MM.1S cells, without cell cycle impairment. On the other hand, the exposure of MSCs to MM.1S hypoxic and normoxic conditioned media does not change their proliferative capacity/metabolic activity, cell cycle or morphology, including cell and nuclei size, compactness, roundness and cell perimeter/surface area. Regarding transwell assays, results show that MM.1S secretome induces MSCs migration compared with control (cell culture media only), but it is not dependent on the percentage of oxygen in which the MM.1S are cultured.

In conclusion, MM.1S secretome promotes MSCs migration through a hypoxia-independent mechanism.

This work was supported by FCT project R2BONE - PTDC/BTM-TEC/31402/2017; AOSpine; Associação Portuguesa Contra Leucemia, Sociedade Portuguesa de Hematologia, Amgen.

Discovery of new natural products from PCC 6407

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Abstract

Natural products (NPs) represent a large family of diverse chemical entities with various biological activities. With the surge of DNA sequencing, it became clear that the genomes of natural product producing-organisms encode Biosynthetic Gene Clusters (BGCs) that are responsible for many metabolites that have never been observed in the laboratory. Currently, there is an effort in natural products research to uncover the compounds encoded in such orphan biosynthetic gene clusters, which led to the development of genome mining technologies. However, the deorphanization of these clusters can be very difficult, which may hinder the discovery of the compounds they encode. This led to a recent development of several genome-independent strategies for the detection of new natural products.

Cyanobacteria are known for producing a variety of bioactive natural products but genetic manipulation, extremely important for genome-dependent methods of natural product discovery, is hard for these organisms and there is a current lack of tools for the full study of its potential. But cyanobacteria show some peculiarities in terms of their fatty acid metabolism, and, in our lab, these were leveraged to develop a new genome-independent strategy of cyanobacterial natural products discovery. This new method uses incorporation of fatty acids supplemented with deuterium to label compounds produced by cyanobacteria that, afterwards, can be detected through LC-MS analysis, creating, in short, an MS-guided isolation strategy for natural products. We use this method, that makes possible a more efficient detection of compounds produced by cyanobacteria, to discover, isolate, and characterize the structure and biosynthesis of new metabolites from these organisms.

So far, we have been able to identify numerous new compounds from several cyanobacteria strains and are close to a full understanding of one specific compound, which only proves the applicability of this method of discovery.

"Casa Dos Milagres De Perafita": Home Of Salvation And Memory Space

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Abstract

The study of the Houses of Miracles, specifically the Casa dos Milagres of the Santuário do Senhor dos Milagres de Perafita, intends to understand its existence as a space destined to ex-votos, objects born of a vow contracted in a moment of distress which witness a personal and collective experience of encounter with the divine. The Casa dos Milagres de Perafita is an 18th century building whose walls carry the memory of numerous miracles, granted to members of local community and to pilgrims from far away. In this sense, its existence cannot be dissociated from the devotional phenomenon that transformed the place and contributed to the identity of the community, insofar as the devotion to the "Our Lord of Miracles of Perafita" and the delivery of ex-votos are supported by practices and rituals handed down from generation to generation. At the methodological level, this research is based on the analysis of the Portuguese legislation on heritage, as well as international charters and conventions. It was also relevant the study of similar cases, national and international, in order to validate the results. Thus, we seek to understand its origin and framework and what leads to its classification in 2013 as part of the Ensemble of Public Interest category, followed by the recent musealization of the space and the consequent paradigm shift in the way of seeing and experiencing the building. Finally, considering the values of the ex-votos as objects, but above all as part of intangible experiences, our aim is to demonstrate - paving the way for a future classification proposal - the need and pertinence of protecting these stories of salvation, and show that these objects meet the criteria laid down in Lei-Base nº 107/2001, which regulates the Portuguese cultural heritage. In short, the present study aspires to expose the patrimonial importance of these objects and memory spaces and how the efforts directed to their protection, safeguard and valorization must be a priority.

Geostatistical Analysis of Soil Contamination Data. Case Study: Rio De Frades Mine – Arouca

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Abstract

The purpose of this work consisted on applying mathematical models, within the scope of geostatistics techniques, for the treatment of data from the chemical analysis of soil contaminants, more specifically the arsenic concentration contained in the typology of the mentioned samples, in the mining area of Rio de Frades, in Arouca. The studied mining area is the filonian type with W-Sn mineralization, with tungsten as the most important and relevant economic ore. The target contaminant of this work is arsenic (Potentially Toxic Element - EPT), since this in the form of sulphide, is responsible for most of the environmental problems associated with mining activities, for instance the acid mine drainages. The geostatistical approach used in the work developed aimed at: (a) quantifying arsenic contamination in geological samples, allowing the interconnection of different areas; (b) the prediction of values at unsampled points, through "subjective" extrapolation; (c) mapping the spatial variability of contaminant concentration in the study area; (d) Risk analysis, obtaining mappings by geostatistical simulation. Of the 82 sample points, only 11% which are in the region with the highest altitude have values below the intervention value contained in the Dutch standard (55 mg/kg), meaning that the intervention is necessary and mandatory in terms of the environmental rehabilitation/recovery for the study area. Regarding the analysis of the spatial distribution of the data, it is verified that the contamination continuity is more prominent in the direction (E-W), which was verified by the experimental variograms.

Nanobiocontrol using zein and *Satureja montana* essential oil as new candidates against *Xanthomonas euvesicatoria*

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Abstract

Tomato (*Solanum lycopersicum*) is one of the most produced crops worldwide, with Portugal being one of the top 5 producers of the E.U. *Xanthomonas euvesicatoria* (Xeu), the causal agent of bacterial spot (Bs) is one the most dangerous tomato pathogens. Bs manifests as necrotic spots on leaves and fruits and is a major threat to tomato production. The emergence of copper resistant Xeu strains creates the need for eco-friendly alternatives for its management. Essential oils (EOs) from *Satureja* sp. have antimicrobial activity against xanthomonads, however, their volatility impairs field applications. This work hypothesizes that *S. montana EO* (SEO) encapsulated in a stable matrix, like zein nanoparticles (ZNPs), will have enhanced antimicrobial activity and stability. Thus, the aim of this work was to assess the effects of SEO, ZNPs, and their combination in a nanoformulation (SEO+ZNPs), on the Xeu-tomato pathosystem, by quantifying the pathogen and evaluating the molecular and physiological shifts caused by treatments. *S. lycopersicum* (var. Oxheart) plants were divided in two groups 1) Xeu-infected and 2) Uninfected. Each group was treated with a) Water (control); b) SEO; c) ZNPs and d) SEO+ZNPs. SEO+ZNPs and ZNPs led a reduction in Xeu amount of 36 and 202-fold respectively. Treatments reduced symptom incidence and ROS content in the leaves. Treatments upregulated transcripts of the phenylpropanoid pathway (pal5, chs1 and dfr) in infected plants, while ZNPs upregulated chs1 and dfr in uninfected plants. Genes of the abscisic acid pathway (aao) were downregulated by the application of treatments to infected plants. These results show that SEO, ZNPs and SEO+ZNPs are suitable candidates for Xeu management strategies, due to their antimicrobial activity and the possible role of ZNPs as defence elicitors of healthy plants. However, field studies focusing on the products´ long-term action are required for their successful implementation.

Reduction of heart rate by ATP via P2X4 purinoceptor activation may counteract cardiac failure caused by pulmonary arterial hypertension

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Abstract

Cardiac dysrhythmias and right ventricle (RV) failure are common deleterious outcomes in patients with pulmonary arterial hypertension (PAH). Extracellular ATP and its metabolite adenosine exert critical effects in the cardiovascular system. On its own, ATP exerts negative chronotropic and positive inotropic effects via the activation of ionotropic P2X4 purinoceptors (P2X4R) that are abundantly expressed in the myocardium. This prompted us to investigate the putative beneficial role of ATP-sensitive P2X4R activation in rats with PAH.

PAH was induced in male Wistar rats by a single subcutaneous injection of monocrotaline (MCT group). Rats with severe PAH were euthanized 3-4 weeks after injection. Myographic recordings were used to assess chronotropism in spontaneously beating atria.

The atrial rate ab initio was similar in MCT and control (CTRL) rats. ATP (0.01-1 mM) concentration-dependently reduced the atrial rate in both groups. The negative chronotropism of ATP (100 µM) was reduced in PAH (-10±2%) compared to CTRL (-24±4%, $p<0.05$) rats; this divergence was dissipated by increasing ATP concentration to 1 mM (CTRL: -54±5% vs PAH: -50±7%; $p>0.05$). The P2X4R blockage with 5-BDBD (10 µM) partially attenuated ($p>0.05$) ATP (100 µM)-induced negative chronotropism in CTRL (-29±11% vs -21±8%) and PAH (-8±3% vs 3±7%) rats. The positive allosteric modulator of P2X4R, ivermectin (30 µM), increased the negative chronotropic effect of ATP (100 µM) in CTRL (-27±6% vs -48±14%; $p>0.05$) and PAH (-12±6% vs -24±9%; $p<0.05$) rats. CTP (1 mM), a non-selective P2XR agonist that does not generate adenosine, mimicked the effect of ATP (100 µM) as it decreased atrial rate by -21±5% and -12±2% in CTRL and MCT-treated rats, respectively.

Data indicate that ATP can still reduce the atrial rate in rats with RV failure due to PAH via P2X4R activation. This strategy may be valuable to increase heart efficacy in failing hearts of patients with PAH.

A Wolcott-Rallison Syndrome Model in Zebrafish induced by PERK inhibition

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Abstract

PERK is an endoplasmic reticulum (ER) kinase that responds to proteostasis decline in the ER. Mutations in PERK are the main cause of Wolcott-Rallison syndrome (WRS), a disease that manifests during embryonic development mainly through neonatal diabetes, skeletal dysplasia, cardiac malformations and neuromotor deficit [1]. Zebrafish are commonly used as a model of embryonic development due to their fast lifecycle, optical transparency and good homology with humans [3]. To test the hypothesis that zebrafish might yield a WRS model for efficient screening of potential treatments, we first investigated the phenotypes evoked by pharmacological inhibition of PERK in zebrafish embryos. Also, since PERK activators have been proposed to benefit individuals with mutations that partially decrease PERK activity [2], we characterized the toxicity of selective (CCT020312, CCT) and non-selective (thapsigargin, Tg) PERK activators. PERK inhibition with GSK2606414 (10 µM) mimicked main WRS phenotypes by inducing skeletal defects, cardiac oedema, bradycardia and decreased sensorimotor reflexes. Preliminary data also show reduced uptake of a glucose probe, suggesting a diabetic phenotype. Regarding PERK activators, the No Observed Adverse Effect Level (NOAEL) for Tg within the evaluated parameters was 0.1 µM since higher concentrations reduced sensorimotor reflexes and induced skeletal abnormalities. NOAEL for CCT was 3 µM, while higher concentrations induced bradycardia and death. These results indicate that the pharmacological inhibition of PERK in zebrafish larvae mimics main developmental defects present in human WRS, supporting the genetic disruption of PERK in zebrafish as a potential model for WRS. The NOAEL concentrations of CCT or Tg could be used to test if PERK activation recovers WRS phenotypes.

References

[1] Julier C et al. OrphanetJRareDis. 2010; 4; 5:29;
[2] Yuan SH et al. Hum Mol Genet. 2018 Nov 15;27(22):3951-3963;
[3] Basnet RM, et al. Biomedicines. 2019; 7(1):23

What about the micro-world in the interior of our face-mask? An experimental investigation based on a dental student's population

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Abstract

Introduction/Objective: In the course of Sars-Cov-2 pandemic, face-mask became a fundamental element of mundial population outfit. As a consequence of this measure, apprehension about the contamination of the mask became an issue, which this investigation aims to demystify, comprehend and/or clarify.

Methods: Samples were collected from the interior face of 59 dental student masks and grown on contact plates with three culture media: Brain Heart Infusion (for total counts excluding fastidious bacteria), Mannitol-Salt (for Gram-positive) and Mac-Conkey (for Gram-negative). The number of Colony Forming Units (CFUs) were analyzed 48h later. Each student answered a survey focusing on the assessment of oral hygiene (duration and frequency of tooth and tongue brushing) and addiction habits (coffee, smoking, and onicofagy). The results were considered statistically significant for $p<0.05$ values.

Results: The mean time of mask use was 6.3±4.6h. Overall, 100% of our student population presented colonization inside the face-mask with a mean total count of 6.87±6.61 UFC/cm2. Gram-positive bacteria were present in 93.2% with a mean count of 2.53±3.45 UFC/cm2, and Gram-negative were present in 20.3% with a mean count of 0.06±0.30 in UFC/cm2. No statistical significant differences were found between students with or without good oral hygiene habits or with or without addiction habits.

Conclusion: There is no doubt that the interior of our face-mask becomes contaminated, with a majority of Gram-positive bacteria. Oral hygiene or addiction habits do not seem to significantly condition the type and quantity of that contamination. This study alerts to the need for the regular substitution of face-masks.

Exploring the role of BMP-signaling in the evolution of vertebrate appendages

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Abstract

Vertebrate appendages have undergone several morphological changes that allowed them to explore new environments. One of these changes was the transition from fish fins to tetrapod limbs. Genes in the 5´ end of the HOXD cluster are known to regulate limb skeletal formation, in particular Hoxd13, which is involved in the formation of the autopod, the most distal structure of the tetrapod limbs. Overexpression of this gene during zebrafish fin development causes endochondral expansion and a concomitant reduction of the finfold, mimicking the major events thought to have happened during fin-to-limb transition. Bmp2 is a downstream target of the Hoxd13 encoded transcription factor, and its overexpression also leads to a similar reduction of the finfold. Here we explored how this hoxd13-bmp2 mechanism mediate finfold size. To this purpose, we characterized the expression of BMP-signaling related genes in three zebrafish lines with distinct finfold size: 1) wild type; 2) hsp70:hoxd13a transgenics with shorter finfolds; 3) leot1/lofdt2 mutants with longer finfolds. The results suggest that the BMP signaling is enhanced in transgenics with shorter finfolds and inhibited in mutants with longer finfolds, with genes in this network exhibiting distinct heterochronic dynamics. Our data lead to a more profound understanding of the molecular changes involved in the definition of the finfold size, a structure that was progressively eliminated during the fin-to-limb transition in vertebrates.

Epigenetic Regulation of HOXB genes and Novel Targeted Therapies for Breast Cancer

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Abstract

Breast Cancer (BrCa) is the most incident cancer in women and the leading cause of cancer-related death in this group. This type of cancer is highly heterogeneous, which emphasizes the need to find biomarkers to improve prognosis and therapy and ensure personalized treatment. Several HOX genes were found dysregulated in BrCa and related to poor prognosis. However, the causes of this dysregulation and the mechanisms affected remain largely uncharacterized.

In this work, we studied the causes of HOXB7 dysregulation in BrCa by illustrating three epigenetic events involved in its aberrant expression in distinct BrCa cellular models: promoter methylation, histone deacetylation, and histone acetylation.

Furthermore, we evaluated the therapeutic potential of novel N-1,2,3-triazole-isatin hybrid drugs, by performing gene expression assays regarding their target proteins (acetyltransferase p-300 and acyl-protein thioesterase), and the effect of their inhibition on HOXB7 expression. We found that these compounds were highly effective on all breast cells analyzed, but needed a higher dosage to induce cytotoxicity on other cancer cell lines and in normal kidney cells (Hek293). Target inhibition was able to modulate HOXB7 expression, particularly on MCF-7, in which p-300 inhibition strongly decreased HOXB7 expression, strappingly suggesting that histone acetylation is one of the reasons why this gene is overexpressed in this cell line.

Overall, this work aimed to explore the mechanisms associated with HOXB7 dysregulation in BrCa, and contribute to uncovering novel therapeutic agents and targets to improve prognosis, diagnosis, and therapy in BrCa patients.

Characterization of *Enterococcus faecium* obtained from recent samples of hospitalized patients (2019-2020)

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Abstract

Enterococcus faecium (Efm) is a relevant opportunistic agent causing hard-to-treat human infections worldwide. Efm has been globally associated with specific clones (ST78-like) and with resistance to multiple antibiotics including last-line ones such as vancomycin or linezolid. As epidemiological studies about Efm circulating in Portuguese hospitals are lacking since the 2000's, our aim was to characterize Efm isolates (n=50) obtained from a hospital in Porto area during 2019-2020. Susceptibility was studied for 12 antibiotics (disk diffusion; EUCAST/CLSI). Species (ddl gene) and the screening of genes relevant in human infections caused by Efm were performed by PCR. These genes included virulence factors (esp/sgrA/ecbA/acm/hyl/ptsD/orf148/IS16), vancomycin/linezolid resistance genes (vanA/vanB/optrA/poxtA), and plasmids (rep_Inc18/rep_pRE25/rep_pLG1/rep-pRUM/rep_pHTβ). Clonality was established by FTIR-ATR and MLST. All isolates were multidrug-resistant expressing resistance to erythromycin-92%, ampicillin-86%, ciprofloxacin-82%, streptomycin-42%, vancomycin/teicoplanin/quinupristin-dalfopristin (38% each), tetracycline-32% and gentamicin-14%. Representative isolates clustered into 3 main groups by FTIR-ATR (2 including ST78-like clones and one ST494). VREfm (all vanA) belonged to clade A1 (globally associated with human infections) and mostly to ST78-like clones such as ST80, a clone rarely observed in our country before. Most isolates were enriched in relevant virulence genes (ptsD/IS16/orf1481/esp/sgrA/acm), regardless of vancomycin resistance. Plasmids were identified in variable proportions, but the lower rates of pRUM plasmid in comparison to former collections (60% vs. 91%) suggests a change in Efm populations dynamics. In conclusion, there were no substantial changes in resistance trends over time, but more studies including recent collections are needed to understand the changes, to anticipate epidemic scenarios and to optimize antibiotic stewardship.

New Functional Hybrid Materials Based on Liquid Crystals and 2D Inorganic Nanomaterials

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Abstract

In recent years, the combination of nanomaterials with liquid crystals (LCs) has been increasingly investigated with the aim of developing hybrid materials with enhanced optical and electrical properties, or of optimizing the organization of the nanomaterials using the LC as matrix, taking advantage of its self-assembling properties. The liquid crystals can be produced either by varying the temperature of a mesogenic compound (thermotropic LCs) or by adding solvent to an amphiphile (lyotropic LCs), which makes them interesting for the development of new nanostructured materials.

In this work, the LC-forming molecules used were cationic gemini surfactants of the family 12-s-12 (where s = 2, 6, 12), with a known lyotropic [1] and thermotropic behavior [2], and the nonionic block copolymer Pluronic F127, that shows liquid crystalline behavior in water. To build the hybrids, first the 2D nanomaterials graphene and molybdenum disulfide were exfoliated by ultrasonication in liquid phase [3]. To study the effect of the nanomaterial incorporation in the LCs, the morphology and phase behavior of thermotropic- and lyotropic-based hybrids were evaluated by TGA, DSC, SEM and PLM techniques.

The results obtained for the thermotropic-based hybrids indicate the formation of structures with phase behavior and properties that are markedly distinct from those of the neat surfactants. Preliminary results for lyotropic-based hybrids indicate a possible hexagonal LC formed upon combination of graphene and F127. Overall, these results are very promising for the construction of the novel hybrids.

Acknowledgments

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References

[1] Wang, Y.; Fernandes, R.; Marques, E.F., J. Mol. Liq., 2019, 285, 330-337.
[2] Fernandes, R.; Wang, Y.; Tavares, P.; Nunes, S.; Pais, A..; Marques, E.F., J. Phys. Chem. B, 2017, 121, 10583-10592.
[3] Abreu, B.; Montero, J.; Buzaglo, M.; Regev, O.; Marques, E.F., J. Mol. Liq, 2021, 333, 11602-11.

19558 | Chitosan/poly-gamma-glutamic acid nanoparticles for delivery of non-steroidal anti-inflammatory drugs in articular cartilage

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Abstract

Articular cartilage is a connective tissue with a limited capacity for intrinsic healing. The degeneration of this tissue is one of the leading causes of Osteoarthritis (OA), a disorder correlated with hypertrophic changes in the subchondral bone and a strong inflammatory component. As a consequence, different anti-inflammatory therapies have been examined for articular cartilage regeneration, but there is a lack of immunomodulatory scaffolds to reduce local inflammation in degenerated cartilage. Previously, our group has developed anti-inflammatory nanoparticles (NPs) of Chitosan (Ch) and Poly-γ-glutamic acid (γ-PGA), two oppositely charged polyelectrolytes that spontaneously associate at controlled pH (5.0). Ch/γ-PGA NPs have been used as a reservoir for the non-steroidal anti-inflammatory drug (NSAID) Diclofenac (Df) with success (Gonçalves, 2015; Teixeira, 2016). Here, we hypothesized that the Ch/γ-PGA NPs could be employed as vehicles for Ibuprofen (Ibuf), another NSAID currently administered in OA, and then incorporated in 3D collagen type 1-based matrices to decrease inflammation in this degenerative disorder. We were able to incorporate similar amounts of Df and Ibuf in Ch/γ-PGA NPs, but the entrapment efficiency of Ibuf was much lower that of Df (40 vs 100%). Also, Ibuf was not able to be retained in Ch/γ-PGA NPs upon centrifugation, contrarily to Df. Therefore, the use of Df, and not Ibuf, in Ch/ γ-PGA NPs, seems to be more promisor in a immunomodulatory strategy for OA.

“What happens when you don’t behave?” Discipline Strategies used in Residential Care: A Multi-Informant Mixed-Method Study

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Abstract

In Portugal, in 2020, 97% of children/adolescents were placed in residential care. Evidence on discipline strategies used in these childcare contexts is scarce. This study aims at analysing the discipline strategies used by caregivers in residential care, based on multiple informants´ reports - children/adolescents in care, caregivers, and directors. It follows a theoretical framework that includes and relates the concept of quality in residential care, positive discipline, and the child's rights. A total of 424 children/adolescents, 266 caregivers and 60 directors in 60 residential care centres participated in this study. Data on discipline strategies were collected using the ARQUA-P system and analysed resorting to a mixed methodology. The qualitative content analysis allowed for the identification of 33 subcategories, organized into six categories, which were computed into three major types of discipline strategies: Positive and Induction-Based Strategies, Punitive Strategies and Strategies that Violate the Child´s Rights. Additionally, a cluster analysis based on the reports of the three informants allowed for the identification of three groups of residential care centres that used different discipline strategies - Punitive Centres, Inductive Centres and Centres that Violate the Child´s Rights. Significant differences in discipline quality were found between the three groups. There were no significant differences or associations between the clusters and the characteristics of the caregivers (specific training and professional experience) and the residential care centres (typology, external supervision and caregivers recruitment processes). Implications for qualified practice in residential care were drawn from the findings.

Keywords: residential care; residential care centres; Child's Rights; discipline strategies; positive discipline; residential care quality; multi-informants.

Eco-friendly extraction of propolis: Valorization of a natural matrix

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Abstract

Propolis is a complex resinous substance used by bees to protect hives, being collected from various plant sources, such as buds and exudates. Due to its chemical composition-related biological and pharmacological properties, low toxicity, and therapeutic potential, propolis has an enormous potential for applications in several different industries. This work aims to explore the potential of propolis as new pharmaceutical ingredient, presenting data concerning chemical composition and biological properties.

Propolis extraction conditions were optimized by Ultrasound-Assisted Extraction, an eco-friendly methodology, employing green solvents (water, water: ethanol (50:50 m/v) and ethanol). Aqueous, hydroalcoholic and alcoholic extracts were characterized regarding total polyphenol content (TPC) and antioxidant/antiradical activities assessed by reducing the ferric ion (FRAP) and through the 2,2'-azinobis-3-ethylbenzothiozolin-6-sulfonic acid radical scavenging capacity (ABTS). The ability to capture reactive oxygen species, namely hypochlorous acid (HOCl) and superoxide ($O_2^{\bullet-}$), was also screened. The phenolic profile was investigated by HPLC-DAD. Regarding TPC, the aqueous extract achieved the best result (217.7 mg Gallic Acid Equivalents/g dry weight (dw)). Similarly, in the ABTS assay the best solvent was water (IC_{50} = 202.8 ± 14.9 µg/mL), while the alcoholic extract obtained the highest result in FRAP assay (IC_{50} = 30.0 ± 1.7 µg/mL). The ability to capture reactive oxygen species confirms the potential of the aqueous extract. The values determined for HOCl and $O_2^{\bullet-}$ were, respectively, IC_{50} = 7.5 ± 1.2 µg/mL and IC_{50} = 67.3 ± 1.0 µg/mL. A total of 33 phenolic compounds were identified. The synergic action of the various phenolic compounds is probably responsible for the antioxidant activity observed. Further studies assessing the propolis anti-Candida spp. activity are currently underway for determining its potential as an antifungal agent.

Diversity of copper tolerant and antibiotic resistant *Klebsiella pneumoniae* clones in poultry production using inorganic or organic copper feed formulations

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Abstract

Copper-Cu is widely used as an inorganic trace mineral in feed (ITMF) of food-producing animals. We aim to assess if poultry farms using ITMF are reservoirs of Cu tolerant-CuT and multidrug resistant-MDR *Klebsiella pneumoniae*-Kp clones comparing with those using the alternative Cu-organic feed (OTMF). Kp (n=100) from 18 broiler flocks (9 OTMF/9 ITMF; 7-farms) were studied (2019/2020). Pooled feces-P (2 days+pre-slaughter broilers), environment (feed-F/soil-S/water-W) and meat-M samples were plated in SCAI/SCAI+colistin with/without previous enrichment. CuT (silA gene) was studied by PCR and agar dilution (MIC range: 0.25-36mM/anaerobiosis); antibiotic susceptibility by disk-diffusion/microdilution; and clonality by FTIR spectroscopy, wzi sequencing and MLST. Fisher exact test was applied. Kp were from P-n=85 (all farms/16 flocks-8 OTM+8 ITM), environment-n=11 and M-n=4 of ITMF/OTMF flocks (50% each). They showed similar antibiotics resistant rates, independently of ITMF/OTMF use, associated with a high MDR (86% vs 76%). Resistance to clinically relevant ciprofloxacin (68% vs 62%), colistin (52% vs 66%) and cefotaxime/ceftazidime (4%/10% vs 2%/10%; 2 ESBL) were found in ITMF/OTMF Kp. Similar rates (72% vs 64%) of CuT (n=68; silA; MIC>16mM) were found in Kp of ITMF/OTMF flocks. Kp were from 30 clones (12 spread in more than one farm), with KL64 (n=7/4 farms/P+S; ST147), KL106 (n=18/1 farm/P+W; ST11) and KL109 (n=23/3 farms/P+M; ST631/ST2039) as the most frequent, regardless of ITMF/OTMF. Other relevant clones were KL12 (n=4/2farms/P; ST46), KL19 (n=5/2farms/P+M; ST1/ST15), KL22 (n=4/2 farms/P+F+S+M), KL27 (n=2/1 farm/F; ST392) and KL146 (n=5/2 farms/P; ST15). A high diversity of CuT/MDR Kp clones was detected, independently of ITMF/OTMF. Further studies are needed to clarify the origin and persistence of clinically-relevant Kp and their selection drivers throughout poultry production towards food safety and sustainability.

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Novel method for cellulose and nanocellulose extraction from hydroponic agriculture residues

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Abstract

Hydroponics is a recent agriculture innovation where the soil is replaced by a nutrient-rich water. Plants may grow with their roots exposed to the nutritious water, or the roots may be physically supported by an inert substrate [1]. Different types of substrates can be used, such as pine bark, coconut husk fiber and rice husk. The waste produced after cultivation is a valuable resource, due to the properties inherent to its origin, such as being a low-cost, abundant, biodegradable, and renewable material. Such residues are rich in lignocellulosic components that can be extracted and purified to obtain cellulose and nanocellulose [2].

In this work, we have studied different procedures for extracting cellulose and nanocellulose from residues of coconut husk fiber and a mixture of pine bark and coconut husk fiber, used in tomato and strawberry hydroponics, respectively. Residues were grinded, washed and chemically treated to obtain cellulose and nanocellulose. The chemical process consisted in different stages, namely acid and alkaline treatment, and bleaching. The acid hydrolysis followed by ultrasonication is the final stage to obtain nanocellulose. Both materials were characterized by FTIR-ATR and TGA, which confirm that they have very low levels of lignin and hemicellulose. The morphological characterization performed by SEM revealed the existence of micro and nanocrystals in the cellulose and nanocellulose samples, respectively, reinforcing the efficiency of the extraction method used. Henceforth, the potential of using cellulose and nanocellulose as a soil amendment additive, namely for the immobilization of toxic heavy metals, will be evaluated.

Acknoledgments

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References

1- N. Zainul; A. Zulkifli; S. Gunaseelan; S. Palanivelu; K. Salleh; M. Che; S. Zakaria Polymers 2021, 13, 3586
2- V. An; H. Nhan; T. Tap; T. Van; P. Viet J. Polym. Environ. 2020, 28, 1465.

Correlates of fear of crime: an analysis of Portuguese population

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Abstract

Fear of crime has been a prominent research topic in Criminology, and a problem that deserves public and political attention. It has two main dimensions: an emotional dimension defined as a negative reaction to crime (Ferraro & Lagrange, 1987), and a cognitive dimension that is associated with the perception of victimization. Concerning individual variables, it has been shown that women´s and elderly people reported more fear of crime than men and youngsters (Hale, 1996; Killias,1990). Social cohesion and collective efficacy have been associated with fear of crime. Also, physical and environmental characteristics such as streets and public spaces, dark, unattractive, or uncared places (War, 1990). Thus, fear of crime is expressed in particular environments with particular social and physical characteristics, and by particular individuals.

The present study aims to analyze the contribution of individual variables, variables related to social vulnerability, and variables related to social capital on fear of crime. This way, three regression models were computed, using data from ESS 9 (European Social Survey, 2018), from a representative sample of the Portuguese population (N=1503). In the first model (individual variables), results showed that gender (female), years of education (less educated), marital status (not married), nationality (Portuguese), and place of residence (urban areas), are significant predictors of fear of crime (R^2= 0,151, p <0.001). In the second model (social vulnerability variables), only perceived (SES) Social Economic Status (low) predicted fear of crime (R^2= 0,034, p <0.001). Finally, in the third model (social capital and collective efficacy), only trust in others (low trust), social cohesion (low), and collective efficacy (low) predicted fear of crime (R^2= 0,064, p <0.001).

The relevance of these results will be discussed in the light of criminological theory policies related to the prevention of fear of crime.

Perceptions of victim support professionals about the police responses in domestic violence cases

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Abstract

The effectiveness of the police responses is a longstanding concern. Despite all the legislative and social changes that we have witnessed, evidence demonstrates that laws and practices do not always meet the needs of victims, resulting in recurrent criticism of the functioning of the police and other criminal justice agencies.

A Questionnaire was administered to 114 victim support professionals. Measures were collected on their perceptions regarding the knowledge police have about domestic violence, the police actions (demeanour, behaviour, and justice) when dealing with domestic violence episodes, and the effects of those actions (fulfilment of expectations, satisfaction, and safety). Measures of collaboration between police forces and victim support agencies, of perceived effectiveness of police responses and coordinated responses, were also collected. Finally, victim support professionals´ perceptions regarding their own knowledge about police actions were also collected.

The results show that victim support professionals evaluated positively the police actions, but negatively the results of these actions. The perceptions regarding the actions of the police (demeanour, behaviour, and justice) towards the victims affect how professionals express themselves about the effects of the police actions (fulfilment of expectations, safety, and satisfaction of the victim). It is also concluded that victim support professionals assess more positively the effectiveness of the contribution of collaboration between victim support organizations and police forces in responding to cases of domestic violence than the contribution of the police for the resolution of those situations.

Keywords: domestic violence, police response to domestic violence, coordinated responses to domestic violence.

Lighting graphene oxide: the guide to the end of catheter-related infections?

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Abstract

Catheter-related infections (CRIs), often originating from bacteria colonization of the catheter hub, are a significant cause of morbidity and mortality among hemodialysis patients and a huge economic burden to the healthcare systems worldwide [1]. Therefore, it is of utmost importance to fight CRIs. Previous work by our group showed that NIR-irradiated GO films kill 99% of planktonic bacteria, by photothermal and photodynamic effects [2]. This work aims to translate those results into a light-activated cap for catheter hub sterilization, by developing a prototype of such catheter cap - SmartCap. The SmartCap comprises a plastic cap that contains a NIR source, powered by a battery, whose light is dispersed by a GO-coated waveguide that extends into the catheter hub. The cap prototypes were designed by CAD software and produced by 3D printing. Different NIR sources and waveguide materials were explored. Waveguides were coated with GO by dip-coating, varying the concentration of the GO suspension and the number of dipping cycles. Coating homogeneity was assessed by optical microscopy and SEM. After components´ assembly, the light guidance of the prototype was assessed using an IR viewer and its physical performance was evaluated by measuring the temperature on the coated waveguide´s surface using a thermal camera. Homogeneous GO coatings for the different waveguides were obtained, allowing to modulate the amount of GO on the surface. After the assembly of the components, SmartCap prototypes capable of guiding NIR light through a GO-coated waveguide were achieved. The interaction between the light and the GO coating led to a slight temperature increase on the surface of the waveguide. In conclusion, these results show that SmartCap is a promising technology, with scalable production, making it an economical solution for catheter sterilization.

References

[1] W. F. Hussein et al., Kidney360 2021;2(6):955-965;
[2] P. C. Henriques et al., Carbon 2021;180:1

Graphene/pectin-based hydrogels for cancer treatment and tissue regeneration

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Abstract

Skin cancer is the fifth most common type of cancer worldwide, resulting in millions of new cases per year. Current treatment options have harsh side effects or can be invasive to the native tissue. As a result, there is a continuous search for better alternatives.

Here, we therefore present a pectin-based hydrogel, reinforced with different types of graphene-based materials (GBM) that have application in both cancer treatment and subsequent tissue regeneration.

First, the crosslinking by internal gelation of the pectin-based hydrogels was optimized through the addition of calcium ions (20-100 mM). Then, reduced graphene oxide (rGO) nanoparticles were synthesized by the modified Hummer´s method, exfoliated by sonication and, finally, magnetized into magnetized reduced graphene oxide (@rGO) at an average particle size of 200 nm. Both these materials, when loaded into the pectin-based hydrogel (0-10 wt.%) exhibited the ability to induce hyperthermia from near-infrared radiation (NIR) with an average temperature increase of 15 degrees. Furthermore, the hydrogel could be loaded with a commonly used anti-cancer drug, 5-fluorouracil (5-FU) (0.1-0.25 µg/mL), to further increase the cancer treatment potential. Lastly, by additive manufacturing pectin/GBM composite scaffolds responsive to manipulation by external magnetic field were fabricated that are expected to boost the regeneration of the tissue.

Therefore, smart-design platforms based on the association of GBM with pectin-based hydrogels could be achieved, which constitute completely innovative tools that can be triggered from outside of the body to selectively deliver phototherapy, pharmacological therapy, induce tissue regeneration, or those combined, as decided by the physician according to treatment progress.

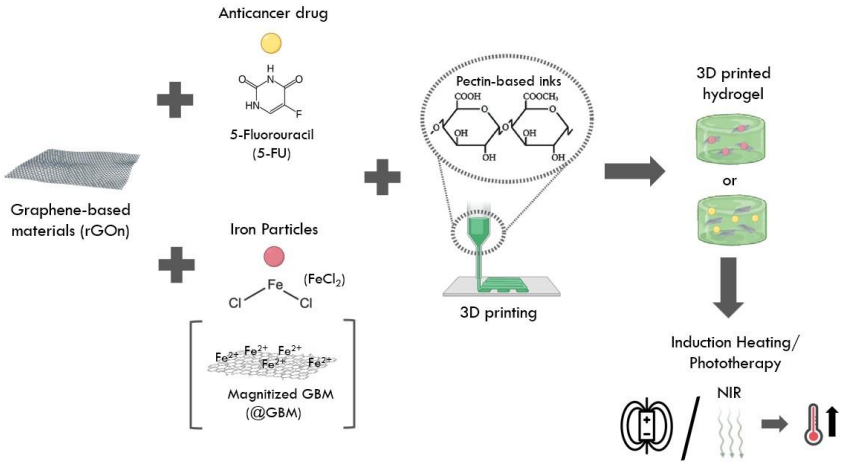

Figure 1. Graphical abstract on graphene/pectin-based hydrogels for cancer treatment and tissue regeneration

Education and its gaps - mapping hesitant educational possibilities

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Abstract

This brief article aims to map a set of references that may serve to outline possible territories of reflection for pedagogical practices and future academic research in the field of education in visual arts and/or artistic mediation practices.

In a first moment, and taking the article "There is no education without hesitation" (Biesta, 2012) as a starting point, we will research and collect references from the theoretical fields of philosophy, philosophy of education and art mediation that can inform about the contingencies of the communication acts.

In a second moment, we will focus on the generative and significant possibilities of the communication gaps in pedagogical relations and power relations.

Finally, a brief appreciation will be made about the relation of time with communicative practices and knowledge in arts.

The impact of the synthetic cannabinoid AMB-FUBINACA on global DNA methylation during neuronal differentiation of NG108-15 cells

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Abstract

The endocannabinoid system regulates various key processes during neurogenesis. In consonance, we have previously shown that synthetic cannabinoids (SCs) are involved in the increased neurodifferentiation of NG108-15 neuroblastoma x glioma hybrid cells, via CB1 receptor (CB1R) activation. We now hypothesize that changes in DNA methylation may underlie the SCs-induced neurodifferentiation, using a frequently abused SC, AMB-FUBINACA (AMB).

Neurodifferentiation of NG108-15 cells was induced in serum-starved (1% FBS) cell culture medium supplemented with forskolin and retinoic acid. Global DNA methylation was evaluated using a commercially available colorimetric kit, in 3 distinct settings of AMB exposure: A) single addition at the start of differentiation (t0), sample collection at day 3 (t3); B) single addition at t3, sample collection at day 6 (t6); C) SC additions at t0 and t3, sample collection at t6. AMB was tested at 1pM, 1nM and 1µM in all treatments. In a set of experiments, SR141716A, a selective CB1R antagonist, was added at the concentration of 500nM, 20 minutes prior to SC addition to assess CB1R´s involvement.

Our data showed that AMB decreased global DNA methylation only in treatment B at 1pM, and C at 1µM, which accompanied AMB-induced neurodifferentiation. Our data also suggest that the epigenetic impact of AMB occurs at a later stage of differentiation, as no changes in DNA methylation were noted in treatment A. Pre-incubation with SR141716A did not alter AMB-induced DNA methylation levels, suggesting that the CB1R is not involved in this SC´s epigenetic action.

Further research is required to clarify how AMB may affect the epigenetic machinery elements, namely those regulating DNA methylation, during neurodifferentiation.

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Nanotechnology in agriculture: the development of insecticides formulations considering safety-by-design concept

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Abstract

Despite the need to control pests and diseases in agricultural practices, the indiscriminate use of insecticides can lead to environmental contamination. Recently, nanotechnology started to benefit the agri-food sector by providing the use of nanopesticides (NPest) for pest control. In this context lipid nanoparticles (LN) have been proposed as a promising strategy for the encapsulation of insecticide active ingredients (AI) to improve their efficacy and decrease their environmental impact. In this context, from a safety-by-design concept, this work aimed at encapsulating the insecticide lambda-cyhalothrin (LC) in LN using ecofriendly methods; and evaluating their safety on agriculture crops (*Solanum lycopersicum* and *Avena sativa*) and on soil invertebrates (*Folsomia candida* and *Eisenia fetida*). LN-LC were tested at concentrations from 0 to 55 g LC ha-1 which were based on commercial formulations applied in the agricultural practices. The results indicated that the produced LN-LC showed a mean particle size of 165.4 ± 2.34 nm and remained stable for 4 months at 25ºC. Also, the nanoencapsulation efficacy was 98.4%, indicating that LC has high affinity to LN. Regarding to safety assays, the survival of the adults, as well as the reproduction of soil invertebrates were not affected by the exposure to LN-LC at all concentrations tested. LN-LC significantly inhibited the root biomass of *S. lycopersicum* (EC50 of 6.6 g LC ha-1). However, *A. sativa* suffered no effects after the exposure to the LN-LC. The results showed that LN are a promising encapsulation material for LC, making the active ingredient less harmful to non-target species. The next step is to test these safety doses for their efficacy to target species from a safety-by-design perspective. However, further safety studies are being carried out with other test organisms. This work was supported by FCT under the scope of the project SaFe NPest (POCI-01-0145-FEDER-029343).

Studying the chemosensitizing effect of Pirfenidone to Paclitaxel or Paclitaxel plus Carboplatin in non-small cell lung cancer cell lines

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Abstract

Non-small cell lung cancer (NSCLC) is the most common type of lung cancer, accounting for 85% of the cases. Despite recent advances in NSCLC treatment, with the introduction of immune- and targeted therapies, a large proportion of patients is ineligible for monotherapy with these modalities or ends up developing drug resistance. Thus, for those patient's platinum-based chemotherapy remains the only therapeutic approach available, and new strategies are required. Drug repurposing emerged in oncology as a strategy to identify antitumor activity of drugs already approved or under investigation for other diseases. Pirfenidone (PF), an antifibrotic drug, was recently shown to sensitize distinct cancer models to some anticancer agents. Hence, the aim of this work is to verify whether Pirfenidone (PF) increases the sensitivity of NSCLC cells to Paclitaxel (PAC) or to PAC plus Carboplatin (CBP).

Our results (sulforhodamine B assay) revealed that PF sensitizes NCI-H460 cells to PAC treatment. Furthermore, the combined drug treatment consisting of PF with PAC significantly reduced NCI-H460 cell viability (trypan blue exclusion assay) and proliferation (BrdU incorporation assay), induced major alterations in the cell cycle profile (flow cytometry following PI staining) and increased the % of cell death (flow cytometry following Annexin V-FITC/PI staining). Additionally, this combined drug treatment did not cause toxicity to non-tumorigenic cells (MCF-10A and MCF-12A). Importantly, PF also sensitized NCI-H460 cells to the combined treatment of PAC plus CBP. Together, our pre-clinical work supports the benefit of using PF in combination with PAC or with PAC plus CBP, thus contributing to the long-term goal of verifying the possibility of repurposing PF as a perioperative measure for the treatment of NSCLC.

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Architecture, Communication and Curation: Exhibiting Practices

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Abstract

Reflecting on architecture exhibitions means looking at a history of experimentation and communication within the architectural field. Both nationally and internationally, there is a growing interest in curation practices focused on understanding exhibitions´ role in architecture. Bringing together communication, curation, and architecture, the present investigation aims to contribute to the idea of exhibition as architecture, discussing its potential to go beyond "representation" while looking at different roles architects can play in it.

As a growing field of research, architecture curation has opened the way to explore exhibitions not only as portraits and milestones of an architectural period but also as ephemeral moments that are themselves architecture, which justifies an examination of their curatorial and design premises as processes of architectural thought.

The investigation analyses communication as a process of social construction, connecting it to art and architecture, creating a transdisciplinary perspective that gradually approaches exhibition as a medium of spatial communication. Building on the idea that "showing is telling" the exhibition is scrutinized according to three structural concepts: communication, language, and experience. Paradigmatic examples in both the artistic and the architectural fields are summoned to frame the exhibition as an autonomous entity.

Looking deeper into the definition of architecture exhibition, its components, and the articulation between the curatorial narrative and the spatial experience, it introduces the concept of "curatorial design", as well as discusses authorship and the roles architects have in exhibition-making. Through the analysis of four case studies from both the national and international scope, it provides a cross-section of creative production that asserts exhibition-making as an architectural practice with an essential role in knowledge production, public communication, and spatial experimentation.

Evaluate to map out: A case of diagnostic evaluation of educational activities in a museum network

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Abstract

Evaluation is a disciplinary field little explored in the portuguese museum context. This work argues for the need to integrate evaluation as a recurring museum practice, namely within the scope of educational programmes. As such it is an effective tool to understand the system as a whole. Therefore, the research project aimed at applying a diagnostic evaluation approach, mapping out the educational activities of the Vila Nova de Famalicão Museum Network.

The object of study is contextualized within a theoretical framework based on three key concepts: evaluation as a research methodology, the place of education in museums, and the application of the concept of network in the museological context, mainly in Portugal.

To arrive at the design of a simultaneous mixed methods approach with traces of an ethnographic design, the study started with some basic questions: "What activities were planned and carried out?", "By whom?", "For whom?", "How? "," When? "," With what resources? ". Data was collected through an online survey and a diagnostic form, with the objective of tracing the sociodemographic profile of the employees, understanding the

educational activities of the Vila Nova de Famalicão Museum Network different museum units and their teams, and mapping out educational activities planned for 2019.

The data analysis shows that, when applied in the context of educational programming, evaluation shows itself as a useful and relevant method of understanding practices and as a starting point for deeper changes, both in thinking and in action. In addition, the diagnostic form developed is revealed as a useful tool in the museum field, since it can be adapted and integrated by institutions to design, register and evaluate their educational service activities.

Mechanistic insights into the catalytic reaction of Russell's viper venom factor X activator (RVV-X): a computational study

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Abstract

Snake venom metalloproteinases (SVMPs) are the largest enzyme family expressed in venom and hence represent an important therapeutic target for snakebite envenoming. Russell's viper (*D. russelii russelii*) is one of the "big four" snakes of the Indian subcontinent which, together, cause 90% of the snakebites leading to .ca fifty thousand annual deaths. Its venom contains a class III metalloproteinase - the "Russell's viper venom factor X activator" (RVV-X) - which activates the coagulation factor X (FX), causing abnormal blood clotting and death.

Here, we clarified the RVV-X mechanistic using quantum mechanics/molecular mechanics (QM/MM) techniques. First, the three-dimensional model of its structure was built based on a homologous crystal structure from the Protein Data Bank (ID: 2E3X) and an eight-residue peptide was modelled as a substrate. Then, the HPepDock webserver was used to obtain an initial structure of the substrate-bound complex. The energy profiles of the RVV-X hydrolytic process were calculated using the two-layered ONIOM method. The QM layer of the system was described at the B3LYP density functional theory, in combination with the 6- 31G(d) basis set, while the MM part was described by the AMBER ff14SB force field. Results revealed that the catalytic process splits into two steps. The first step involves a nucleophilic attack by an in situ-generated hydroxide ion on the substrate carbonyl, yielding an activation free energy of 16.6 Kcal/mol. The second step involves protonation of the peptide nitrogen and scissile peptide bond cleavage with an energy barrier of 21.2 Kcal/mol. The reaction´s second and rate-limiting step of the free energetic profile offers the needed template to develop transition-state-analogue inhibitors targeting RVV-X, and possibly other SVMPs because of the highly conserved active site in this enzyme family.

Modelling counts with excess zeros: a host-parasite ecology case study

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Abstract

Count data, such as species abundance, are frequently used to analyse ecological phenomena. These data distribution is often skewed with many zeros, along with repeated assessments that promotes an inefficient or incorrect statistical inference, unless serious attention is given to the excess of zeros, correlation structure, and how to model them effectively. As a result, there is growing interest in statistical tools that deal with excess zeros in ecology research, with zero-inflated (ZI) and hurdle (H) models being often used to fit such data. This study gives a host-parasite model as an example of this complexity. Parasites count often yield databases with many `true zeros´ due to rare organisms or high infection spikes in small groups of hosts (few multi-parasitised hosts vs. many parasite-free hosts). Thus, this work aims to model longitudinal count data with excess zeros corresponding to the abundance of parasites in the edible cockle, *Cerastoderma edule*, taking abiotic data into account. For 1 year, cockles were monthly collected in 18 sites of the Ria de Aveiro (coastal lagoon, Portugal). Fifteen cockles per site and month were dissected to identify and count trematode species. Trematodes are common parasites of molluscs and vertebrates in coastal areas. Due to the high number of uninfected cockles in our dataset, ZI and H mixed models were used to link abiotic data with parasitic infection. These two-part models included a binomial regression for the excess of zeros (ZI) or presence/absence of infection (H) and a negative binomial (ZI) or truncated negative binomial (H) count regression to model the number of trematodes infecting cockles. Both models provided similar significant results: a random effect per site accounted for the within-site variability in the population; salinity was positively associated with cockle infection; and the number of parasites evolved over time as a quadratic function, with the highest incidence estimated for winter.

Nutritional value of fermented plant-feedstuff mixture with *Aspergillus niger* for European Sea Bass (*Dicentrarchus labrax*)

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Abstract

Modern aquaculture relies on plant feedstuffs as the main alternative to unsustainable ingredients. However, plant feedstuffs present some constraints such as poor digestibility, high fiber content, and anti-nutritional factors. Biological processes, such as Solid-State Fermentation (SSF), can improve plant feedstuffs´ nutritional quality. SSF is an economical and eco-friendly bio-process that relies on microorganisms to digest the substrate and increase nutrient bioavailability. This study aimed to evaluate bioactive compound production and substrate modifications of a plant-based mixture by SSF, using 3 different *Aspergillus* fungi, and access their effect on fish growth.

A plant-based mixture (soybean, rice bran, sunflower, rapeseed, 25% each) was fermented with the 3 fungi (*A. ibericus* 03.49 MUM; *A. niger* 2088 CECT; *A. niger* 2915 CECT). Carbohydrase production and protein digestibility increased with all fungi. The highest enzymatic yield and protein digestibility was obtained by SSF with *A. niger* 2088, so it was chosen to be tested in vivo. Four isoproteic (42%) and isolipidic (18%) diets were formulated, including 20% and 40% of the unfermented plant-feedstuff mixture (20M; 40M) and 20% and 40% of the fermented mixture (20SSF; 40SSF).

Triplicate groups of 20 fish with 10g were fed for 50 days with these diets and at the end of the trial, growth performance was higher with the diets including 20% than 40% plant-based mixture, independently of processing. SSF of the plant-based mixture reduced growth performance. Feed efficiency, protein efficiency, and nitrogen retention were highest with the 20SSF and lowest with the 40SSF diet, compared to all treatments.

Overall, dietary inclusion of 40% plant-based mixture reduced growth performance. SSF reduced growth performance but increased feed and protein utilization. Further studies should be done to evaluate the effects of dietary inclusion of lower levels of both fermented or unfermented plant-based mixtures.

A rosamine loaded metal-organic framework composite as a highly sensitivity fluorescent platform for sensing Cu(II) in water samples

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Abstract

Copper (Cu) is a vital trace metal that plays a crucial role in many of the biological systems that govern the human body. In excess, free Cu ions can cause abnormal cellular events that are believed to be linked to many neurodegenerative diseases including Menkes, Alzheimer´s and Parkinson´s diseases. Therefore, it is of utmost importance the development of new and improved sensors for detecting and monitoring different Cu sources, such as industrial sources of waste, Cu water pipes and drinking water [1].

Over the last 10 years, metal-organic frameworks (MOFs) have proven to be powerful platforms for many applications including catalysis, adsorption, and particularly as sensory materials capable of accurately and selectively monitoring many analytes of interest [2,3]. Thanks to their porous structure, MOFs exhibit unique characteristics that makes them excellent chemical sensors. The present work intends to develop fluorescent materials that can overcome some limitations of organic dyes, such as self-quenching caused by aggregation and their low water stability, while maintaining their sensory capability to detect and quantify harmful substances accurately and selectively. With this in mind, we prepared and characterized a composite material that combines the properties of a MOF (UiO-66) with the sensory capabilities of rosamine dyes. The resulting material provides an accurate and selective fluorescent response for Cu containing water samples.

Acknowledgments

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References

[1] Gaetke, L. M. et. al.; Arch. Toxicol. 2014, 88 (11), 1929.
[2] Chen, L. et.al.; Chem. Rev. 2020, 404, 213113.
[3] Sousaraei, A. et. al.; J. Anal. Chem. 2019, 91 (24), 15853.

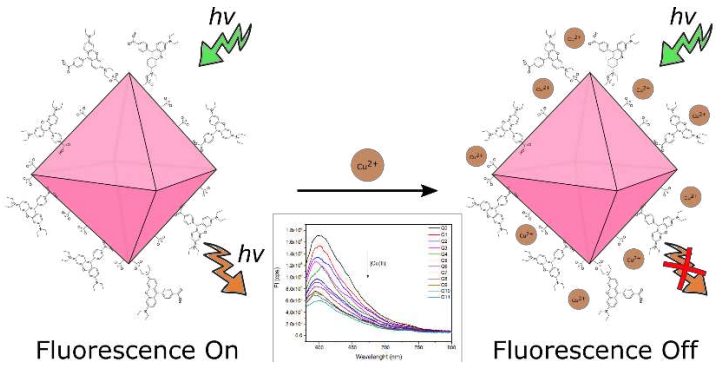

Figure 1. - Schematic diagram of the fluorescence detection mechanism.

Extending the phenotypic characterization of zebrafish models of parkinsonism and amyotrophic lateral sclerosis

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Abstract

Neurodegenerative diseases, including Parkinson´s Disease (PD) and Amyotrophic Lateral Sclerosis (ALS) pose a major burden to global health. Both PD and ALS lead to progressive disability and motor impairment, albeit through different pathological pathways - PD is characterized by the degeneration of dopaminergic neurons in the substantia nigra, while in ALS motor neurons are the main affected population. Additionally, sleep and circadian rhythm disruptions are common in ALS and PD patients, contributing to disease progression and burden. The small vertebrate zebrafish is a leading organism to model PD and ALS. Traditionally, the behavioural characterization of such models has been primarily focused on spontaneous locomotion and reflexes. Here we innovate by assessing whether the models also exhibit altered sleep and circadian rhythms. We combined an infrared-based Locomotion Activity Monitor (LAM) with our recently developed Rtivity behavioural analysis software [1] to characterize zebrafish locomotor activity, sleep and circadian rhythms in induced models of PD and ALS versus non-induced controls. Although some (5-10%) of PD and ALS cases are familial and have a genetic cause, most cases are sporadic and potentially associated with environmental exposures. To model sporadic disease, zebrafish were exposed to the Parkinsonian toxin MPP+ or to the motor neuron degeneration-inducing BPA (Bisphenol A), which induced concentration-dependent reductions in activity and sleep disruptions (e.g. increased sleep ratio and sleep latency). These results evidence the feasibility of using infrared-based LAM to assess multi-parameter behavioural disruptions in zebrafish models of neurodegeneration. The extended characterization of sleep and circadian rhythm phenotypes in neurodegeneration models can assist future studies addressing pathogenic pathways and experimental therapeutics.

References

1- Silva RFO et al. (2022) Scientific Reports 12:4179

Psychological Pricing in footwear e-commerce

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Abstract

In the offline world, the use of psychological pricing is not a new strategy, being 9-ending prices frequently employed in nearly all domains. The tendency of customers to associate 9-endings with low prices explains this prevalence. Several theories have been offered to explain this low-price association, including the association of 9-ending prices with promotions and good bargains, or consumers' underestimating of such prices due to information processing limitations.

E-commerce, due to all of its benefits, has nearly become a need for every business that wants to stay competitive in the future. Even so, research on the importance of the psychological pricing method in e-commerce remains scarce and unclear, and does not include the analysis of world´s largest e-commerce segment - the fashion sector.

In this domain, the present research work examines to what extent psychological pricing is applied in footwear online retailing and in under which conditions it is verified. Using a web scraping mechanism, all prices of women and men shoes will be collected from Zalando.de website, being applied a logit model to identify the factors that have an impact on the probability of use of 9-endings in this sample.

Since pricing is a critical aspect of a retailer´s economic success and the price-setting strategies used in e-commerce are still poorly understood and investigated, the findings of this study will provide important insights about the online pricing method adopted by e-tailers, particularly in the footwear segment, where price proves to be an extremely relevant factor for both offline and online purchases.

Chronic alcohol exposure induced in the hippocampal formation Neuroinflammation, neurogenesis and behavioural changes that were neither reversed by long-term withdrawal nor by flavonoids

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Abstract

Introduction: It is known that chronic alcohol intake in humans leads to significant brain functional and structural changes. Flavonoids are polyphenolic compounds, present in a variety of aliment, pointed as useful candidates in the prevention of neuroinflammation. The present study aims to examine the effects of chronic ethanol treatment (CET) and long-term withdrawal (WD) on the function and morphology of hippocampal formation and assess the potential of flavonoids in ameliorating those effects.

Methods: 8-week old male Wistar rats were assigned to: 1) CET, rats drunk a 20% ethanol solution for 6 months. 2) WD, rats were treated as CET for 6 months and, then switched to water for 2 months. 3) WD + flavonoids rats were treated as WD rats, but received food pellets with embedded blackberry extract. 4) Control rats. Rats were tested for anxiety and for learning and memory. Rats were sacrificed and brains were processed for immunohistochemical and biochemical studies.

Results: No significant cognitive deficits in CET rats though in WD rats there was an impairment of their overall performance. Cognitive impairment in WD was not reversed by flavonoids. Decreased anxiety induced by CET and WD was not reversed by flavonoids during WD. CET induced an increase in activated microglia though microglia did not exhibit a full activation phenotype. Partial activation of microglia was not reversed by WD nor by flavonoids. TNFα and COX-2 did not change between groups. In CET and WD+flavonoids rats, IL-15 increased significantly relative to control and WD rats. The density of DCX-ir neurons in the subgranular layer of the HF was significantly reduced due to CET ($p<0.0001$) and WD ($p<0.01$) treatment. In WD, the density of DCX-ir was increased relative to CET ($p<0.05$). No differences were found between WD and WD+flavonoids.

Conclusion: Behavioural and morphological changes induced by CET were not reversed after WD and only flavonoids modulated neuroinflammation through IL-15 levels.

Association between Breastfeeding and Postpartum Depression: a Systematic Review

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Abstract

Background: Research suggests the existence of a relationship between postpartum depression and breastfeeding. It is well-established that postpartum depression can cause early breastfeeding cessation. However, the reverse relationship is not yet fully understood. Thus, the authors conducted a systematic review of the literature, aiming to assess how breastfeeding impacts postpartum depression and the role of healthcare professionals in improving maternal breastfeeding experience and reducing the incidence of this condition.

Methods: In December 2021, a literature search was conducted in three electronic databases - PubMed, Web of Science, and Scopus - using the keywords "breastfeeding" and "postpartum depression". The authors included longitudinal observational studies in Portuguese and English that evaluated the association between breastfeeding and postpartum depression in healthy adult women, with naturally conceived, low-risk, and full-term pregnancies. Study protocols, case reports, and reviews were excluded from this study. No restrictions were imposed regarding the date of publication. Quality assessment of the studies was performed using the NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies. The results of the studies included were then extracted and synthesized qualitatively.

Results: Thirty-five studies were selected and included in this systematic review. Overall, most studies showed that long, frequent, effective, and successful breastfeeding, even if not exclusive, reduces postpartum depression scores. Breastfeeding difficulties and its early discontinuation increased the risk of depressive symptoms. Among women with difficulties, support in feeding practice appeared to have a protective effect on this disorder.

Conclusions: In general, breastfeeding appears to protect against postpartum depression. However, breastfeeding difficulties and its early discontinuation have a negative impact on maternal mental health.

Potential of astaxanthin-loaded nanostructured lipid carriers (NLC) for the management of neurological diseases

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Abstract

The intranasal route has been suggested as a promising alternative to improve drug delivery to the central nervous system, as it can transport drugs from the nose directly into the brain (nose-to-brain delivery), avoiding the need to cross the blood brain barrier. In this context, the use of nanostructured lipid carriers (NLC) has been highlighted as an effective strategy in the treatment of neurodegenerative diseases (NDs), particularly when these systems are associated with intranasal administration. The objective of this work was to prepare NLC loaded with astaxanthin, an antioxidant existent in marine microorganisms, for nose-to-brain delivery. Astaxanthin can be used in the management of NDs due to its remarkable antioxidant activity that reduces the oxidative stress associated with the pathogenesis of these diseases. Furthermore, the use of this natural compound promotes greater sustainability and awareness on the importance of recovering waste resulting from marine organisms processing and thus the concept of circular economy is considered. Three NLC formulations loaded with different amounts of astaxanthin (250, 500 and 1000 µg/mL) were prepared. On the production day, the particle size, polydispersity index and zeta potential were 122.333 ± 1.704 nm, 0.210 ± 0.007 and -23.300 ± 0.625 mV; 115.733 ± 1.137 nm, 0.204 ± 0.010 and -20.467 ± 1.665 mV; 117.300 ± 2.163 nm, 0.222 ± 0.016 and -23.267 ± 0.451 mV, respectively for formulations 1, 2 and 3. Three months after storage at 20.0 ± 0.5 oC, these parameters underwent only slight changes, which predicts good long-term stability for the developed formulations. Biocompatibility studies in human neuronal SH-SY5Y cells showed that the developed formulations are safe at least at concentrations up to 100 µg/mL. The results of this study highlighted the potential of using astaxanthin-loaded NLC to improve the progression of NDs, although more experiments are needed to confirm this evidence.

Nutritional composition and antioxidant activity of wild *Opuntia ficus-indica* (L.) cladodes and its juice

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Abstract

Opuntia ficus-indica (L.) Miller is a fruit-bearing cactus, native to Mexico, currently spread on all continents due to its outstanding propagation capability and resistance to arid climate. The cladodes are an often-leftover part of Opuntia as the main purpose of the plant is the fruit. The cactus requires frequent trimming because of its rapid growth making fruit production economically difficult. The cladodes that are trimmed constitute themselves a problem. Opuntia has the ability to propagate and reproduce itself from these trimmed cladodes, which rapidly develop roots and grow a new plant in very little time. In the light of this, a solution is needed to dispose of these cladodes. The cladodes are edible and cheap since they are considered waste.

The aim of this study was to study the cladodes and the juice obtained by a conventional machine. It was compared the nutritional value and antioxidant power of these two samples. The first step to develop a successful product from the cladodes is to know the value of the raw material, highlighting the importance of this research.

Standard AOAC methods were used to analyze the macronutrients [1]. The bioactive and antioxidant compounds were determined by spectrophotometric methods, following an ethanol/water (1:1) extraction. Free sugars were determined by an HPLC method [2].

The cladodes are mostly composed by water and fiber (93.6% and 31.3% dw). Juicing decreased the amount of fiber (10.4% dw) and increased the moisture content (95.4%). The cladode juice shows 1.66% of free sugars (glucose and fructose). The juice also shows a higher antioxidant power in comparison to the whole cladode.

Acknowledgements

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References

[1] AOAC (2012)
[2] C Ma et al., Food Chemistry 2014; 145C (145):784-788

Between solutions: Proposals for the neighbourhood of Bom Sucesso

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Abstract

The present study intends to find new solutions for evolutionary minimum housing within the context of the Portuguese social housing program. The space of the house is the object of the laboratory study, which intends to investigate and understand the needs for new housing models on a reduced scale, in order to rethink the domestic space and reach a conclusion on how to use a more flexible architecture.

With continued use the social housing produced in mid-20th century, it will be necessary to rethink the model, its program organization, number of rooms, spatial function, formal flexibility and modulation, and even its relationship with real estate. The above will provide some autonomy to users and clarity to the place where they live, whilst also responding to contemporary housing needs and new ways of living with all housing rights.

This research intends to conduct an in-depth theoretical and practical study for the neighbourhood of Bom Sucesso in the city of Porto. The main objective will be to study some design strategies, from the ground floor to the rooftop, carrying out what will be the most appropriate proposals for the housing design that correspond to current needs, always considering the type of user who can inhabit these spaces. The strategy of presenting a set of design solutions has the architectural drawing as a predominant factor, exposing all its importance to alternatives designs for evolutionary minimum housing.

This investigation is taking place within the thesis on master´s degree in Architecture at FAUP, under the supervision of the professor Marta Rocha.

Cluster Analysis on Anxiety and Depression Symptoms during COVID-19 pandemic

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Abstract

The COVID-19 pandemic had a severe impact on the population's activities which might be taking a toll on mental health. The goal of the current study was to understand how different sociodemographic and behavioral factors have been related to anxiety and depression symptoms during the pandemic. Between November 2020 and February 2021, an online questionnaire regarding anxiety and depression symptoms, sociodemographic and behavioral characteristics was carried out, following a cross-sectional snowball methodology. A total of 453 responses were obtained, concerning 18 variables, including the continuous variables anxiety and depression, measured according to the HADS scale.

Different behavior profiles of anxiety and depression were identified by the K-means clustering algorithm. The number of clusters - 3 - was determined by the elbow method and corroborated by the gap statistic method. Cluster 1, Cluster 2 and Cluster 3 contained 194 (42.8%), 82 (18.1%) and 177 (39.1%) participants, respectively. The first cluster is characterized by low symptoms of anxiety and depression, the second contains individuals with high anxiety and depression symptoms and the third is composed by individuals with mild symptoms of anxiety and depression. Identification of the sociodemographic and behavioral characteristics associated with each cluster was obtained from the chi-squared test. Nine out of the sixteen categorical variables studied presented a significant association with the clusters. A sensitivity analysis for the identified clusters included principal component analysis (PCA) on the two continuous variables. The first component was divided into tertiles and individual labels were compared with those obtained from the k-means methodology. It was found that most of the observations from each cluster matched the observations from a PCA group, supporting the previous results.

Elderly People Victims of Domestic Violence: validation of the risk assessment instrument Assessment Guidelines for Elder Domestic Violence (AGED)

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Abstract

Introduction: Elder abuse is a complex multidisciplinary social problem that requires cooperation between institutions and professionals. In Portugal it is possible to identify a small number of studies about elder abuse but not about specific risk factors or about risk assessment and management.

Methods and material: The aim of the investigation was to validate at national context the AGED - Assessment Guidelines for Elder Domestic Violence - risk assessment tool to predict the risk of domestic violence against the elderly. An analysis was made of 234 Online Support Processes (PAO) of elderly people who contacted the services of the Portuguese Association for Victim Support (APAV). As criteria measures, two other instruments were used: Indicators of Abuse (IOA) and Danger Assessment (DA).

Results: the AGED presented favorable results in terms of measuring the phenomenon of violence that it proposed to assess. The first analysis regarding the predictive validation of the tool revealed promising results, approaching the values considered desirable by the literature. In terms of reliability, the values were a little far from what research considered desirable. To suppress this, a short version of the instrument was development and tested. The results were similar in terms of validity and reliability.

Discussion and conclusions: This investigation offers the opportunity to provide valid, user-friendly risk assessment tool of elder abuse to support the professionals, contributing to victim protection and prevent the occurrence of future violence. The AGED seems to be an easy-to-apply tool, being considered an innovative instrument in a national context. The instrument showed good construct validity and, in terms of predict the risk of re-victimization, presented better results than IOA and DA. The same happened with the AGED short version. In terms of reliability, the results reveal the need to rethink the maintenance and organization of some items that comprise it.

The impact of species hybridization promoted by climate change: a case study on hares (*Lepus* spp.)

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Abstract

Anthropogenic climate and habitat changes pose serious challenges to species, inducing retraction of vulnerable species or expansion of favoured ones. Often, these opposing demographic trends imply a change in the dynamics of contact zones and are particularly relevant when species involved are still able to hybridize and exchange genetic variants (introgression). Introgression may introduce maladaptive variation and be another source of aggression but may also add adaptive variation and promote adaptation to new conditions. Assessing the impact of introgressive hybridization in the interspecific dynamics of species facing climate change is therefore important. Here, we inspect the genetic interactions between the European brown hare (*Lepus europaeus*), an invading temperate species, and the mountain hare (*Lepus timidus*), a retracting artic/boreal species well adapted to cold environments, in contact zones in Sweden and Scotland, where an invasion-retraction dynamics between the species with hybridization is predicted. Based on genome-wide single nucleotide variants derived from RAD-sequencing (11938 loci), we show little genetic structure in populations of both species in the focal regions. Also, we found that patterns of genetic exchange differ in the focal regions: while in Sweden, there are evidences of introgression from the mountain hare to the brown hare, the opposite pattern is evident in Scotland. Different demographic trends of the species in the two regions

may be influencing the patterns of genetic exchange. We are thus characterizing these demographic histories and linking them to magnitudes of introgression. Also, using historical samples from natural history collections, we will dissect whether temporal changes in the rates of hybridization are visible, as consequence of climate change. Our work will advance knowledge about the impact of climate change on the genetic integrity of species, especially driven by hybridization.

Immunochemical characterization and gastrointestinal digestion of gamma-conglutin, a major lupine allergen

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Abstract

Lupine is a high protein and nutritional food source, with interesting functional characteristics, being widely used in Mediterranean diet. It is used as a substitute of animal/vegetable protein sources and as a technological ingredient in the preparation of various food formulations (pastry, snacks and meat products). However, lupine presents allergenic properties, which can cause serious adverse immunological reactions in sensitized individuals, being gamma-conglutin one of the most relevant allergens in lupine. Therefore, this work aims at characterizing gamma-conglutin from the most economically important lupine species (L. albus, L. luteus, L. angustifolius, L. mutabilis) and assessing the effect of different food processing methods and food matrices on its immunoreactivity. Following the application food processing, the effect of simulated gastrointestinal digestion will also be evaluated.

For this purpose, processed model foods (meat or pastry products) with known amounts of lupine flour will be prepared, followed by protein extraction and evaluation of protein profile by SDS-PAGE. Immunoblotting will be used to assess IgG-binding capacity of gamma-conglutin and a harmonized gastrointestinal digestion protocol (INFOGEST) will be applied to model foods. SDS-PAGE results suggest that the protein profile of lupine seeds is very different among species/varieties. A distinct IgG-binding pattern was also observed for gamma-conglutin, depending on the lupine species. The baking/boiling and autoclaving treatments considerably reduced gamma-conglutin immunoreactivity due to an increased damage of the protein structure. Digestibility induced an increased alteration in the peptidic profile of gamma-conglutin, affecting its IgG-binding capacity and subsequent presentation to immunocompetent cells.

This study demonstrates the impact of food processing and matrix on the immunoreactivity of gamma-conglutin as a strategy to develop products with reduced allergenicity.

Conservation genetics of the Broom hare, *Lepus castroviejoi*

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Abstract

The broom hare (*Lepus castroviejoi*) is a threatened Iberian endemism, restricted to Northwest Spain, being listed in the IUCN Red List as Vulnerable. However, its current geographical distribution, population size, several aspects of its ecology and genetic diversity are poorly known, making conservation efforts difficult to implement. In this work, by employing a genetic non-invasive sampling (gNIS) approach, we investigate patterns of genetic diversity and population structure of this species. To compare genetic diversity and infer potential admixture, we included other European hares: *L. europaeus* (N=81); *L. timidus* (N=77); *L. granatensis* (N=68); *L. corsicanus* (N=20). A total of 185 feces were collected across the distribution range of *L. castroviejoi* between 2020 and 2021. Five tissue samples from roadkills and 17 samples collected previously (2003-2007) were also analyzed. Mitochondrial (cytB; 108 bp) and nuclear (transferrin; 240 bp) DNA sequences were used for species ID, and 15 microsatellite loci were genotyped for individual ID. A longer fragment of cytB (556 bp) was used to infer phylogeographic patterns. A total of 54 individuals were identified with gNIS. *L. castroviejoi* showed the lowest nuclear diversity (Na=2.53, Ho=0.160 and He=0.180) among the analyzed species, and very low mtDNA diversity (Hd=0.75 and π=0.01553). Nevertheless, no inbreeding or recent population bottleneck was detected. Two clusters were inferred from Bayesian analyses using microsatellites, partially segregating populations from the west and east of the Cantabrian Mountains. No recent hybridization with neighboring hare species was inferred. Two highly divergent mtDNA clades were found, one resulting from ancient introgression from *L. timidus*. This study emphasizes the importance of using gNIS for conservation planning and generates key information to delineate measures to preserve this species. This work was partially funded by Mr. Klaus Tamm, through the World Lagomorph Society.

Using genomics to dissect the history of divergence and hybridization in the sister broom and Corsican hares (*Lepus* spp.)

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Abstract

Hybridization leading to the exchange of genetic variants between species (introgression) is a relevant evolutionary process that may strongly influence the genetic variation of extant species, and provides opportunities to dissect the history of species interactions and the causes and consequences of genetic exchanges. Here, we study two sister hare species that are the result of a yet poorly characterized recent split from a common ancestor: the broom hare (*Lepus castroviejoi*) and the Corsican hare (*L. corsicanus*), allopatrically distributed in the Iberian and Italian Peninsulas, respectively. These species are known to have anciently hybridized with the mountain hare (*L. timidus*) before their split and may have differentially hybridized after their separation with the neighbouring Iberian hare (i), possibly with the European brown hare (*L. europaeus*) and again with the mountain hare. We use whole genome sequencing datasets from these species to dissect the process of divergence between the sister broom and Corsican hares, and infer ancient and recent introgression from the different sources. Our results confirm that the genomes of Corsican and broom hares have very little genetic differentiation. Yet, peaks of divergence were detected along their genome, suggesting that local adaptation or introgressive hybridization have impacted their evolution after the split. Indeed, analyses of shared genetic variation showed that the broom hare genome has an important contribution from the Iberian and European brown hares due to introgression. Ongoing analyses will reconstruct the history of admixture in the species and clarify the evolutionary forces, adaptation and selection, causing strong differentiation signals along the genome. This will provide novel insights about the historical biogeography of the separation of the sister species, and refine our understanding of the Pleistocene and post-glacial recurrent interactions among southern European hare species

Gene erosion of Sebum-producing genes in Pangolins

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Abstract

The Mammalia skin exhibits a rich spectrum of evolutionary adaptations. The pilosebaceous unit, which consists of the hair shaft, hair follicle, and sebaceous gland, is the most evident synapomorphy among them. Interestingly, the evolutionary diversification of mammals across diverse ecological niches was paralleled by the emergence of particular skin-phenotypic modifications. In pangolins (order Pholidota), keratin-derived scales are one of the most iconic occurrences of unique skin appendages. This formidable armor is intended to serve as a key deterrent against predators. Surprisingly, whereas pangolins have hair on their abdomens, the presence of sebaceous glands in Pholidota is widely discussed. In this study, we aimed to investigate the molecular drivers of sebum production in four pangolin genomes. A combination of comparative genomics methods was used: synteny analysis from the NCBI´s database, sequence alignments via Pseudochecker allied with Geneious Prime, and validation of gene pseudogenization via Sequence Read Archive (SRA). Our results show that genes like AWAT2 (crucial in wax monoesters formation), GSMDB (that plays a key role in pathogen defense), SLURP1 (responsible for the maintenance of physiological and structural integrity of keratinocyte layers), and many other skin-related genes display conserved disruptive mutations among these species. In addition, several molecular physiology components of the skin are also absent. Our findings reveal a sophisticated pattern of gene retention and loss as key evolutionary mechanisms in the development of this distinct mammalian phenotype.

The influence of estuarine tides in the planktonic microbiome diversity

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Abstract

Microbial communities are essential for the balance of the ecosystems by playing a crucial role in the biogeochemical cycles and by representing the base of the food webs. In estuarine systems, these microbial communities need to respond to the high range of environmental gradients that characterise these ecosystems. In this study, we evaluate the impact of the Douro River estuarine tides in the distribution and diversity of the prokaryotic and unicellular eukaryotic communities, across an estuarine transect.

We collect surface water samples in the Douro River estuary, along a transect of 21 Km covering the most downstream and upstream regions, at low and high tide. The workflow started with water filtration, followed by DNA extraction, quantification, PCR amplification, and finally sequencing of the 16S RNA and 18S RNA genes amplicons in order to retrieve the community´s taxonomy. Water column, inorganic nutrients and chlorophylls were also analysed for each station. Bioinformatics analyses relied on the DADA2 and Phyloseq packages in R.

In this study, 51 prokaryotic phyla and 57 unicellular eukaryotic phyla were identified. Preliminary results showed no clear alfa and beta diversity differences in the prokaryotic and unicellular eukaryote communities between high and low tide conditions. However, the station near the mouth of the estuary, more influenced by the marine water masses, showed a highly dissimilar microbial community structure for both 16S and 18S data sets.

In this station, microbial community differences between high and low tide were also registered, most probably as a result of the high amplitudes of the environmental parameters in this region of the estuary, contrasting with the more homogeneous conditions in the rest of the transect. The salinity gradient across the transect seems to be influencing this pattern, however further analysis is necessary to deeply explore how environmental variables change the distribution of microbial communities.

Heterologous expression of the mic BGC from the cyanobacterium *Microcystis aeruginosa LEGE 91341* in *E. coli* confirms its role in microginin production

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Abstract

Cyanobacteria are an important source of secondary metabolites with several biological activities. The genes involved on the biosynthetic pathways of these metabolites in bacteria are usually grouped together on the genome, forming biosynthetic gene clusters (BGCs). Currently, most of the described cyanobacterial secondary metabolites do not have experimental evidence of the correspondent BGC. For instance, microginins, lipopeptides produced by cyanobacteria and well known for being strong protease inhibitors, did not have its biosynthesis completely unveiled. In this study, we applied Direct Pathway Cloning together with Sequence- and Ligation-Independent Cloning (DiPaC-SLIC) to establishing an experimental link between the microginins and their biosynthetic genes. DiPaC-SLIC is a recently developed technique that enables the capture and the heterologous expression of BGCs in *E. coli*. We used it to express a 25 kb hybrid non-ribosomal peptide synthase (NRPS)/polyketide synthase (PKS) BGC (mic) present in the genome of the cyanobacterium *Microcystis aeruginosa LEGE 91341*. The mic BGC had previously been identified in microginin-producing cyanobacteria and has been proposed to be responsible for their biosynthesis. We analyzed an extract from *M. aeruginosa LEGE 91341* and found that it produces twelve new microginin congeners. *E. coli* carrying the mic BGC were able to produce several microginins. The relation between the *E. coli* produced microginins and those found in the *M. aeruginosa LEGE 91341* extract was confirmed through MS/MS analysis. Our research firmly establishes that the NRPS-PKS mic BGC is responsible for microginin production. In addition, our strategy enables access to new lipopeptide protease inhibitors from cyanobacteria or by pathway engineering.

Plastic-related chemicals in terrestrial environments: an emerging challenge

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Abstract

The presence of plastics in aquatic and terrestrial environments endangers many species of fauna and flora and can also affect human health. Plastics that reach the environment are gradually broken down into small particles, fragments, and fibres. The number of additives used in the production of plastics can increase the risk of environment contamination. In addition, the nature of plastic materials allows them to sorb several other chemical contaminants. The main objectives of this work were to: 1. physicochemical characterize soil samples from Montesinho Natural Park (MNP); 2. develop and optimize extraction and analysis methodologies for several plastic-related chemicals (PRC) from MNP soils. Ten soil samples were collected in distinct locations in the MNP. The parameters analysed were pH, moisture content and organic matter. The pH values varied between 3.88 and 6.79, the moisture content varied between 3.12 and 28.01% and the organic matter content varied between 0.67% and 3.01%. The PRC, pyrethroids pesticides, polybrominated diphenyl ethers, polychlorobiphenyl and organochlorine pesticides were extracted and analysed by a QuEChERS extraction approach and Gas Chromatography - Electron Capture Detector (GC-ECD). The method was validated in terms of linearity, matrix effect, recovery percentage, limit of detection(LOD), limit of quantitation(LOQ) and precision. The results obtained showed that the optimized analytical techniques presented good performance in the simultaneous analysis of many PRC. With this work, we can say that controlling the PRC residues and developing best management practices based on these data is one of the most important aspects in the minimization of the potential hazards that these contaminants can pose to human and environmental health.

Acknowledgments

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Relaxin and HFpEF: unveiling a new contributor to personalized medicine?

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Abstract

Aims: Although Heart Failure with Preserved Ejection Fraction (HFpEF) is a growing health problem, there are still significant caveats on the understanding of its pathophysiology, diagnosis and treatment. We aimed to evaluate the role of Relaxin-2 (RLX2) circulating levels on the diagnosis of chronic HFpEF and to explore its associations with HFpEF related risk factors/comorbidities.

Methods and Results: We performed a cross-sectional analysis of a prospective cohort study (NETDiamond), evaluating 85 chronic HFpEF patients and 16 control patients. Serum RLX2 concentration was measured at enrolment using an enzyme-linked immunosorbent assay and its values were compared between groups. Associations between HFpEF risk factors/comorbidities

and RLX2 were evaluated using linear regression models adjusted for age, sex and glomerular filtration rate. No significant differences were found in RLX2 levels between controls and HFpEF patients (mean log2-RLX2 4.64±2.28 vs. 4.80±2.30pg/mL respectively, p=0.798). Female patients had significantly higher RLX2 levels (mean log2-RLX2 5.4±1.96 vs. 4.3±2.41pg/mL in males, p=0.014). Also, RLX2 levels were negatively associated with a history of myocardial infarction (β=-1.3, p=0.018), peripheral artery disease (β=-1.4, p=0.027) and statin use (β=-1.7, p=0.002) and positively associated with obstructive sleep apnea (β=1.1, p=0.028). Regarding analytical parameters, RLX2 was positively associated with C-peptide (β=-1.3, p=0.018), phosphate (β=1.3, p=0.003), uric acid (β=0.33, p=0.001) and HDL (β=0.04, p=0.023) and negatively associated with HbA1c (β=-0.48, p=0.012).

Conclusion: RLX2 did not significantly differ between HFpEF and control patients. However, it might be useful in HFpEF patients' phenotypic characterization, due to its negative association with ischemic cardiovascular disease and positive association with glycemic control. These associations may be useful for a personalized approach to HFpEF and should be further explored.

Magnetic Tunnel Junction Enabled Quantum Energy Harvesting

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Abstract

A huge development in magnetic nanostructures has been witnessed in the latest decades, due to the growing interest in Spintronics, a research area that uses the spin of electrons as an additional degree of freedom. Unlike conventional electronics, spintronic devices take advantage of the spin of electrons to obtain, transmit and process information, with increased efficiency.
Magnetic tunnel junctions (MTJs) [1] are the most successful implementation of this technology. These devices consist of a series of stacked nanometric layers, with the critical effects occurring at the interfaces between the magnetic layers and the insulator. By the application of an external magnetic field, the magnetic layers can be parallel or anti-parallel aligned, offering two different resistance states. This device is used in data storage and processing, namely in hard disk read heads, and in the prominent MRAM.
We present a study on the appearance of an electromotive force (emf) in MTJs devices with paramagnetic impurities in the tunnel barrier [2]. For this, we fabricated MTJ samples with MgO tunnel barriers, which presents a spin filtering mechanism that enhances TMR ratios. We performed magnetic and electric characterization, by measuring IV curves and magnetoresistive hysteretic cycles. We obtained TMR ratios of approximately 70%, from junctions with resistance area products of approximately 4 MOhmμm2. A non-linear IV behavior was observed confirming the presence of tunneling across the barrier. As further work, we expect to obtain current-voltage curves with offset at (zero voltage, zero current), the main indicator of an emf, and characterize the working devices as a function of temperature. We propose to understand this effect and enhance it, by studying MTJs with Ta, Ru or W impurities.

References

[1] Zhu, Jian-Gang Jimmy, and Chando Park. Materials today 9.11 (2006): 36-45.
[2] Pham Nam Hai, Shinobu Ohya, Masaaki Tanaka, Stewart E. Barnes, Sadamichi Maekawa, Nature 458, 489-492 (2009).

Energy harvesting combining triboelectric nanogenerators and thermomagnetic materials in low temperature gradients

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Abstract

Due to high demand for distribution of electrical power, the interest in Energy Harvesting (EH), the concept of converting unused ambient energy from our surrounding environment into electrical energy, is increasing. Amongst the various available external sources, thermal energy is one of the most researched for the purpose of EH, not only because it is the most ubiquitous one, but also for being the form of energy that all the others are eventually turned into. Thermal EH relies on "free heat", so a beneficial alternative of a green energy source would be to capture this lost heat, convert it into electrical energy and use it to re-power devices.

Thus, our study focuses on researching a device that performs such conversion in the low-grade temperature range. Our setup is composed of a NdFeB permanent magnet on top of a hot source and a triboelectric nanogenerator (TENG) directly above a cold source. Between them is a thermomagnetic material (TMM) with a Curie Temperature (Tc) near 23 ºC (e.g. Gd) where an oscillatory motion is forced through heating and cooling. When heated above Tc, Gd transitions from ferromagnetic to paramagnetic and falls on the TENG, generating an energy peak. Then, the Gd is cooled below Tc, leading to a paramagnetic-ferromagnetic phase transition. When that occurs, the Gd is once again attracted by the permanent magnet and lifts off the TENG, generating another energy peak. This cycle repeats as long as the TMM´s temperature oscillates around Tc.

Here, we present a study on how physical properties of TMMs such as Tc or thickness influence the energy generation, optimum resistance or oscillation frequency of the proposed device, aiming its optimization and potential assessment. Although these values depend on several parameters, the best results obtained so far were an open circuit voltage of 8 V, a short circuit current of 0,36 µA and a motion frequency of 66 mHz, for a TMM with Tc = 39,9 ºC and a zigzag PTFE-Nylon TENG.

Understanding the role of AGP6, AGP11 and AGP40 in pollen development

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Abstract

Double fertilisation is an event unique of angiosperms and is critical to the survival and evolution of species, such as *Arabidopsis thaliana*. Both male and female gametes must be produced inside their respective gametophytes, and these play an essential role in the success of double fertilisation. Arabinogalactan proteins (AGPs), proteins rich in carbohydrates, were proven to play a paramount role during gametophyte development, where it is worth emphasising the role of AGP6/11 in pollen grain development and structural integrity, and pollen tube germination and growth. The work to be presented will investigate further the role of AGP6/11/40 during male gametophyte development. AGP40 expression pattern was revealed to be present in anthers, pollen grains, pollen tubes and sepals through GUS assay. The mutant agp6agp11agp40 presented reduced fertility, with a significant decrease in viable mature seeds and a significant augmentation in aborted ovules. These results were obtained through seed set analysis. Additionally, flower morphology was observed through clearing, revealing to be similar to wild type, therefore mutant flowers were considered to be developing normally. Due to the presence of each AGP in mature pollen, its viability was investigated through Alexander staining, and showed an absence of inviable pollen grains. Similarly, pollen tube guidance towards the ovule 24 hours after hand pollination, visualised with aniline blue staining, appeared to be normal. Furthermore, London-Resin white anthers sections of the described mutant were visualised with toluidine blue at several key developmental stages. The work presented will shed light on the role, during pollen development, of several AGPs highly expressed in this organ.

A genetic interplay between Tlx3 and Prrxl1 in dorsal horn neurons differentiation

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Abstract

Mouse genetic studies revealed that Tlx3 and Prrxl1 transcription factors are necessary for the proper development of the spinal cord dorsal horn [1,2], however the molecular basis for Prrxl1 cellular functions is unknown. To define the transcriptional program under the regulation of Tlx3 and Prrxl1 in the mouse embryonic dorsal horn, our group previously performed chromatin immunoprecipitation followed by next-generation sequencing (ChIP-seq) combined with expression profiling. These analyses revealed that Tlx3 and Prrxl1 target genes highly overlap, and gene ontology analysis showed that they are mostly associated with terminal neuron differentiation aspects.

To validate Prrxl1 putative target genes, which were shared with Tlx3, we performed in situ hybridization and RT-qPCR using wild-type and Prrxl1 knockout (KO) mouse embryos. We were able to find evidence that Prrxl1 positively regulates glutamatergic target genes, while repressing genes related to terminal GABAergic differentiation. Then, we performed gain-of-function (GoF) studies using the chick embryo model, aiming to further validate Tlx3 and Prrxl1 shared target genes. But before, we characterized the endogenous spatiotemporal expression pattern of the target genes by in situ hybridization of chick embryo spinal cords and concluded that genes expression patterns of these targets are conserved between mouse and chick species. Lastly, we performed the GoF studies by in ovo electroporation of the chick neural tube to evaluate the effect of forced expression of either Tlx3 or Prrxl1 on the endogenous expression of common target genes. These GoF assay results are in line with gene expression data obtained from mouse Kos.

With this work, we provide evidence that Tlx3 and Prrxl1 cooperate in the regulation of target genes associated with the terminal differentiation of dorsal horn neurons.

References

[1] - Qian, et al. 2002
[2] - Chen, et al. 2001

Identification of a Possible New Therapeutic Target in Kidney Fibrosis

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Abstract

Immunoglobulin A (IgA) nephropathy (IgAN) is one of the most prevalent causes of chronic kidney disease (CKD) and a major source of morbidity and mortality worldwide. Disease progression is characterized by increasing fibrosis of the renal tissue that may lead to End Stage Kidney Disease (ESKD) and the need for dialysis or kidney transplant. Early diagnosis and monitoring of IgAN is of major relevance for effective treatment and disease outcome but the gold standard for IgAN staging is still renal biopsy, an invasive technique that does not allow the continuous monitoring of disease progression.

New methods for IgAN early-stage diagnosis, prognosis, and monitoring, as well as new therapeutic targets to halt and prevent disease progression, are critically needed.

Our group identified a microduplication of a gene in a patient with multiple malformations and unidentified CKD. This gene codifies for a protein that has recently been enrolled in fibrotic processes in different organs, namely the kidneys. Still, most data are merely correlative and nothing is known regarding its involvement in CKD pathology.

In this work, we performed a comparative analysis of the protein expression in human kidney biopsies from IgAN patients and healthy samples by immunohistochemistry and studied its gene expression in TGFb induced fibrosis in vitro, using primary human kidney fibroblasts.

Results showed significant differences in protein expression in fibrotic vs healthy conditions and support a relevant role of this protein in kidney fibrosis.

DNA damage assessment in whole blood samples for further implementation in cumulus cells

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Abstract

The use of medically assisted reproduction techniques and other treatments to overcome infertility has been increasing. Worldwide, more than 8 million babies were conceived through medically assisted reproductive technology. Infertility affects approximately 15% of couples, and half of these cases are due to male causes. Sperm DNA integrity is a strong predictor in male infertility and is regarded as an important criterion of sperm quality. Therefore, the comet assay has been widely used to detect sperm DNA damage.

The comet assay is a simple and versatile method for measuring DNA strand breaks in cells. Cells embedded in agarose are lysed forming nucleoids with supercoiled loops of DNA linked to the nuclear matrix. During electrophoresis at high pH fragmented DNA migrates to the anode leading to a "comet tail" in samples with DNA damage, observed by fluorescence microscopy. The frequency of breaks reflects the total of DNA in the comet tail. An increased level of sperm DNA fragmentation affects the reproductive ability.

These observations together with recent publications, led us to question the applicability of the comet assay in female infertility assessment. Thus, this work aims to implement the comet assay in cumulus cells, located around the oocyte and with implications in fertilization success.

At an early stage, optimization of the protocol was performed in whole blood cells from healthy females and showed that the critical steps in the assay are number of cells, agarose concentration, alkaline incubation time, and electrophoretic conditions. The percentage of DNA in tail was compared in fresh and frozen whole blood samples. Results showed that one freeze-thaw cycle does not affect comet assay results allowing us to proceed with the implementation in cryopreserved cumulus cells.

Youth leadership: Motivations and competences in youth associative leaders

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Abstract

This presentation aims to account the results of a study developed during 2021 by the National Federations of Youth Associations (FNAJ) through the Educational Research and Intervention Centre (CIIE-FPCEUP). The study aimed at understanding the impact of youth association leaders. It was developed through a questionnaire and included scales (using a likert scale from 1 to 5) and open questions. 94 youth leaders submitted their responses, and we will focus on the open questions that aimed to collect information regarding leaders' motivations and experiences while being responsible for the management and coordination of an association, as well as the type of competences they think they developed while in that role. Findings indicate three typologies of motivation: (i) motivations related to the organisation in itself; (ii) motivations activated by a sense of social purpose; and (iii) personal level motivations. The most referred type of competence was (ii) (n=52), followed by (i) (n=32) and (iii) (n=30). These numbers show that associations´ leaders give great importance to the impact that youth associations may have on the community, because of the high choice of type (ii) of motivation, which might indicate external motivation plays a much more active role on their choices, and explains their engagement in these situations. As for competences, we found three types of competences that leaders consider they develop: (i) organizational, (ii) socio-emotional, and (iii) superintendency competencies. The most referred type of competence was (ii) (n=59), followed by (iii) (n=52) and (i) (n=49). Results indicate that youth associations´ leaders regard a complex set of competences to be associated with leadership, which led us to consider that an ecological approach to this topic is necessary. Moreover, leaders place personal relationships and social contexts as priorities.

Contributions of post-mortem studies in the definition of the etiology of Hydrops Fetalis

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Abstract

Introduction: Due to the etiological heterogeneity of hydrops fetalis (HF), establishing the correct etiology is a challenge. Depending on the investigation protocol, the etiology of HF in the prenatal period remains to be identified in 20 to 68% of cases. Thus, the aim of this study is to evaluate the contribution of the post-mortem study of pregnancy losses with hydrops fetalis in the definition of the etiology of HF and to understand the implication this may have in a subsequent pregnancy.

Material and methods: An observational retrospective study was carried out in a tertiary university hospital. All cases of pregnancy loss occurred between 2006 and 2021 with fetal hydrops identified in autopsy, with or without prenatal diagnosis, were included. We performed a comparison between etiology determinate in the prenatal period and after post-mortem study in cases with prenatal diagnosis.

Results: we evaluated 32 cases with HF, 27 (84.4%) identified prenatally, with termination of pregnancy performed in 18 (56.3%). The post-mortem study added information in 24 (75.0%) cases. It identified new cases (20.8%), altered the etiological diagnosis (41.7%), and excluded possible causes of HF (12.5%). Autopsy allowed the diagnosis of five new cases of hydrops fetalis, detection of DNA of the infectious agent allowed the definitive diagnosis of infection in four (66.7%) cases, and genetic studies diagnosed three new cases of chromosomal anomalies. In cases with prenatal diagnosis, the post-mortem study reclassified the etiology in 10 (37.0%) cases but without statistical differences. We classified 16.7% of cases as idiopathic.

Conclusion: Even though no statistical differences were found, the post-mortem studies such as autopsy, microbiological, cytogenetic and genetical studies are essential in the approach to HF once it gives healthcare professionals and parents information that can be considered while making an informed choice about a possible future pregnancy.

Physiological Changes Induced by Negative Film Clips and its Role on Visual Working Memory

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Abstract

Visual working memory keeps a small number of visual information accessible for brief moments. It is assumed that this can be altered by negative emotions: brief emotional reactions (e.g., induced by sad music, exciting images or scenes) may alter the processing and retention of other neutral information over short intervals.

Some previous studies found that induced negative emotion can reduce the quantity of information in visual working memory while, at the same time, increasing the quality of the visual representation. However, other recent studies tried unsuccessfully to replicate these results. Reasons for these discrepancies could be due to the type of emotional induction (e.g., static images) and the use of only self-report to measure emotional induction effectiveness.

Here we examined if negative emotion induced by film clips (which are more potent as an emotional stimulus) alter the quantity and quality of representations stored in visual working memory. During preview of the film-clips and the memory task, electrocardiogram (ECG) and electrodermal activity (EDA) were recorded to monitor the emotional inducing impact of the clips. Three neutral and three negative film clips were selected from the EMBD database, which were presented across six blocks, one per clip. In each block, participants (N = 40) watched one clip, self-rated their emotional state in two scales measuring arousal and valence, and then completed 40 trials of a continuous orientation reproduction task. In each memory trial, they encoded five oriented triangles and reproduced the orientation of one probed triangle after a brief interval.

Negative films were rated as more arousing and more negative than neutral films. Yet, the negative and neutral states induced had no impact on memory performance. In this presentation, we will further discuss the relation between the physiological measures and the self-rated emotion, and how it mediates the impact of emotion fluctuations on ongoing memory.

Thin Films of Semiconductor Materials: Nucleation and Growth of Perylene Films Confined in Ionic Liquids

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Abstract

This work explored the nucleation and growth mechanisms of perylene, an organic material that constitutes the core structure of high-performance organic semiconductors. The strong π-π interaction between perylene cores has been reported as a crucial factor for the excellent chemical, thermal, and optical stabilities exhibited by perylene-based materials [1]. Perylene evidence valuable properties to be used in molecular electronics due to its ability to be deposited as a semiconducting film in a vast area in flexible substrates. Perylene and its derivates are usually used in OPVs, OLEDs, and OFETs [2].

In this project, ionic liquid-assisted vapor deposition was used as an efficient strategy for controlling the perylene film growth. The research strategy comprised sequential, inverted, and simultaneous depositions of perylene and different imidazolium-based ionic liquids (ILs). The film deposition was carried out by a high-performance PVD technique through a customized procedure of vapor deposition/thermal evaporation [3]. The thin films/nanocomposites were characterized by high-resolution optical and morphological characterizations. The influence of the chemical nature, shape, and size of ILs [4] on the growth behavior and morphology of perylene films, was investigated. The nanoconfinement effects and the impact of the alkyl chain length of imidazolium-based ILs on the nucleation and growth of perylene were the major focus of this research.

References

[1] E. Kozma et al., Dyes and Pigments, 2013, 98, 160.
[2] S. Ali, et al., Chemosensors, 2021, 9, 30.
[3] José C. S. Costa et al., Journal of Chemical and Engineering Data, 2015, 60, 3776.
[4] José C.S. Costa et al., Applied Surface Science, 2018, 428, 242.

Development of new multitarget-directed ligands with potential application in Alzheimer's disease

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Abstract

Alzheimer disease (AD) is the most common neurodegenerative disease featuring progressive and degenerative neurological impairments resulting in memory loss and cognitive decline. Its pathogenesis has been linked to a deficiency in the brain neurotransmitter acetylcholine and oxidative stress. However, AD is also associated with iron accumulation within the brain, which triggers a specific form of regulated cell death called ferroptosis. The existing pharmacological therapy nowadays involves the use of acetylcholinesterase (AChE) inhibitors (donepezil, rivastigmine, galantamine), providing only a symptomatic and palliative relief, and does not modify the disease progression. In this context, find new safe and efficient drugs for AD are urgently needed. In this work, and following a multitarget strategy, it is hypothesized that tackling iron-induced cell death (ferroptosis) while inhibiting the cholinesterases (AChE and BChE) might have therapeutic impact for AD patients. With this in mind, we aim to design and develop smart bifunctional compounds, that combine in a single molecule a short-term symptomatic approach (cholinergic therapy via AChE and butyrylcholinesterase inhibition) with a long-term disease-modifying intervention (modulation of ferroptosis via iron chelation).

In this work, a natural compound (Kojic acid) was structurally modified to obtain innovative libraries with iron chelation and anticholinesterase activities. Structural characterization of the newly synthesized compounds was carried out by NMR spectroscopy. Then, several in vitro ADMET properties will be evaluated. Biological screening has included the assessment of acetylcholinesterase and butyrylcholinesterase inhibitory activities, in vitro iron chelation activity and in vitro blood-brain barrier penetration ability. The results obtained so far will be presented in this communication.

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Validation of Temperament Tests and Basic Education Test in a Kennel Environment

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Abstract

Due to the COVID-19 pandemic, the interest in dog´s adoption has increased during lockdown moments. However, this tendency can turn over, and make the overcrowded kennel´s problem worse, synergizing with the euthanize ban in many countries.

When a new dog enters the kennel, we can use temperament tests to know its personality, even though its past is unknown. Besides that, a training protocol can be implemented too, and that brings positive aspects to the animals, already proven in bibliography. But, to check, if the dogs have learned with the training, an education test can be used, and understand in a more accurate form if the dog has evolved.

Therefore, this research has 3 objectives: 1) validate two temperament tests, one in a form of a questionnaire (C-BARQ), and the other, an empirical one (TT: Temperament Test); 2) validate the education/obedience test (BET: Basic Education Test) and 3) with BET, validate the training protocol.

There were selected 12 dogs from Plataforma de Acolhimento e Tratamento Animal (PATA) in Vila Nova de Gaia. In the first phase, the dogs were tested by two PATA members, with C-BARQ. Next, the animals were tested with TT and BET, and after, they participated in a 9 weeks training protocol with positive reinforcement. At last, the dogs were TT and BET tested once more. Besides the in-situ tests, the TT and BET were filmed to a posterior analysis by other evaluators.

The data collected will be statistically analyzed using the score's tests, where it will be explored: the correlation between C-BARQ and TT, the interobserver agreement between the two C-BARQ, the comparison between TT and TEB before and after the training, the comparison between the presential TT and the video´s TT and finally the interobserver agreement of TT´s videos.

With the conclusions, we aim to contribute to standardize the tests and the training protocol, to be used in other kennels, in order to help them better understanding dogs and improving its life.

Claud(in), Claud(out): alternative splicing and the loss of morphological novelty

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Abstract

Genomes comprise the complete sequence catalogue of genes as well as noncoding portions, which makes them dynamic biological units. In this context, gene loss and gene duplication processes translate into evolutionary novelties leading to changes in physiological traits. Due to their expansion into new and varied habitats, vertebrates experienced several genomic changes that in turn have been associated with the appearance of novel traits.

Here we aimed to investigate the evolution of the claudin 18 gene family in vertebrates, and its role in anatomical diversification. Claudins play a critical role in regulating cell permeability and maintaining cell polarity in both epithelial and endothelial cell sheets. Specifically, claudin 18 has two spliced variants, with a distinct first exon, which are expressed at two different tissues. One isoform, CLDN18.1, is generally expressed in the lung while the second isoform, CLDN18.2, is expressed in the stomach.

Using a combination of methods from synteny to phylogenetics and gene expression analyses, we elucidated the evolution of Claudin 18 splicing isoforms in vertebrate species. We found convergent patterns of loss associated with stomach-less lineages. Specifically, in the *Ornithorhynchus anatinus* (platypus), we detected exon erosion leading to the loss of the stomach-specific splice variant CLDN18.2, with the retention of the lung-specific exon. In stomach-less teleost fish (i.e. zebrafish), a single isoform was retrieved, with an apparent expression in swim bladder and gills, whereas in the *Holocephali chondrichthyes* (chimaeras), such as *Callorhinchus milii*, no CLDN18 isoform was found. Such loss patterns paralleled the secondary stomach loss and highlight the role of exon and gene erosion in making of novel phenotypes.

Protein profiling of ovarian cancer ascites: Development of an approach to abrogate peritoneal metastization

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Abstract

Ovarian Cancer ascites is one of the signs of ovarian cancer (OC) metastization and it is found in patients at diagnosis and with tumor recurrence. Malignant ascites constitutes a pathway for peritoneal dissemination typically observed in OC patients. This type of metastization is a multistep process that involves the detachment of cancer cells from the primary tumor, circulation and survival in suspension, homing and growth in peritoneal organs and peritoneal cavity.

Ovarian cancer ascites reflects a liquid tumor microenvironment with low oxygen levels that comprises cancer cells, cancer-associated fibroblasts, mesothelial cells and immune cells floating in a supernatant that contains a mixture of compounds (e.g., growth factors, cytokines and extracellular matrix constituents) that have been reported to promote cancer cell survival, trigger the invasive capacity and interfere with therapy response.

Using a prospective biobank of OC ascites from IPO-Porto comprising samples collected at the time of diagnosis and after chemotherapy, we compared the protein composition in both conditions. To quantify and identify protein composition in both sample groups, we used Liquid chromatography-mass spectrometry available at the Proteomics Scientific Platform at i3S.

In this analysis, we will search for proteins involved in several steps of the metastatic process: [1] cell survival in suspended multicellular aggregates; [2] promotion of an invasive phenotype; and [3] blockage of drug agents used in oncological treatments. In this ongoing work, we expect to identify biomarkers that will allow reliable screening of ovarian cancer and key proteins that can be targeted for therapy as well. Our future aim is to develop a therapeutic approach focused on the impairment of its functionality to abrogate this metastatic process.

Development and testing of triboelectric nanogenerators in a wave tank

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Abstract

In the last decade, our planet has been threatened by resource scarcity and environmental issues, therefore, alternative sustainable energy sources are in great need. Despite not reaching that, wave energy could represent up to 400% of the present worldwide electricity demand, and a way to reach that is by using triboelectric nanogenerators (TENGs), since they are light, low cost, sustainable, effective, and low maintenance nanogenerators which makes them really promising in harvesting blue energy. However, they are still in the beginning and there´s still space for improvement and new concepts, but for this we need standardized ways to test them. In this work, a wave tank was developed to create a more realistic environment. This device has a mechanical component that induces wave motion through oscillation at user-specified frequency and constant amplitude. To test the system, a special buoy was built (based on the design of commercially available products) using 3D printing technology, with a rolling sphere-based TENG placed inside. This allowed us to obtain the motion behavior of the buoy for different wave conditions, while measuring the short circuit current, open circuit voltage, and electrical power generated by the TENG. The TENG performance was thus studied under different frequencies of motion. Following this, the same TENG was tested in an already developed system, and its results compared.

Functionalized Carbon Xerogels as a Novel Platform for the Immobilization of L-Asparaginase

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Abstract

In the pharmaceutical sector, the enzyme L-asparaginase (ASNase, EC 3.5.1.1) is used to treat acute lymphoblastic leukemia (ALL), the most common type of cancer in children. In the food industry, this enzyme is used to reduce carcinogenic acrylamide on starchy-rich foods. Taking into consideration the ASNase important applications, it is of great interest to improve its enzymatic properties through its immobilization. Immobilization not only allows easier recovery and reuse of enzymes, but also contributes to the improvement of their stability.

In this work, the ASNase immobilization was studied by physical adsorption onto functionalized carbon xerogels (CX), a very promising material due to its high surface areas and adsorption capacities, as well as the possibility to precisely customize its porosity. Initially, the ASNase immobilization was tested onto CXs with different functionalizations. After selecting the best material, a central composite design with three factors (contact time, pH and enzyme concentration) combined with response surface methodology was applied to optimize the immobilization process in order to attain the highest relative recovered activity (RRA) of the immobilized ASNase. The results obtained revealed that ASNase concentration is the factor that most influences the predicted response.

The best results were obtained using the CX-OX-600, 81 min of contact time, pH 6.2 and 0.36 mg/mL of ASNase, reaching RRA values of 103% and an immobilization yield (IY) of 100%. Finally, under optimal conditions, the immobilized ASNase showed an exceptional operational stability, retaining 97% of its initial activity after 6 reaction cycles. Nevertheless, temperatures of 60ºC led to denaturation of immobilized enzyme. The kinetic parameters indicated a 1.25-fold increase in the immobilized ASNase affinity for the substrate.

All these results confirm the CXs potential as a support material for the ASNase immobilization by physical adsorption.

Would social housing of zebrafish (*Danio rerio*) interfere with the physiological stress response?

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Abstract

Zebrafish are often individually housed in the animal facility to do several procedures such as fin clipping for genotyping, recovery from procedures, and behavioural analysis. Several studies have been done regarding how social isolation can impact development, animal welfare and the quality of the scientific data, but using long periods of isolation. Thus, we aimed to study how individual housing affects animals´ cortisol levels and response to acute stress using a shorter period of isolation, similar to what happens in the animal facilities. In this protocol we used 40 adult mixed-sex AB zebrafish; 20 were exposed to 15 days of social isolation (I), while the others stayed in standard social housing (C); all zebrafish were in a recirculating water system in standard conditions. In the end of the isolation period, 10 isolated (IS) and 10 non-isolated animals (CS) were subject to acute stress and the others were euthanised (INS, n= 10; CNS, n= 10). To induce acute stress, we net chased the animal for 5 minutes, followed by 30 seconds of air exposure that was previously validated. All animals were euthanised by rapid cooling with further decapitation for whole-body analysis of cortisol levels, measured using the Salimetrics ® Cortisol Enzyme Immunoassay Kit.As the cortisol levels were not different between sexes within each group, this factor was not considered in the main analysis. Our results showed that control animals and isolated animals that were not exposed to acute stress had significantly lower values of cortisol than the ones that went through the stress protocol (CNS vs CS and IS: $p<0.001$; INS vs IS: $p= 0.02$; INS vs CS: $p= 0.006$). No significant differences were detected between any other groups. Overall, 15 days of social isolation does not affect cortisol levels when compared to the values from animals housed with their conspecifics, nor induce a different response to acute stress. Further analysis will be carried regarding behavioural alterations.

Optimization of Scale-Up Conditions for IVD Decellularization and Hydrogel Formation

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Abstract

Low Back Pain (LBP) is a common health problem, mainly caused by intervertebral disc (IVD) degeneration (Wang et al., 2021), that affects over 70% of the people worldwide (Buchbinder et al., 2018). Since current strategies (e.g., spinal fusion) do not provide long-term solutions, there is a need to develop others to prevent or reverse disc degeneration. The production of hydrogels derived from decellularized nucleus pulposus (dNPs) is a promising one, as it can be injected locally in a minimally invasive manner, and mimics the native composition, microarchitecture and biomechanics of the IVD (Wachs et al., 2017).

The aim of this work was the optimization of a scale-up decellularization system and hydrogel development. For that, three systems were engineered: an agitation system (AS), a vacuum-assisted perfusion (VAP) bioreactor and a vacuum and agitation setup (VAS). Decellularization efficiency was assessed by DNA quantification, DAPI staining and histology. As for the hydrogel development, several conditions were tested, including the extracellular matrix (ECM) concentration, digestion temperature, and ionic strength.

In line with H&E and DAPI staining, results demonstrated a high percentage of DNA removal in all setups (>94%). Still, decellularization was more effective when using the AS or VAS. Regarding biochemical content, histological and quantification analysis showed that sulfated GAGs were partially lost (over 50% in all systems). GAG retention was slightly higher when using the VAS. Regarding hydrogel development, the condition with short gelation time (~20 min) and highest turbidity was that formulation obtained with 40mg/mL of ECM, PBS 10x, and digested with 4 mg/mL of pepsin at room temperature (RT) for 72h.

In conclusion, VAS was the experimental setup that produced the best results. As for hydrogel development, preliminary tests showed that the best conditions were the following: 40mg/mL of ECM, PBS 10x, digested with 4 mg/mL of pepsin at RT for 72h.

Dynamic sensory characterisation of a functional vanilla ice cream using temporal check-all-that-apply with emotions (TCATA-E)

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Abstract

Sensory perception of a food product is considered a dynamic process, changing across consumption experience. Also, food-evoked emotions constitute relevant information for predicting food choice and can aid industry players in improving marketing and sales. Consumers´ tendency towards healthier but sensory pleasing food alternatives is accompanied with the development of several innovative sensory analysis techniques, such as temporal Check-All-That-Apply (TCATA). This methodology allows for a multi-attribute simultaneous analysis during a given time, using sensory or emotional parameters.

This work aimed to evaluate the dynamic emotional and sensory profiles of vanilla ice creams with incorporated phytosterols (FIC) and with no added bioactive compounds (CIC). A TCATA with emotions (TCATA-E) ballot was used, in which 101 consumers were asked to select all the applicable attributes during 30 seconds. Attribute fading was set to 8 seconds. At the end, consumers were asked to rate their overall liking. A TCATA ballot using sensory attributes was also performed using a trained panel of 10 tasters.

Results showed that FIC was significantly more liked than CIC. Globally, FIC evoked significantly more pleased, satisfied, and happy emotions over time when compared to CIC. Specifically, between the 10-15 seconds period, FIC had significantly higher citations for pleased than CIC, while the opposite was perceived over the 20-25 seconds period for interested. In the former period, FIC presented higher citations for enthusiastic. FIC presented a very positive sensory trajectory, concentrating on attributes such as pleased. Although, near the end of the trial, the trajectory led to unsatisfied, depicting a possible unpleasant aftertaste.

The incorporation of phytosterols in the vanilla ice cream resulted in an emotionally well-connected product, giving space to introduce more functional foods in the market.

Synthesis and Pharmacological Evaluation of Melanostatin Peptidomimetics Using β-Amino Acids as Proline Surrogates with Application in Parkinson's Disease

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Abstract

Parkinson's Disease (PD) is the second most common neurodegenerative disease of the central nervous system affecting a staggering 20 million people worldwide and causing thousands of deaths every year.

The main symptoms of PD include motor disabilities such as tremors, bradykinesia, and gait alterations, but it can also have non-motor implications such as sleeping disorders, fainting, and dementia, with symptoms worsening as the neurodegeneration progresses.

Currently, common treatments of PD are mainly focused on the potentiation of dopamine (DA) levels through the administration of levodopa (L-DOPA) and inhibitors of the catechol-O-methyl transferase and monoamine oxidase B enzymes.

Although the L-DOPA regimen successfully attenuates and delays the progression of PD symptomatology, long-term treatment with L-DOPA is often associated with serious drawbacks such as motor fluctuations and dyskinesias. In this sense, pharmacological alternatives to reduce the reliance on L-DOPA are of utmost importance.

Melanostatin (MIF-1, Fig. 1) is a hypothalamic neuropeptide derived from the oxytocin hormone that acts as a positive allosteric modulator (PAM) of the dopaminergic D2 receptors (D2R), displaying intrinsic anti-Parkinson activity.

In this sense, this neuropeptide is being explored as an alternative pharmacological alternative in PD to target and modulate the D2R response by increasing its affinity towards DA rather than classical approaches focused on the potentiation of DA levels.

In this work, six MIF-1 peptidomimetics were synthesized bearing two different chiral β-amino acids as proline (Pro) surrogates. Functional pharmacological evaluations at D2R (expressed in CHO cells) through mobilization of cyclic adenosine monophosphate in the presence of DA showed that two analogues exhibit higher PAM potency in comparison with MIF-1 neuropeptide.

Chemical structures of MIF-1 and MIF-1 analogues bearing chiral β-amino acids as Pro surrogates.

Monitorization of the implementation of Educational and Psychological support service (SPE) in a sports club

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Abstract

Educational processes take place in all learning contexts - formal, informal, and non-formal (Canário, 2006). Assuming the sports context as a non-formal education context, it represents a space of learning values, principles, and rules, a space where teamwork, social skills, and critical thinking about society/world are developed (Malho, 2018). This communication presents the monitoring process of the organization and implementation of an educational and psychological support service, "Service of Psychology and Education" (SPE), in a sports club located in Porto. The SPE aims to promote the club´s social and educational responsibility and to support the whole community of the sports club, such as athletes, coaches, family, coordinators, on a psychological and educational level. In an initial phase, it was essential to understand with the community (Menezes, 2010) its needs and interests for change and/or creation of new social and educational responses, so two discussion forums were held to understand the relevance of creating an educational support service. Subsequently, the SPE was created and the organization of the educational spaces and counseling at the individual and collective level of the athletes and other sports agents was started, besides the interaction with the whole community through social networks and lectures. To monitor the implementation process of this service, over the months, fourteen semi-structured interviews were carried out to find out the perspectives of the agents of the different sports modalities. The results showed that the SPE is meeting the club's needs and expectations: the requests for monitoring (individual and collective) made by coaches or managers have been increasing; the "SPE Tips" (social networks) and lectures have generated a growing interaction with the sports community; the interviewed sports agents unanimously recognise the importance of the SPE, listing its advantages and added value for the whole sports community.

Performance of the CAEN digitizer DT5730SB in the context of Perturbed Angular Correlation Spectroscopy measurements

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Abstract

Perturbed angular correlation (PAC) is a method of nuclear solid-state physics with which magnetic fields and electric field gradients, the so-called hyperfine fields, at lattice specific sites in crystal structures, can be measured with very high precision. This unique method can be used to study physical phenomena, such as structural, magnetic, charge and orbital phase transitions, at an atomic scale perspective. In order to upgrade several present PAC systems, converting them from analogic to digital, we have carried out a series of tests with a DT5730SB 8-channel digitizer from CAEN S.p.A, characterized with 8 input channels, a sampling rate of 500 MS/s and 14-bit ADC. Initially we used a 22Na calibration source to study the temporal resolution in the detection of pairs of simultaneously emitted γ-photons, with an energy of 511 keV, in experiments related to positron-electron annihilation processes. For optimum conditions, a time resolution of ≈ 362 ps was obtained. Furthermore, connected to a set of LaBr3 scintillator based detectors, we studied the temporal resolution of this module in which we obtained resolutions of 1.207(3) ns for a cascade of 356 vs 81 keV in the decay of 133Ba, compared to 1.342(4) ns obtained on a 1 GS/s, 8-bit digital machine “DigiPAC” assembled with a much more expensive technology.

Relationships of saturated fat intake with sociodemographic and lifestyles characteristic

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Abstract

Background: Saturated fat (SF) intake is related to cardiovascular diseases and total mortality among all population groups, making it critical to understand which factors may influence it.
Objective: To study the association between SF intake (% of total energy intake (TEI) and compliance with the recommendations) with sociodemographic data and lifestyles.
Methodology: A sample of 141 Portuguese was assessed by questionnaire: socio-demographic features (sex, age, education level); lifestyles (including physical activity); adherence to the Mediterranean Dietary Pattern (MAP); and food consumption (24-hour recall). Dietary data was used to calculate SF intake using Nutrium Software.
Results: The %SF was not related with sex, education level, adherence to the MAP or physical activity practice. Older participants consumed less SF ($r = -0.195$; $p = 0.015$). There are more women within the recommendations for SF intake than men (65.6% vs. 54.8%, $p = 0.184$). There is also a greater compliance with the recommendations among people with higher adherence to the MAP.
Discussion: Women consume higher %SF, as previously reported in the 2015-2016 National Food and Physical Activity Survey. Concerning age, 53% of the Portuguese population exceeds 10% of saturated fat in TEI. Regarding the consumption of SF and adherence to MAP, Castro-Quezada et al. (2014), concluded that higher adherence to the Mediterranean diet was associated with lower %SF intake, as found in the present study, despite the association having no statistical significance, probably due to our small sample size.
Conclusion: Nutritional education must include strategies that promote a reduction in the consumption of foods rich in SF, although the results of the present study only found a (weak) association between its intake and age, with older people presenting lower intake.

Rechargeable sodium seawater battery with optimized cathode

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Abstract

Humanity is reaching a tipping point where new sustainable energy solutions are needed to combat climate change. And oceans, covering more than 70% of Earth surface, can become the key asset in this fight. Oceans provide an inexhaustible source of Na ions which could be used as active materials in energy storage devices. These aspects are particularly important in the case of Portugal, that has one of the largest EEZ of Europe. Rechargeable sodium seawater battery, assume the world leadership of high voltage batteries in marine environment. This battery uses multiple electrolytes, i.e. seawater as the catholyte, a solid electrolyte that separates the two electrode compartments (usual NASICON) and a non-aqueous ion liquid as anolyte. The anode compartment, where Na cations are stored upon charging, is sealed, while the cathode compartment is open to the environment. With natural seawater as the active material, the SWB can be supplied infinitely with Na cations.

The first step to study the SWB was to consider a commercial carbon felt (CF) as a cathode. The CF was connected to the anode compartment in the seawater container that allowed us to control the flow of seawater. With this setup, we analyzed the charge and discharge voltage profiles for currents ranging from 0.1 to 0.01 mA. Two different states were considered, one with continuous flow of seawater and another in steady seawater. The continuous supply of Na+ ions and dissolved O2 to the cathode resulted in an improvement of the final voltage gap between the two profiles. After studying and characterizing the battery using a commercial CF cathode, we modified the properties of the CF by subjecting it to a heat treatment to reduce its hydrophobic nature. A considerable improve of the cell performance was achieved by this process.

Optical Tweezers development as a tool for biomedical diagnosis

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Abstract

Single-beam optical gradient force trap, also known as optical tweezers, are widely known by the scientific community and find applications in subjects from biology to medicine [1-2]. Earning Arthur Ashkin the Nobel Prize in Physics in 2018, it has proven itself as a reliable and versatile tool for analyzing and differentiating particles in a medium with relatively inexpensive equipment. However, to achieve a high throughput necessary for most of technological applications, fully automated and integrated instruments are required.

In this work we present a full stack approach to the automation of an optical tweezer system towards the implementation of a real-time tool for biomedical diagnosis. Employing an ab-initio approach to the control of the system components and machine learning algorithms, we deployed a software solution that is capable to perform real-time analysis and classification of trapped particles, with possible applications in biomedical diagnosis and screening.

References

[1] Choudhary D, Mossa A, Jadhav M, Cecconi C. Bio-Molecular Applications of Recent Developments in Optical Tweezers. Biomolecules. 2019; 9(1):23.https://doi.org/10.3390/biom9010023

[2] Coirault C, Pourny JC, Lambert F, Lecarpentier Y. [Optical tweezers in biology and medicine]. Med Sci (Paris). 2003 Mar;19(3) 364-367.doi:10.1051/medsci/2003193364. PMID: 12836420.

Carbon xerogels for the purification of anti-leukemic drugs

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Abstract

Nowadays, L-asparaginase (ASNase, EC 3.5.1.1) is an enzyme used for leukemia treatment, in the pharmaceutical industry, and for starchy foods pre-treatment, in the food industry. These applications require an enzyme purification process with a vast number of processing steps, resulting in high operating costs. In addition, many cases of adverse reactions in patients have been reported due to ASNase instability and thermolability.

In order to increase the stability of this enzyme and reduce its purification costs, non-functionalized and functionalized carbon xerogels (CXs) were studied as a purification platform of ASNase from a cell extract of Bacilllus subtilis. These materials were selected due to its unique properties, such as tunable porosity, high surface area and adsorption capacity.

In this work, different operating conditions were studied during cell extract adsorption onto CXs, such as: cell extract concentration (1-15 mg mL^{-1}), material's type and mass (12, 18 and 24 mg), and net adsorption volume (1.5, 2 and 15 mL tubes). SDS-PAGE analysis was carried out to complement the results.

The results showed that high extract concentrations (7.5, 10, 12.5 and 15 mg mL^{-1}) hamper the separation between ASNase and the remaining proteins. However, adsorption of 3 mg mL^{-1} of extract onto functionalized CXs seems to be unfavorable, since it decreased the purity of the enzyme in most cases. On the other hand, adsorption of 3 mg mL^{-1} extract onto non-functionalized CXs in 15 mL tubes allowed a 1.63-fold increase in the ASNase specific activity in the supernatant, when compared to the initial extract. SDS-PAGE analysis confirmed that these conditions seem to be the ideal relationship between cell extract concentration/material's type and mass/net adsorption volume.

In summary, the results obtained in this work revealed that the use of non-functionalized CXs is a promising alternative to traditional ASNase purification processes.

Thiophene-Based Melanostatin (MIF-1) Neuropeptide Analogues by O-to-S Bioisosteric Replacement in MIF-1 Furoyl Peptidomimetics

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Abstract

Parkinson's disease (PD) is the second most common neurodegenerative disorder of the central nervous system as consequence of the loss of dopaminergic neurons. The main symptoms of PD are tremors, rigidity, akinesia, postural instability, bradykinesia, sleeping disorders, and dementia. There is no cure for PD, however, the available treatments are used to delay the progression of the disease. Currently, the first-line treatment for PD is the administration of L-DOPA, a precursor of dopamine (DA), with co-administration of inhibitors of the catechol-O-methyl transferase and monoamine oxidase B enzymes. However, long-term treatment with L-DOPA causes serious health problems, thus pharmacological alternatives are mandatory.

Melanostatin (MIF-1, Fig. 1), formally L-prolyl-L-leucylglycinamide, is an endogenous hypothalamic neuropeptide that acts as a positive allosteric modulator (PAM) of the DA D2 receptors (D2R). Due to its PAM activity and D2R selectivity, MIF-1 is considered a valid candidate for the development of new anti-Parkinson pharmaceuticals.

Previous studies developed by our research group using 2- and 3-furoic acids as Pro surrogates, lead to three new peptidomimetics with PAM activity comparable to that of MIF-1 (Fig 1).

In this work, 2- and 3-thiopenecarboxylic acids were used to explore the convenience of O-to-S replacement in the MIF-1 analogues and to determine the impact on the pharmacological outcome.

Four new MIF-1 analogues were synthesized (Fig. 1) and tested for their ability to modulate the activity of D2Rs using functional assays with the determination of cAMP mobilization. Functional assays demonstrated that these peptidomimetics enhanced the DA potency more than 2-fold at nanomolar concentration, showing a behaviour compatible with PAM at that concentration.

This work is expected to obtain useful structure-activity relationship information for the rational design of potent PAM of D2R, paving the way for the development of new anti-Parkinson

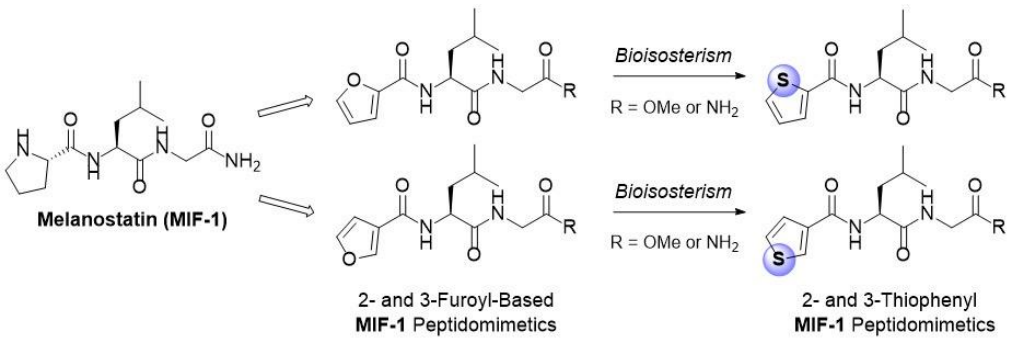

Figure 1. Structures of MIF-1 and its 2- and 3-furoyl derivatives and the corresponding 2- and 3-thiophenyl analogues described in this work.

Is the back squat a fundamental movement for increased sports performance? – A biomechanical approach

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Abstract

Back squat (BS) is a fundamental exercise in the production and characterization of strength and is often heavily considered in the design of strength and conditioning and rehabilitation exercise programs. This research was developed with the following aims: (i) to analyse the behaviour of the hip and knee joints during the BS with 85% of one-repetition maximum (1RM); (ii) to understand how the vertical component of the ground reaction force and its impulse act in the different phases of BS; (iii) study the technical performance of BS through surface electromyography (sEMG). This project was a case study with an athletic male subject. The kinematic and dynamometric evaluation of the BS was performed using a 3D motion capture system and force plates. The relationship between sEMG and BS was analysed through bibliographic search for articles that associate sEMG and the BS. The treatment and data analysis were performed using Excel. Results: (i) the systematic biomechanical evaluation of the BS seems to be relevant to trace the individual profile and associate it with possible injuries and/or strategies to increase performance; (ii) the gluteus maximus and biceps seem to be the most important muscles in the strength gains associated with the BS force production, and the manipulation of the load has more influence on the production of force than the distance of the supports/lower limbs, or even the angle at which the squat is performed (greater gains with loads between 80 to 90% of 1RM). Conclusion: The BS is a complex exercise that involves fundamental movement patterns for strength, power and speed gains, and should be considered in training plans to increase performance in different sports.

Keywords: Back squat; biomechanics; kinematics; dynamometry; surface electromyography.

The absence of a coordinated drought risk management between Portugal and Spain: social and political effects on the Iberian climate future

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Abstract

A common, coordinated response to drought-related impacts in the Iberian Peninsula, specifically in the Guadiana River Basin region that stretches between Portugal and Spain, is considered a challenge by the UN. Overall, there´s little coordination at the national and regional levels among both countries regarding drought management. The UNDRR's "Special Report on Drought 2021" reveals that the drought in the Portuguese Guadiana region has led to urban water supply restrictions, degradation of water quality and quantity, and an increase in the number of wildfires. This documentary analysis of public reports, academic papers and mass media at regional, national and global levels looks at the anti-desertification and water management policies in the Iberian region. We intend to discuss whether regional, coordinated actions are possible, based on the case study of the Guadiana Basin. We'll also discuss whether the lack of a coordinated framework for drought risk management between Portugal and Spain could impact the Iberian climate future and raise geopolitical tensions, harming future drought management policies in southern Europe. Political and regional integration has proved challenging over the years, which may threaten climate adaptation, especially in regions where many rely on subsistence farming, such as Portugal. Although there have been agreements and improvements in regional drought risk management, the different mechanisms implemented by each country can lead to tensions, migrations and confrontations in a region so vulnerable to desertification. We conclude this paper pointing out possible ways to mitigate these issues, such as: understanding socio-regional cohesion as a priority against climate change in the Iberian Peninsula; integrating management policies that incorporate regionally binding policies and plans for climate adaptation; and politically engaging citizens to put pressure on governments to comply with regional cooperation agreements.

Exploring biomaterials as new energy sources to develop self-powered electronic medical devices

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Abstract

Cardiovascular diseases are the prominent cause of death worldwide. Despite the remarkable benefits of cardiac electronic devices (CEDs), the use of batteries to power supply them is a major drawback, with their depletion being responsible for 85% of CEDs replacements. In addition, batteries are heavy, oversized, and its content leakage is toxic [1]. Thus, there is a need for self-powered CEDs. Triboelectric nanogenerators (TENGs) can harvest electric energy by the relative movement between two materials with opposite tribopolarities [2]. However, most TENGs are not biocompatible and/or electric outputs are inefficient to supply CEDs.

This work proposes a TENG based in an FDA approved biomaterial to harvest energy from body motion to supply CEDs. A setting comprising the TENG was developed testing different electrode materials. TENG stability was evaluated by immersing the device in PBS and vortexing. Surface was visualized by SEM [3] and leachables were analyzed by spectrophotometry. The best coupled electrode was selected and electrical outputs measured varying resistance and capacitance. For a resistance of 470 MΩ, it was obtained an electrical output of 5.7 V/cm², 0.09 µA/cm² and 0.5 µW/cm². This TENG was able to charge a capacitator of 100 pF, achieving a maximum of 7.9 V/cm², 0.3 µA/cm² and 2.16 µW/cm². Moreover, this electric energy allowed to light up a LED.

These findings show the potential of using a TENG based in a FDA approved biomaterial to power supply electronic medical devices by harvesting energy from body motion. This will be a breakthrough in the biomedical field towards self-powered, smaller and lighter CEDs.

References

[1] Q. Zheng et al. (2021) Nat Rev Cardiol. 18:1. 7-21.
[2] S. Wang et al. (2015) Nano Energy. 11, 436-462.
[3] A. T. Pereira et al. (2021) Biomaterials Science. 9:9, 3362-3377

In-service teacher training in Angola: how the system works and aspects of teachers' personal, professional and social lives

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Abstract

The study presented here is the result of a Master's research project developed around the in-service training system for teachers in the province of Kwanza-Sul, Angola, reflecting on the functional structure of the in-service training system for teachers and the types and modalities of in-service training, considering the perspective of education sector leaders, teachers, and union members. It also reflects on aspects of teachers' personal, professional and social lives, highlighting their experiences and how they view their profession and the processes of in-service teacher education. The objective of the study, besides questioning the functioning of the in-service training system for teachers in Angola, was to understand and analyse the conditions under which in-service training takes place in Kwanza-Sul, and the influence of various aspects of teachers' lives on their relationship with in-service training, questioning the place of their experiences in the development of in-service training policies, programs, and plans. The study developed is qualitative, using document analysis, online semi-structured interviews with teachers and other educational actors, and content analysis. The results indicate that the in-service training system, at the provincial level, operates with weaknesses related to the implementation of training plans, with no monitoring throughout the process and even less evaluation at the end of the training actions. The training provided to teachers, organized in a cascade logic, is not based on the real situations experienced in each context, does not consider or value the concrete lives and experiences of teachers, making the training actions de-contextualized and non-significant.

Keywords: Teacher Education; Continuous Teacher Education; Models of Training; Professional Development of Teachers.

Symptoms of anxiety and depression in patients with persistent asthma: data from the INSPIRERS studies

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Abstract

Background: Psychological disorders are relevant comorbidities in asthma, but in Portugal data is scarce. We aimed to assess the frequency of symptoms of anxiety and depression among patients with asthma. Furthermore, we aimed to assess the level of agreement between the Hospital Anxiety and Depression Scale (HADS), a specific patient-reported outcome measure (PROM), and the European Quality of Life Five Dimension Questionnaire (EQ-5D), a more general PROM, in screening these symptoms.

Methods: This is a secondary analysis of baseline data from the multicenter prospective INSPIRES studies with adolescents (>=13 years old) and adults with persistent asthma. Demographic and clinical characteristics were collected. Patients completed the HADS and the EQ-5D. A score >=8 on HADS-A/HADS-D was considered as the presence of these symptoms. The positive answers (moderate or severe) to EQ-5D item 5 "Anxiety and Depression" were used to assess the presence of these symptoms.

Results: A total of 614 patients with asthma from 17 primary care centres and 32 immunology, pneumology and pediatric services were enrolled. Participants had a mean age of 33±17 years, 73% were adults and 65% were female. According to HADS, 36% of the participants had symptoms of anxiety, 12% of depression and 38% of anxiety or depression. According to EQ-5D, 36% participants had anxiety or depression problems. The agreement between these two questionnaires was moderated for anxiety (k=0.54, 95%CI 0.47-0.61); sufficient for depression (k=0.23, 95%CI 0.17-0.30) and moderated for both symptoms (k=0.55, 95% CI 0.48-0.62).

Conclusions: At least 1/3 of the patients with persistent asthma experience symptoms of anxiety/depression. The obtained results show the relevance of emotional impact screening of anxiety and depression in patients with asthma.

Tunning the transport properties of Bi2Te3/PVA/PEDOT:PSS

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Abstract

Flexible thermoelectric (TE) technologies present a promising future in our energy-dependent planet due to their ability to function as remote energy generators by producing electrical power when a temperature gradient is applied. TE generators are scalable and easily manufactured employing printing techniques such as screen-printing, which was engaged herein [1].
In the present work, ternary inks composed of PEDOT:PSS (poly(3,4-ethylenedioxythiophene) polystyrene sulfonate), PVA (Poly(vinyl alcohol)), and Bismuth telluride (Bi2Te3) are being conceived and optimized in order to increase the efficiency and power output of the produced devices. The inks formulation studied weight percentages vary from 60 to 85 wt% for Bi2Te3 and 5 to 30 wt% for the polymers PVA and PEDOT:PSS. The film's characterization was performed concerning their morphology, structural, and transport properties (through its Seebeck coefficient (S) and electrical (σ) and thermal (k) conductivity). The TE performance is characterized by the figure-of-merit ZT=S^2×σ/k and power factor PF=S^2×σ [2]. Preliminary results from the developed inks show a S of ≈ 136 µV/K and σ of 146 S/m, for highest wt% of PVA when compared with the wt% of PEDOT:PSS. In addition, the design and manufacturing of radial flexible TE devices is a goal to be achieved in the present work. A homemade setup was developed that allows low pressure and low-temperature environments under laser incidence. The complete characterization of the printed films and devices will be presented and thoroughly discussed.

Keywords: Thermoelectric materials, PVA, PEDOT:PSS, Printed films, Flexible devices.

Acknowledgments

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References

[1] Pires, A., et al., 2019. ACS Applied Materials & Interfaces, 11(9), pp.8969-8981.
[2] Yang, J., et al., 2021. Composites Communications, 27, p.100855.

Electrophysiological brain responses to familiar and unfamiliar faces

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Abstract

From the time we are born faces might surely be the most pertinent social stimuli, with a role in identifying emotions and identity, vital processes that monitor our daily interactions. Previous research suggests that face recognition is enhanced by their degree of familiarity. Thus, the present study aims to explore how familiarity improves face processing. We hypothesize that the neural response and accuracy rates will be higher with the increase of familiarity of each face. This can be explained by the greater robustness of the neural representations for these stimuli that can induce extra neural processes to the ones already prompted by facial identification (e.g., affective processes and autobiographical information related to the individual recognized). Through two experimental tasks, we analyzed accuracy rates and the morphology of event-related brain potentials associated with face processing (P100, N170, and N250), elicited by inverted and emotional faces with different degrees of familiarity. In the first task, to study facial processing, three different categories of facial stimuli were presented during a target detection task: famous familiar faces; personally, familiar faces; and unfamiliar faces. To explore the face inversion effect accordingly to each degree of familiarity, these facial stimuli were also presented upside down. In the second task, to study emotional face processing, an emotional recognition task on personally familiar and unfamiliar faces was conducted. The preliminary electrophysiological results showed higher ERP amplitudes when faces are presented upside down, independently of their degree of familiarity. This result is in line with previous research suggesting that inverted faces are more difficult to process, leading to higher recruitment of neural resources.

Evaluation of the relation between Allostatic Load and Periodontal Disease: an original method with findings from the NHANES 2011

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Abstract

Purpose: Allostatic load (AL) is a latent variable based on the multi-systemic physiological dysregulation. Periodontal Disease (PD) has been associated with many systemic diseases, the reason that sustains this investigation, which aims to evaluate the relation between AL and PD.
Methods and Results: Data from the National Health and Nutrition Examination Survey (NHANES) 2011 were used. AL was measured using eleven surrogate biomarkers representing cardiovascular, inflammatory, and metabolic system functioning. A total of 1414 US adults aged 35 years and older were allocated to two fuzzy clusters, using an unsupervised machine learning classification method - the fuzzy k-means clustering algorithm. The cluster 1 presented more advantageous values for the allostatic load surrogate biomarkers. In both clusters, the membership degrees (MD) varied from 0.5 and 1.0, with an average of 0.7. The PD parameters´ were compared between both clusters using GAMLSS models, yielding statistically significant differences ($p<0.05$) for pocket probing depth (PPD) mean and maximo and clinical adherence loss (CAL) rate. The correlation coefficients between PD parameters and cluster 1 MD´s ranged from -0.06 and -0.11, being statistically significant. The association of PPDmean with cluster 1 MD´s remained statistically significant after adjustment for age and gender.
Conclusion: The latent nature of AL poses major difficulties when classification of individuals is needed. We propose to tackle this issue using fuzzy clustering methods in combinations with GAMLSS models. This approach allows us to find an association between AL and PD by measuring AL through the mahalanobis distance between the observation and the cluster prototype.

Antimicrobial properties of Lamiaceae and Apiaceae essential oils against *Pseudomonas syringae pv. actinidiae*

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Abstract

The kiwifruit (*Actinidia spp.*) agroindustry has grown significantly in the last decades and became one of the most important crops in Portugal. However, kiwifruit orchards are being threatened by several diseases and pests resulting in significant economic losses. The kiwifruit bacterial canker (KBC), whose etiological agent is *Pseudomonas syringae pv. actinidiae* (Psa), is the most severe disease of this crop. Despite its impact, no viable treatments for this pandemic disease have yet been developed, and European Union directives have restricted the use of conventional agrochemicals like copper-based compounds, prompting the development of new and sustainable products. Essential oils (EOs) extracted from Apiaceae and Lamiaceae plants have been extensively studied for their antibacterial activity, namely against phytopathogenic bacteria. This work aims to unveil the potential of three EOs as antimicrobial agents against Psa.

Mentha pulegium, Satureja montana, and *Trachyspermum ammi* EOs were evaluated against the reference strain Psa biovar 3 (CFBP7286). In vitro susceptibility was assessed through the broth microdilution method to determine minimal inhibitory and bactericidal concentrations (MIC and MBC) after 5 and 24h. When comparing EOs´activities on Psa, the *T. ammi* EO at 10 mg/mL revealed higher inhibitory and bactericidal efficiency (85% efficiency after 5h). The causes behind the more variable effects of *M. pulegium* and *S. montana* are under study.

These results show the antimicrobial activity of these EOs, in particular *T. ammi* EO, against Psa. Ongoing work is evaluating the elicitation activity of these EOs on kiwifruit (cv. Hayward). The EOs´ bioactivity to kiwifruit protection as a prophylactic and therapeutic measure to KBC will be evaluated and further biocontrol EOs-based products could be developed.

Acknowledgments

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Crosstalk of macrophages with colorectal cancer cells, an in-silico approach

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Abstract

In eukaryotic systems, 3´end mRNA-processing involves the pre-mRNA cleavage and addition of a polyadenosine tail. The use of different polyadenylation signals results in mRNA transcripts with different 3´ends. This co-transcriptional mechanism, known as alternative polyadenylation (APA), provides great variability of mRNA isoforms stemming from a single gene. Genome-wide transcriptomic studies have shown that short 3´UTRs, generated by selection of proximal polyA signals in the 3´UTR (3´UTR-APA), correlate with proliferative and cancer cells. However, the crosstalk between immune-cancer cells is still being deciphered.

In this work, we focus on bioinformatics analysis of 3´mRNA-seq data, to comprehend how colorectal cancer (CRC) cells affect the 3´UTR-APA profile of primary human macrophages. We performed a sequence alignment data analysis obtained from 3´mRNA-seq data. We analysed data from 3 healthy donors using unpolarised macrophages (M0), polarized macrophages (M1), and primary human macrophages co-cultured with two CRC cell lines (HCT15 and RKO). To analyse 3´UTR-APA and APA events that occur in introns (intronic APA, IPA) in macrophages co-cultured with CRC cells, we employed the APAlyzer algorithm that uses the PolyA_DB database (DB), a poly(A) signal collection of APA events occurring in coding regions, in untranslated regions, and introns. Our results show that macrophages co-cultured with CRC, present more IPA events than those without co-culture. We also observed an increase in the number of genes with short 3´UTRs in pro-inflammatory macrophages (M1) in comparison to M0 and an increase in the number of genes with longer mRNA isoforms in macrophages that have been in co-culture with CRC. This is, to our knowledge, the first time a computational study of the relationship between APA modulation in macrophages in the presence of cancer has been performed. The findings will contribute to the identification of novel biomarkers for CRC diagnosis.

Is Proline accumulation under GLY toxicity a tolerance mechanism or a stress signal?

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Glyphosate (GLY) is the most widely used herbicide, and its cumulative use has been resulting in the contamination of agricultural soils, potentially harming non-target organisms, such as crops. Although GLY´s herbicidal action is not directly related to oxidative burst, recent evidence suggests that a disbalance in the redox homeostasis is often an indirect consequence of GLY. Upon exposure to GLY, an overaccumulation of proline (Pro) takes place, though this is not accompanied by a tolerance response. Moreover, when distinct biostimulants are used to reduce GLY toxicity, Pro levels drop dramatically. In this way, the primary question driving this research was whether Pro overaccumulation in response to GLY is a tolerance mechanism or a stress signal. To answer this, *Arabidopsis thaliana* T-DNA insertional mutant lines for genes encoding enzymes involved in the Pro metabolic pathway (P5CS1 and ProDH) were used to compare GLY-induced effects on plants with contrasting Pro accumulation patterns. Firstly, Pro content was determined in wildtype (wt) *Arabidopsis* growing on MS medium with increasing GLY concentrations (0.5, 1, and 2 mg/L) to prove that GLY does, indeed, lead to a Pro increase. Then, homozygous mutant lines were selected - p5cs1-1, p5cs1-4, and prodh - and the plant responses, in terms of growth and Pro accumulation, were compared between wt and mutant seedlings, after 14 days of growth in MS medium supplemented, or not, with GLY (1 mg/L). Though a general growth inhibition was perceived, a significant interaction between GLY and genotype was found, revealing potential sensitivity patterns. Moreover, an exacerbated accumulation of Pro was also observed in plants grown in GLY supplemented medium, though mutants showed diminished Pro levels in these conditions. Currently, studies are being conducted to fully unravel the role of Pro against GLY-induced toxicity, namely regarding redox homeostasis, gene expression, and reproductive growth.

Exploring *Drosophila suzukii* gut microbiome as a potential new sustainable management tool

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Abstract

Associations with microorganisms are an essential part of animal biology. In insects, the microbiome has a key role in stress tolerance, environmental adaptation, nutrition, metabolism and other physiological parameters. *Drosophila suzukii*, or spotted-wing drosophila (SWD), is a quarantine pest that causes damage to soft-skinned fruits worldwide, leading to producers´ major economic losses and food waste, as infested fruits become destroyed and unmarketable. Current management practices rely mostly on the use of insecticides that, over the years, have raised concerns in the scientific community due to their effects on public health and their ecological risks to non-target insects. New SWD management strategies are urgently needed, with the characterization and manipulation of SWD microbiome potentially providing new sustainable management and control tools. Thus, this project aims to characterize SWD gut microbiome, sampled from different Portuguese berry orchards. Isolated SWD-gut bacteria were identified by Sanger sequencing of the 16S ribosomal partial gene and whole gut microbiome is being characterized resorting to metagenomic Illumina sequencing. Bacteria with symbiotic or entomopathogenic potential will be selected to assess their interactions with SWD and its effects on SWD life cycle and metabolism. The identification of SWD gut isolated microorganisms has shown naturally occurring bacteria that may be potential colonizers of SWD gut, such as Acetobacter spp., already known colonizers of other drosophilids, or Bacillus spp, among others. Further analysis is currently ongoing to identify potential essential microorganisms (to be used as control targets) or detrimental (to be used as biological control agents). As part of an ID&T project, this work will further culminate on the establishment of new personalized SWD sustainable management tools, by focusing on disrupting and/or manipulating the microbiome of the fly.

New highlights into mammalian ovarian aging

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Abstract

Ovarian aging may be related to the presence of a population of giant multinucleated cells (GMC) identified in the ovaries of aged mice. However, it is unknown whether GMC are also present in the ovaries of other mammals and how they contribute to fertility loss. The present work aims to identify GMC in the ovaries of reproductively aged laboratory and domestic animals, correlate GMC with follicle pool depletion and identify possible mechanisms involved in their formation. Ovaries from young and aged animals (mice, rats, queens and bitches) were analysed. H&E and Sudan Black B (SBB) staining techniques were performed to study morphology and to determine lipofuscin deposition (marker of cellular senescence), respectively. In mice, senescence-associated β-galactosidase (SA-β-gal) activity and galactosidase β1 (GLB1) expression were used as additional markers of senescence. Picrosirius Red staining was used to quantify fibrosis. Protein nitration determined by immunohistochemistry techniques was used as a marker of tissue stress. Statistical analyses were performed with GraphPad Prism 9.0.0. GMC were identified in the ovaries of reproductively aged animals. In mice, they were positive for markers of cell senescence (SBB, SA-β-gal and GLB1) and correlated negatively with follicle reserve. The fact that GMC were scarce in the ovaries of the aged queen (an induced ovulator) led us to address the role of ovulation in ovarian aging and the formation of GMC. Our results showed that aged nulliparous mice had significantly higher values for lipofuscin deposition and lower follicle pool than aged breeders (animals with decreased number of ovulations). Surprisingly, ovarian fibrosis did not show significant changes during aging. Aged animals had significantly higher values of protein nitration than young ones, but they did not differ between groups of the same age. Our findings point to ovulation as the promoter of the formation GMC and an important trigger of ovarian aging.

In vitro evaluation of telomere length in SH-SY5Y neuroblastoma cells exposed to heroin and tramadol

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Abstract

Opioids, a family of analgesic drugs commonly used in therapeutics, have high addiction potential with considerable drug-related mortality and morbidity. Opioid abuse has been related to chronic and acute diseases, including accelerated aging. Thus, we analyzed the effect of therapeutic (tramadol) and recreational (heroin) opioids on telomere length, an aging hallmark, in SH-SY5Y neuroblastoma cells.

Metabolic activity and plasma membrane integrity of SH-SY5Y cells exposed for 24h to heroin and tramadol, at a range of 1nM-100µM, was assessed by the MTT reduction and lactate dehydrogenase assays, respectively. SH-SY5Y cells were incubated with 1nM and 1µM of tramadol or heroin every 48h for 60 days (from cell passage 22 to 32). Absolute telomere length was quantified through qPCR, by calculating the ratio between telomere and single-copy gene (IFNB1) lengths. Vehicle (0.1% HBSS) and basal (untreated cells at passage 22) controls were also tested.

Neither heroin nor tramadol significantly reduced metabolic activity or plasma membrane integrity up to 100µM. According to our preliminary data (n=3), exposure of SH-SY5Y cells every 48h for 60 days to heroin resulted in telomere lengths of about 4.1 ±2.6 Kbp at 1nM and 1.9 ±2.8 Kbp at 1µM. Tramadol exposure resulted in telomere lengths of about 4.4 ±4.9 Kbp at 1 nM and 2.5 ±3.3 Kbp at 1µM. Comparing to vehicle controls, with telomere lengths of about 7.7 ±1.7 Kbp, we can see an overall reduction in telomere length due to opioid exposure.

In conclusion, we suggest that telomere length reduction may underlie opioid-related accelerated aging. Further research is required to reduce data variability and clarify the impact of opioids on telomere length.

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Nanostructures towards optimised triboelectric nanogenerators power output

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Abstract

The worldwide climate crisis, alongside the continuous progress of technology we are witnessing, brought the need to develop and invest in sustainable energy sources. Solar, wind and geothermal energy have been the focus regarding this issue. However, the constant development of small electronics, which require a reduced amount of power, led to the invention of a particular kind of generator: the nanogenerator.

The triboelectric nanogenerator (TENG) is a technology that has the advantage of converting low-frequency mechanical energy into electricity, allowing the powering of small devices such as self-powered sensors or wearable electronics [1]. Due to their simple assembling, stability and cost-efficiency, they are considered a promising sustainable power source.

Since its invention, several approaches have been proposed in order to enhance the TENG output performance. Considering that this technology depends on the surface charge density on the material's surface, its improvement leads to an increase of the dipole moment between electrodes. This results in a higher power output and can be achieved by increasing the effective materials dielectric constant [2].

Towards this goal, in this work we discuss two methods to increase this quantity in independent devices: the surface nano-structuration of a tribo-material, and the incorporation of dielectric magnetic nanoparticles. The surface patterns, achieved through nanoimprint lithography, resulted in a power output increase of 75%. Besides, the presence of magnetic nanoparticles and the control of their position via an external magnetic field is also studied.

References

[1] Handbook of Nanomaterials for Industrial Applications. (2018). Elsevier. https://doi.org/10.1016/C2016-0-04427-3

[2] Yu, A., Zhu, Y., Wang, W., & Zhai, J. (2019). Progress in Triboelectric Materials: Toward High Performance and Widespread Applications. Advanced Functional Materials, 29(41), 1900098. https://doi.org/10.1002/adfm.201900098

Changes in screen time from 4 to 7 years of age and dietary patterns: findings from the Generation XXI birth cohort

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Abstract

Introduction: Increased exposure to screens has been linked with unhealthy eating behaviours and obesity, but screen time changes from pre-school to school age have not been well characterized.
Aims: To analyse changes of screen time from 4 to 7 years of age and associated factors, and the relation with dietary patterns at 7 years.
Methodology: The analysis included 4 531 children evaluated at 4 and 7 years of age, as part of the population-based birth cohort Generation XXI (Porto, Portugal). Screen time (television and electronic games) was assessed for weekdays and weekend and average daily time was estimated. Three dietary patterns (DP) were previously identified at 7 years based on dietary intake evaluated through a food frequency questionnaire - Energy-dense foods, Snacking and Healthier. Associations were estimated by odds ratios and confidence intervals (95% CI), calculated by adjusted multinomial regression models.
Results: At 4 years of age, 27.9% of children were exposed to screens more than 120min/day. From 4 to 7 years, 31.5% of the children decreased their screen time, 21.8% increased, 16.5% maintained low (<=60 min) and 30.2% maintained high (either 61-120 min or >120 min). After adjustment, lower maternal education (OR=2.33; 95% CI, 1.82-2.99) and lower family income (OR=1.72; 95% CI, 1.35-2.11) were associated with higher odds of increasing screen time, while being a girl was associated with 35% decreased odds of increasing screen time. Children that increased and those that maintained high (vs. low) screen time, showed greater odds of presenting a Snacking DP at 7 years (OR=2.34; 95% CI, 1.64-3.35, and OR=2.65; 95% CI, 1.89-3.72, respectively), in comparison to those with a Healthier DP.
Conclusions: Children increasing screen exposure from pre-school to school age were more frequently from lower socioeconomic strata and presented unhealthier dietary patterns at 7 years.

Food supply in take away or delivery restaurants in confinement period

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Abstract

Introduction: There has been a considerable increase in take-away and delivery food offer in Portugal, also determining an increase on availability and diversity of meals and menus. This service has grown due to the lack of time, decreased desire and motivation to cook or the lack of practical skills to cook. The COVID-19 pandemic reduced or impaired restaurants attendance, so the take-away and delivery services became a routine for those who usually consumed their meals away from home.

Objectives: To characterize take away or delivery service food offer in restaurants in the North of Portugal, during a confinement period.

Methodology: Data collection occurred during one week in the 2nd confinement caused by the COVID-19 pandemic in restaurants with take-away/delivery service. Analyses of the food offer was performed using a qualitative tool designed, based on the evaluation checklist of menus of the School Meals Planning and Evaluation System tool.

Results: 61 dishes were evaluated. In most restaurants, the non-starchy vegetables availability was presented only in 52% of the dishes. No fruit or bread was available in any menus. Availability of meat dishes (57.4%) was higher than fish (39%). Fried foods were available in 26% of the analyzed dishes. The mention of side dishes, information about allergens, as well as nutritional information, were not present in the evaluated menus.

Conclusion: The food offer at the available meals was unbalanced. Considering the increase of take-away and delivery service in Portugal, the results highlight the need to promote healthier meals that combine local gastronomy. A strategy to achieve this goal must include training and increase awareness of involve stakeholders (consumers, food providers).

Modeling the growth of anodic WO3 self-ordered nanopores for solar water spliting

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Abstract

Much attention has been brought to nanostructured tungsten trioxide (WO3) for its potential applications as a stable photoanode for solar water splitting and as photocatalyst for hydrogen production. Many morphologies of nanostructured WO3, like nanopores, nanoplates, nanorods, among others, can be synthesized by several fabrication techniques including hydrothermal, sol-gel, electrodeposition, and anodization [1]. Electrochemical anodization of metals has shown to be a simple and low-cost method for the growth of highly self-ordered nanoporous/nanotubes (NTs) oxides with precise shape and dimensions, being widely reported for WO3 [1], titanium oxide (TiO2) NTs [2], hematite (α- Fe2O3) NTs and several other anodic metal oxides (Al, Sn, Zr). In this work, anodic nanostructured WO3 layers were obtained by the electrochemical anodization of W foil. A detailed investigation was conducted on the influence of the anodization conditions [electrolyte type, applied anodization voltage (V)] in the formation of self-ordered nanopores/NTs. The impact of different solvents in F−based aqueous electrolytes was analysed, in one-step anodization at 40 V for 1 h, at room temperature. After electrolyte optimization, the effect of V (10 to 80 V) was studied and its impact on the growth mechanism of the nanoporous WO3 layers was monitored and analysed by the anodization curves J(t). The length (L) of the nanopores was estimated from the charge curves Q(t) using the Faraday´s law. Scanning electron microscopy (SEM) was performed for the morphology characterization. A relation between pore diameter (Dp), interpore spacing (Dint), porosity (P), wall thickness (W) and V was established. Furthermore, optimized samples with a higher degree of nanopores organization were characterized in terms of their photoresponse performance to evaluate their solar to hydrogen efficiency.

References

[1] M. Zych et al., Electrochim. Acta, 411, 140061 (2022)
[2] A. Apolinário et al., J. Phys. Chem. Lett., 6, 845 (2015)

H2 Solar: Nanostructured oxide semiconductors as photoelectrochemical cells for green hydrogen production by solar water splitting

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Abstract

Hydrogen (H2) as a source of energy has been gaining popularity in recent years, yet about 96 % of the H2 currently produced is derived from fossil fuels. Photoelectrochemical (PEC) cells arise as a clean and less spending alternative for the production of green H2 through solar water splitting [1]. Hematite (α-Fe2O3) is considered a promising semiconductor for PEC cells due to its narrow optical band gap (2.2 eV), long-term stability, low cost and natural abundance, allowing it to reach 16.8 % solar-to-hydrogen efficiency in theory [2]. However, short hole diffusion length and poor conductivity limit this value in practice.

This work focuses on the development and optimization of efficient photoanodes based on hematite. Different strategies were addressed to improve the photoanodes: nanostructuring, elemental doping and surface modifications. 1D bare hematite nanowires (NWs) were obtained through hydrothermal method, followed by thermal annealing, leading to a photocurrent density (j) of 0.6 mA·cm-2 @ 1.45 VRHE and an onset potential (Voc) of 0.69 VRHE. Afterwards, an elemental doping approach for hematite NWs was performed, testing Sn and Mn (1%) dopants and ranging Mn doping concentration from 1 to 13 %, to improve j and lower the Voc. Best results were attained for Mn doping, with an increase of j to 0.9 mA·cm-2 @ 1.45 VRHE achieved for the doping amount of 7 %, while a lower Voc of 0.67 VRHE for 1 %. Surface treatments with co-catalysts as C-Co, FeOOH and FeCo were applied to further enhance the j response, obtaining an efficient photoanode.

Electrochemical Impedance Spectroscopy was used to study the donor density and flat band potential, allowing to understand the role of the doping concentration. Furthermore, UV-Vis spectroscopy allowed to determine the optical band gaps, Scanning Electron Microscopy to analyze the morphology and X-Ray Diffraction the photoanode's crystalline structure.

References

[1] DOI: 10.1038/35104607.
[2] DOI: 10.1002/cssc.201000416.

Real and Discrete AdaBoost Algorithms versus Simple Classifiers – A Review

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Abstract

Boosting methodology constitutes an important development in classification problems as it is relatively simple and can achieve significant performance improvements over traditional classifiers.

AdaBoost was introduced in 1990 by Schapire as an algorithm that sequentially generates classifier models trained with data that overvalues the contribution of misclassified observations by the previous classifier. Originally, the prediction returned by this algorithm was the weighted majority vote by the classifiers generated by the algorithm.

In this study, we replicated the simulations in the reference work of Friedman, Hastie and Tibshirani (2000) comparing the performances of Real and Discrete AdaBoost with each other and relatively to the corresponding simple classifier. Decision trees were used as the base simple classifier because boosting algorithms naturally adjust to these models, given that the conditional expected values necessary to the algorithms can be approximated by the trees´ terminal nodes´ weighted averages. Two classes were considered in the simulations. The training input consisted of 2000 random vectors in R10, generated from the multivariate Gaussian MVN10(0, I). The decision boundaries for successive classes were concentric spheres in R10, with the origin as center of the spheres. The test set was independently sampled and consisted of 10000 observations. The final error rates were the averages of 10 independent simulations. Results are depicted in Figure 1; they illustrate the significant performance improvement w.r.t. simple classifiers. Of note, the performance of the Discrete AdaBoost with depth 3 decision trees (figure 1 - right) was actually significantly better than its performance in the original article.

All statistical analyses were implemented in Python, using the sklearn package.

References

[1] Friedman, Hastie, Tibshirani (2000). Additive logistic regression: a statistical view of boosting. The Annals of Statistics, 28 (2), 337-407

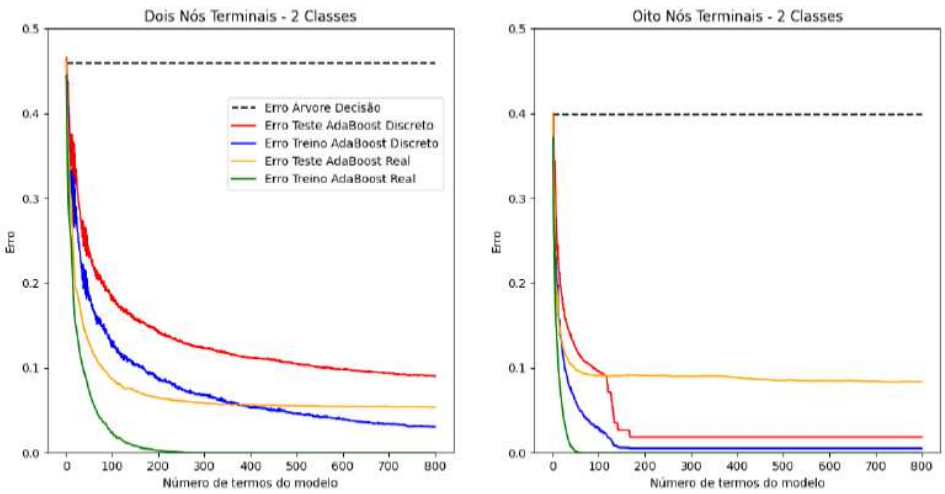

Figure 1: Error rates for 2 terminal nodes ($depth = 1$) and 8 terminal nodes with *pruning* with $\alpha = 0.004$

Starting medical school: The build of clinical communication self-efficacy

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Abstract

Context: In the beginning of medical education, students´ sense of self-efficacy about interacting with patients is based on their ideas and intuition. Research has paid little attention to students´ "lay" sense of self-confidence regarding this interaction. Yet, self-efficacy can have a direct influence on individuals´ performance and students´ self-confidence about some aspects of the doctor-patient interaction might require special attention in medical education. The goals of this cross-sectional study were to assess this sense of self-efficacy in preclinical years and how it differs after a communication skills (CS) course.

Methods: A group of 223 students at the end of their 1st year of medical school (G1) and another group of 245 students at the end of their 2nd year (G2) responded to the self-efficacy questionnaire (SE-12). G2 students had attended a CS course during their 2nd year. Analyses were based on group differences and variable associations.

Results: G1 students´ mean self-efficacy was 74.56, a value somewhat above the SE-12 scale´s midpoint. G2 students´ mean self-efficacy was significantly higher ($M=87.94$; $p<0.01$). Both groups reported greater self-efficacy regarding the emotional component vs. content/structure component of the clinical interview. Some aspects of the interaction changed positions in students´ self-efficacy rankings with the attendance of the CS course.

Conclusion: In the beginning of medical school, students display average self-confidence levels regarding their ability to interact with patients. A CS course can increase students´ sense of self-efficacy even in preclinical years and self-confidence regarding some aspects, relative to others, can change after the course.

Users' Engagement and Loyalty with Newspapers on Social Media: Review and Research Agenda

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Abstract

This article aims to further advance the research by providing a state of the art and proposing a research agenda regarding the determinants of user engagement and loyalty with newspapers on social media. The article includes a systematic literature review on the determinants of social media users´ engagement and loyalty regarding newspapers. Data eligibility and selection followed the PICOT and PRISMA protocols. A total of 206 items were identified in Web of Science database, but only 13 complied with the selection criteria and were included in the review. The main determinants of news engagement found in the literature were related to content characteristics and users´ characteristics. The type of news (e.g., soft vs. hard, deviance vs. social significance) are shown to vary in terms of the ability to generate reactions, comments, and shares. Amongst the emotions portrayed, negative ones seem the most able to generate engagement, although the literature provides rich contributions on this behalf. The literature also explores the role of demographic characteristics of the users, particularly gender, on news engagement, although other factors namely in the psychological domain (e.g., trust in the news and personality traits) are also highlighted. The contributions on the determinants of user loyalty are particularly scarce, being one of the most prominent gaps in the literature. Based on the gaps found, several future research suggestions are provided.

“10 minutes to think and communicate!” - Starting classes by developing students’ problem solving skills in mathematics

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Abstract

Problem solving in mathematics is an indispensable skill for students´ development. As such, we designed a pedagogical intervention, with a class of 9th graders, dedicated to fostering students´ ability to solve mathematical problems and to communicate their reasoning. Each lesson starts with a specific moment: "10 minutes to think and communicate".

The study herein presented unfolds around this moment and it has two major goals: 1) to understand the difficulties that students reveal when solving problems and expressing their reasoning; and 2) to understand how the teacher´s oral and written feedback may help students in improving in their ability to solve problems and express their thinking.

The teacher´s role is quite challenging. He needs to choose problems that motivate students to find efficient strategies and that stimulate them to explain their reasoning clearly. The teacher also needs to provide adequate feedback, whether in written or oral forms, since feedback is assumed to be as an effective means of promoting students´ meaningful learning.

Data collection includes students´ written responses to selected problems (first and second versions) and the teacher´s written feedback to both versions. When students receive their first version with the teacher´s feedback, they can ask for oral feedback and, in that case, students´ interactions with the teacher are audio-recorded.

Preliminary results suggest that the intervention has been successful. Students have improved, not only in selecting appropriate strategies to solve the problems, but mainly in devising efforts to communicate their thinking effectively. The enthusiasm around this initial moment of the mathematics lessons has even led the students to engage in a regional problem-solving contest! Data from the planned individual, semi-structured interviews will help in shedding more light into the development of the intervention and its fruits regarding problem solving and mathematical communication.

E-Tattoos for Monitoring Vital Signs

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Abstract

Biotechnological developments shift medicine from a reactive approach to a more proactive and preventive attitude. Therefore, wearable electronic devices integrated into the skin to monitor health have attracted interest. Electronic tattoos (also known as e-tattoos) — which are stretchable, ultrathin, and ultrasoft membranes — track multiple biomarkers, including electrophysiology, and skin temperature and hydration level [1]. To achieve outstanding performance, these devices must also meet specific criteria regarding design, materials, and fabrication.

For health monitoring, the optimal design is an in-plane serpentine shape. Such geometry allows wider circuits and more electronic components to be integrated. Additionally, the serpentine shape displays an elastic behavior similar to the epidermal layer, notably regarding their extensibility [2]. Thus, a homogeneous deformation followed by a constant electrical conductivity is observed. The materials should be biocompatible, non-irritating, electrically conductive, and skin adherent [3].

In the present work, a serpentine-shaped shadow mask will be used to produce the e-tattoos, first in a flexible substrate and then into a commercial transfer paper tattoo. Photolithography will be used as the main process. Concerning the material, sputtering of copper and silver targets will be used to build the electrodes. Mechanical and electrical characterization of the electrical will be presented and thoroughly discussed.

References

[1] Williams, N. X., & Franklin, A. D. (2020). Electronic Tattoos: A Promising Approach to Real-time Theragnostics.

[2] Gao, Y., Yu, L., Yeo, J. and Lim, C., 2019. Flexible Hybrid Sensors for Health Monitoring: Materials and Mechanisms to Render Wearability. Advanced Materials, 32(15), p.1902133.

[3] Wang, Y., Qiu, Y., Ameri, S., Jang, H., Dai, Z., Huang, Y. and Lu, N., 2018. Low-cost, μm-thick, tape-free electronic tattoo sensors with minimized motion and sweat artifacts. npj Flexible Electronics, 2(1).

Evaluating the protective role of TRSP vaccination against malaria

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Abstract

Malaria is one of the most hazardous parasitic diseases causing thousands of deaths globally. The most advanced malaria vaccine, RTS,S/AS01, only provides protection against clinical disease but not infection by *Plasmodium falciparum*, the most dangerous parasite to humans, not reaching the standards to eradicate malaria. RTS,S/AS01 targets the circumsporozoite protein (CSP), the protein that densely coats the surface of sporozoite, the parasite stage introduced in the skin of the mammalian host by infected mosquitoes. Preventing sporozoites from reaching and infecting the liver, where they will multiply into thousands of merozoites, is among the most attractive vaccination strategies. A possibility to improve the efficacy of vaccines targeting sporozoites is the development of multivalent vaccines.

Thrombospondin-related sporozoite protein (TRSP), a sporozoite surface protein, was previously associated with an infection establishment role, being an antigen of interest. Using rodent malaria models, we aim to evaluate the potential of TRSP vaccination to protect against sporozoite infection. We optimized the heterologous expression and purification of recombinant TRSP. To evaluate its immunogenicity, C57BL6 mice were immunized with protein adjuvanted by poly(I:C), a TLR3 and RIG-I/MDA5 agonist. Specific antibody titres were quantified by ELISA. Immunized animals were challenged with luciferase-expressing sporozoites delivered through the skin. The liver load was assessed by bioluminescence imaging and blood infections were monitored.

So far, our results indicate that TRSP is an immunogenic protein but does not confer protection against sporozoite infection. Immunolocalization assays in sporozoites show that TRSP may not be completely accessible to antibodies, as labeling was dependent on parasites permeabilization. Our results suggest that TRSP despite being on the surface of *Plasmodium* sporozoites is not a promising candidate for vaccine development.

How does whole body fat mass percentage relate to trunk and knee muscle strength?

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Abstract

We aimed to investigate the association between whole body fat mass percentage and muscle strength.

A total of 148 subjects [59% females, 35.4±12.4 years, 34.9±10.4 kg·m-2 BMI, 38.4±13.2 %fat mass] were assessed for anthropometry, body composition, trunk and knee strength. Whole-body fat mass percentage (%fat mass) was evaluated by dual-energy x-ray absorptiometry. Knee and trunk extension and flexion peak torque were measured with an isokinetic dynamometer. Data was analyzed in absolute terms (Nm) and relative to body weight (Nm·kg-1). Pearson partial correlation, adjusted for sex and age, was used to examine the relationship between %fat mass

and strength. Prediction models of strength were also developed through linear regression analyses.

The association between %fat mass and absolute strength was significant at knee extension (r= 0.23, p=.006), but not at knee flexion (r= -0.15, p=.081), neither at both trunk extension (r= -0.05, p=.594) and flexion (r= 0.01, p=.901). %fat mass was strongly and inversely associated with relative strength of knee extension (r= -0.66, p<.001) and flexion (r= -0.76, p<.001), as well as with trunk extension (r= -0.59, p<.001) and flexion (r= -0.55, p<.001). The prediction models in which %fat mass was a significant predictor were absolute knee extension [130.95 + 82.91(sex) - 1.17 (age) + 0.97 (%fat mass)], relative knee extension [3.57 + 0.25 (sex) - 0.01 (age) - 0.03 (%fat mass)], and relative trunk flexion [3.52 + 0.34 (sex) - 0.01 (age) - 0.04 (%fat mass)].

In conclusion, the excess adiposity seems to be related to some improvements in absolute strength, mainly on antigravitational muscles, but the same seems not to occur when values are normalized to body weight, even hampering the relative strength at knee extension and trunk flexion.

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Derivation of soil reference values for potentially toxic elements (As and Pb) using a regosol representative of Estarreja soils

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Abstract

Soil reference values (SRV) are thresholds concentrations of contaminants in the soil that, when attained, an effect on the terrestrial ecosystem is expected. These values are preliminary screening benchmark values used to evaluate the potential toxicity of specific contaminants in the soils, providing information about the impacts on the terrestrial ecosystems. The Portuguese Environmental Agency has proposed several SRV for soil, based on their uses, but the soil type was not considered. However, and given the role of soil properties on the mobility and bioavailability of contaminants, it is widely recognized that SRV should be defined for different types of natural soils. In this context, to refine the ability to predict the risks of contaminants affecting the soil nearby the Estarreja Chemical Complex, the project aims to derive SRV for the primary PTEs of concern in the area (As, Pb) using a regosol, which is the main type of soil in that area.

To achieve this aim, a non-contaminated regosol was collected and spiked with a range of concentrations of arsenic (As) and lead (Pb). After, a battery of ecotoxicological tests was performed using the spiked soil, such as microbial parameters, reproduction with invertebrates, plant assays following standard protocols (ISO and OECD). A set of ecotoxicological tests with aquatic organisms using soil elutriates were also performed to understand if the soil retention function was compromised. Ecotoxicological endpoints such NOEC, EC10, EC20, EC50 (effect concentration that causes an effect of x% in test organisms) from the different species and endpoints will be used to estimate a PNEC/SRV using Species Sensitivity Distributions (SSD).

The results showed that As was very toxic to all the tested organisms and based on the data we collated, we proposed HC5 (EC10) of 2.80 mg as SRV for regosol. The assays with Pb are still ongoing, and all the data collected will be used to estimate an SRV for this metal on this type of soil.

Functional analysis of genes involved in *Arabidopsis thaliana* reproductive process

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Abstract

JAGGER is a gene that encodes an arabinogalactan protein, AGP4, important for reproduction in *Arabidopsis*. Arabinogalactan proteins (AGPs) consist of a large family of hydroxyproline-rich glycoproteins, highly glycosylated, predicted to be anchored to the plasma membrane by a GPI (glycosylphosphatidylinositol) anchor, involved in several steps of the reproductive process. Due to their richness in sugars and their anchorage to the membrane it is hypothesized that they may function as signalling molecules.

In angiosperms, sexual reproduction starts with a pollen grain landing on a stigma where it hydrates and germinates a pollen tube (PT). This PT carries two immotile sperm cells along the pistil tissues until it reaches the female gametophyte – embryo sac – inside the ovule. In its last steps of growth, the PT is attracted to the embryo sac by specific molecules produced by the synergid cells on its inside. Once attracted, one PT enters the embryo sac by one of the synergids bursting and releasing the sperm cells to achieve double fertilization. This synergid undergoes cell degeneration and no longer attracts more PTs. If fertilization succeeds, the second synergid degenerates too, and PT attraction stops completely. JAGGER is essential for synergid cell death and cessation of PT attraction to ovules, preventing the growth of multiple PTs into one ovule ("polytubey").

An RNA-seq (unp. data) was made on jagger vs wild-type flowers to discover jagger interactors in *Arabidopsis*. From this study several genes were selected for further analyzes. This study is focused on the analysis of two genes that may interacted with JAGGER in signalling pathways. For this, T-DNA insertion lines were selected for the genes of interest: β-1,3-GLUCANASE (GLUC3) and AVRRPT2-INDUCED GENE 1 (AIG1). These lines were genotyped, the insertion location confirmed by sequencing and imaging studies are being performed to detect defects in PT growth and attraction.

Extracellular vesicles from *L. infantum* axenic amastigotes

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Abstract

Leishmania infantum is responsible not only for a human disease called Leishmaniasis but also for a veterinary disease called Canine Leishmaniasis. Considering that there are no human vaccines and the treatment options available have serious issues related to toxicity and efficacy, it is essential to find new tools to fight this disease. *Leishmania* is a digenetic parasite, most of the studies are performed in the promastigote stage, the form that exists in the insect vector. The amastigote form is responsible for the disease in the mammalian hosts. This form is less studied due to several technical limitations related to the fact that amastigotes are obligate intracellular protozoa that survive and proliferate in the phagolysosome of macrophages. It is possible to study axenic amastigotes, which are considered not true amastigotes but share many of their characteristics. Using this axenic model we addressed the possibility to evaluate the extracellular vesicles (EVs) produced by *L. infantum*. The EVs can carry virulence factors that might be essential for amastigote survival. Thus, knowing their composition and content is a major unmet challenge in *Leishmania* research. For this goal, we adapted the existing medium that enables the continuous cultivation of axenic amastigotes to allow the recovery of axenic amastigotes EVs produced by continuous cultivation in this medium. We demonstrate that we can use ultrafiltration to remove exogenous EVs from the medium, maintaining its most relevant biologic characteristics, continuous growth, and infectivity of THP1 cells. After this validation, we recovered the EVs from these parasites and performed a preliminary proteomic analysis that identified several known amastigote-specific proteins that support the use of axenic amastigotes to understand the secretome of the intracellular form. Further studies are ongoing to validate the relevance of the identifications in true amastigotes.

Topology and Disorder in Quadratic Band Crossing Systems

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Abstract

Topological quantum matter has attracted a great deal of attention recently due to the robustness (topological protection) of certain material properties to perturbations like small disorder. As disorder is increased, a topological transition may occur. Here we investigate the interplay between the Chern insulator instability and a local random potential in a model hosting quadratic band crossing points in the clean limit. We determined the phase diagram in the plane of topological mass versus disorder strength, characterizing the system with respect to spectral, localization, and topological properties. In the clean limit, the Chern insulator is characterized by Chern numbers C=+2 or C=-2. Increasing the disorder, the system undergoes a topological phase transition to a Chern insulator with C=+1 or C=-1, absent in the clean limit. A careful analysis shows that these C=+/-1 phases are an instability of the QBCP, appearing for any infinitesimal amount of disorder. These phases occupy a considerable region of the phase diagram for intermediate disorder and show features of topological Anderson insulators: it is possible to reach them through disorder-driven transitions from trivial phases. However, contrary to common topological Anderson insulators, the C=+/-1 phases cannot be explained through a perturbative self-consistent Born approach

The Mindset of a Champion: Beyond performance excellence. Perceptions of Mental Toughness in the World's Greatest Basketball Players of all times

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Abstract

In the World of sports, we often witness unbelievable moments, where players achieve the apparently unachievable, driven solely by the power of their mind. Achieving the unachievable, strengths the idea that the real barriers to excellence exist only in the mind and players with a mental toughness mindset, are driven to overcome those barriers.

PURPOSE: to study the players' perceptions regarding mental toughness in basketball through the mental toughness profiles of two of the worlds´s greatest basketball players, Michael Jordan and Kobe Bryant.

METHODS: a player-centered qualitative methodology based on the Personal Construct Psychology theory (Kelly, 1955). Data is going to be collected with a Performance Profile session focused on the participants perceptions of mental toughness in basketball performance excellence. The sample will comprise 8 current and former elite basketball players, who have achieved ultimate success, such as competing professionally at a high level or representing their country's national team.

RESULTS: to elicit the participants' perceptions of mental toughness and performance excellence in basketball through developing a mental toughness profile of two of the worlds´s greatest basketball players of all times.

CONCLUSION: The study of performance profiles through the mental toughness profiles of Michael Jordan and Kobe Bryant aims to provide a better understanding of what mental toughness means and what it really takes to go from good to great and achieve beyond performance excellence in the sport of basketball and, to provide for a future tool for ultimate success by enhancing self-perceptions of the "current self" and exposing areas that the player needs to work, in order to achieve his "desired self".

Development of a flow-based strategy for the synthesis of fluorescent coumarin-lipid probes

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Abstract

The normal function of human cells relies on numerous pathways that involve several molecules such as proteins, nucleic acids, and lipids. Concerning lipids, these biomolecules act as potent signaling agents since many diseases are associated with disruptions in lipid metabolism and function including neurological disorders, autoimmune diseases, and cancer [1,2]. Therefore, it is crucial to monitor lipid activity in order to accomplish more precise and earlier diagnosis and consequently new therapeutics.

Fluorescent labelling is used as the preferred tool for the investigation of lipid metabolism. Nevertheless, there is still a lack of functionalized lipid probes suitable for this research area due to the demand of structurally diverse probes depending on the specificity of the biological study [3]. The synthesis of these templates can be achieved thought bioconjugation with fluorescent tags based on N-hydroxysuccinimide chemistry.

The present work describes the functionalization of phospholipid analogues with a coumarin derivative taking advantage of an automated flow synthesis procedure based on multi-syringe flow injection. The continuous flow synthesis was chosen since this method allows a meticulous control of the reaction conditions and an improved outcome when compared to the classic batch approach. The newly synthesized probes were submitted to spectroscopic studies and the preliminary results revealed their high potential as fluorescent lipid probes.

Acknowledgements

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References

[1] Brown, H. A. et al. (2017) Nat. Rev. Drug Discov. 16 (5), 351-367.
[2] Hussain, G. et al. (2020) Crit. Rev. Food Sci. Nutr. 60 (3), 351-374.
[3] Varandas, P. A. M. M. et al. (2020) Bioconjugate Chem. 31, 417-435.

Development and optimization of Bismuth Telluride nanoplates for thermoelectric devices

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Abstract

The growing quest for new, improved and sustainable ways to harvest energy and the unprecedented expansion of the Internet of Things (IoT) market we are witnessing keeps pushing technology to the limit nowadays. In 2021 IoT counted with more than 10 billion active devices, however, this number is expected to surpass 25.4 billion by 2030. Despite that, its further expansion has been slowed down by the lack of viable power supply methods capable of replacing the old wires or batteries.

Thermoelectricity seems to be promising to solve this problem because it is noiseless, vibrationless, does not produce pollutants, uses waste heat, and has reliable conversion. Thermoelectric materials convert thermal energy into electrical energy through the temperature difference-induced separation of positive and negative charges generating a voltage inside it. Inside the thermoelectric materials, 2-dimensional (2D) nanostructures present a boost compared with bulk materials due to quantum confinement effects on the thermal conductivity [2].

This work reports an easy scale and low-cost method to synthesize Bi2Te3 as well as the characterization of their structural and morphological (by X-Ray diffraction, field emission scanning electron microscope, and transmission electron microscopy), and transport properties (electrical conductivity and Seebeck coefficient).

Acknowledgments

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References

[1] Kumar, S., Tiwari, P. & Zymbler, M. Internet of Things is a revolutionary approach for future technology enhancement: a review. J Big Data 6, 111 (2019). https://doi.org/10.1186/s40537-019-0268-2

[2] Mao, J., Liu, Z. & Ren, Z. Size effect in thermoelectric materials. npj Quant Mater 1, 16028 (2016). https://doi.org/10.1038/npjquantmats.2016.28

Vigilance Behaviour in A Highly Social Bird

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Abstract

Vigilance, where individuals interrupt what they are doing to scan for potential threats, plays an important role in group-living species [1]. It allows for anti-predator detection, while also collecting useful information on the activities of conspecifics [1]. Previous studies on vigilance behaviour show that it can vary between classes of individuals (age, dominance, sex) [2]. In addition, there is the potential for intra-individual variation depending on context such as satiation level of the actor and group size [2,3,4].

The goal of this project is to describe for the first time the vigilance behaviour in the sociable weaver (Philetairus socius), a colonial, cooperatively breeding passerine endemic to southern Africa. Specifically, we aim to investigate whether individual investment is repeatable in short and long timescale (up to one year), whether some classes of individuals invest more on vigilance behaviour than others and why. Using video recordings and deep learning automatic image analysis [5,6] we measured the time spent on watch at feeders by identifying and quantifying the number of frames in which an individual´s posture suggests the bird is being vigilant vs. feeding.

We expect that the time spent in vigilant behaviour will be influenced by different factors and, if vigilance can be reliable for the group, we expect it to be consistent among individuals throughout time.

References

[1] Iki, et al. 2021
[2] Arbon, et al. 2020
[3] Ridley, et al. 2010
[4] Sorato, et al. 2012
[5] Ferreira, et al. 2020
[6] Unpublished Results

Printmaking processes as translation tools

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Abstract

Translation is a simple concept to grasp - at least in simplistic terms - it is the interpretation of a certain information/concept from one language into another, serving as a bridge between two or more dialectical contexts. It is, however, a topic that is widely explored in social sciences, specifically in Anthropology, where translation poses itself as a problem, illustrated here from the cliché traduttore - traditore (translator - traitor). Whenever certain information is transposed from its context of origin to another, there will be discrepancies and barriers to understanding, which Viveiro de Castro calls a misunderstanding (equivoco), a betrayal. Another anthropologist, Jean Sagata, points to the notion of translation as a process of describing what is seen from the observer's own frameworks, thus generating, in the process, new representations, new worlds, distinct from the real.

This concept can be transposed to the artistic field, and here I refer in particular to printmaking in the context of this research. Ruth Pelz-Montada points to translation as a methodological tool to understand printmaking, considered here as a process of medial transposition. The very core of printmaking is notably a method of translation/transposition, especially when one considers that its most basic element is the matrix that reproduces an image/print in a different support/context.

Using this concept as a ground zero, the research continues as a process of workshop experimentation of different graphical reproduction techniques, some of them obsolete - or close to obsolescence -, in order to explore the material possibilities of representation and transformation of images of the territory/landscape. Each printmaking process realized in the research is, therefore, considered an action of translation, creating new territories in the misunderstanding that happens between two distinct states of representation.

The wanderer reporter: Graphic autofiction stories collection and perception about the practice of wandering

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Abstract

The "wandering reporter" is an investigation project developed to search a narrative construction method applied to comics. The method relates three phases of a narrative doing, which materializes as drawing: walking and wandering through the city; the metawalk, that reconstructs the previous experience in diaries and small narrative fragments; and the autofiction, that recombines fragments of real-life experiences and small fictions.

The walking was the catalyst action of the work, which appeared because of the necessity of wandering, in the second lockdown, and was an investigation object which lenses were the senses, relating to the situationist practice of psychogeography. The collected stimulus during that action, in the social, physical, personal and collective space of the city are recollected by diverse means such as photography, sketches, notes, ideas and thinkings.

Starting from those elements, the project method develops within a second phase, the metawalks: the production of an authorial thinking which unfolds in a casuistic form, relating characteristics of different comic genres such as metacomics (comics that talk about their own narrative nature), documentaries, autobiographies and different technical and material formulae that the drawing medium offers.

The last stage of the narrative construction reflects about the condition of the author and narrator, using the process of autofiction.

By unfolding the authoral and autobiographical identity through the fictional field, it creates a "bubble" within itself, which is protected by a speculative effect between what really happened and what´s retold and restaged. The space of autofiction in that way, offers solutions of certain actions to happen, which would be impossible to materialize in reality, creating a space of possibilities over what´s real.

Does hand dominance explain veering in swimming?

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Abstract

To achieve optimum performance, the energy spend to swim should be mainly related with propulsive force production, avoiding entropy due to factors like body misalignment. Body veering during swim costs a lot of energy to the swimmer, once he/she needs to be constantly correcting the movements to keep the swimming line. The current study aimed to observe and quantify the veering in free and tethered swimming conditions with normal and impaired vision, and relate it with a possible cause. Ten international level swimmers (29.7 ± 5.16 years, 178.6 ± 8.39 cm and 73.2 ± 8.90 kg) performed 2 x 25 m free and 2 x 30 s tethered front crawl swimming trials at maximum exertion with 30 min interval in-between (one repetition with normal vision and the other with impaired sigh using black painted googles). The swimming pool lane dividers were removed and a video camera (Go Pro Hero Black 6) was used to record the hip deviations from the swimming longitudinal axis (determined through the Kinovea 0.8.15 software). Independent samples t-test was applied to compare veering mean values of the two visual conditions (normal and impaired) and the two swimming tests (free and tethered swimming). Data evidenced deviations from the swimming line that were higher with impaired vision, both in free (15.82 ± 10.61 vs 150.23 ± 93.98 cm) and tethered swimming conditions (20.20 ± 8.21 vs 252.54 ± 122.13 cm). Veering occurred mainly for the right body side, with the swimmers hand dominance being tested as a possible cause (Table I). The relationship between variables (veering side and dominant hand) was analysed performing a cross tabulation. However, no relation between veering side and hand domination was observed, meaning that other possible factors determining the veering side should be tested in the future.

Relation between swimmers hand dominance and veering side in free and tethered front crawl swimming conditions performed with normal and impaired vision.

Tunning of the Magnetic Nanoparticles Properties for Biomedical Applications

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Abstract

The concern for human healthiness have aroused exponentially creating a large demand on the scientific community to discover new and improved treatments for diseases, which need to be highly effective and cost-effective. Another crucial aspect is the focused ability to target only the illness without causing any harm to the healthy tissues. Metallic nanoparticles have been extensively studied due to their very wide biomedical applications as treatment or diagnosis agents including targeted drug delivery, magnetic resonance imaging, magnetic hyperthermia and thermoablation, bioseparation, and biosensing. Magnetic nanoparticles are of great interest given their ability to tune their application according to their response to the magnetic field, which is directly associated with their intrinsic properties. This opens up the potential to conjugate various bio-cargos to the nanoparticles that could then be direct applied for treatment/diagnosis in the human body. Superparamagnetic nanoparticles, such as iron oxides are nanomaterials especially promising since exposed to an external magnetic field these nanoparticles can align along the field direction, achieving magnetic saturation at a magnitude that far exceeds that from any of the known biological entities. This unique property allows not only the detection of the magnetic nanoparticles-containing biological samples, but also the manipulation of these biological samples with an external magnetic field. In this work. Superparamagnetic nanoparticles (Fe304 and MnFe204) will be presented and discussed. The chemical structure and crystallite size of the prepared nanoparticles was obtained using X-ray diffraction showing that the samples can be indexed to the bulk materials, proving the effectiveness application of these materials in illnesses diagnosis and/or treatment.

Keywords: Wound Infection, Negative Pressure Wound Therapy, Antimicrobial, Magnetic Nanoparticles, Superparamagnetic, X-ray Diffraction.

References

[1] Fernandes, H, Diana Oliveira, and Nuno Vale. “AMP – Chitosan Coating with Bactericidal Activity in the Presence of Human Plasma Proteins.” Molecules 25(13), no. 3046 (2020).
[2] Patmo, Aryan S.P., Pieta Krijnen, Wim E. Tuinebreijer, and Roelf S. Breederveld. “The Effect of Vacuum-Assisted Closure on the Bacterial Load and Type of Bacteria: A Systematic Review.” Advances in Wound Care 3, no. 5 (2014): 383–89.
[3] Vikatmaa, P., V. Juutilainen, P. Kuukasjärvi, and A. Malmivaara. “Negative Pressure Wound Therapy: A Systematic Review on Effectiveness and Safety.” European Journal of Vascular and Endovascular
[4] Pereira, Clara, et al. “Superparamagnetic MFe2O4 (M = Fe, Co, Mn) Nanoparticles: Tuning the Particle Size and Magnetic Properties through a Novel One-Step Coprecipitation Route.” Chemistry of Materials 24, no. 8 (2012): 1496–1504.
[5] Li, Wei. “Facile Synthesis of Monodisperse Bi2O3 Nanoparticles.” Materials Chemistry and Physics 99, no. 1 (2006): 174–80.

When land becomes landscape

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Abstract

Nowadays, the use of natural materials in artistic practice is gradually recurrent. Whether it is for ecological reasons or simple curiosity, in general these have a strong presence in artist´s work. With an increasing desire to incorporate natural pigments available around me and replace conventional materials, my work around landscape fosters the idea of a direct relationship with space through the association of nature-image, in a kind of cartographic recreation, and the collecting of raw materials on site. The outside/studio relationship allows for different processes in the way that materials are worked on, positioned, and used. If, in nature, a "rawness" is expected, in the studio the opposite is assumed, where the pre-treatment resembles a laboratory course of action. These specificalities inherent to each space become an integral part of the image, which provide a new approach.

In this sense, the idea of belonging to a larger project, which would touch the same points of interest, emerged when the opportunity to insert the project "SHS - Soil health surrounding former mining areas: characterization, risk analysis, and intervention". This project intends to establish a direct relationship with places linked to mining areas, where the surrounding land differs from one another because of environmental changes and similar phenomena. Being the territory of main interest, having the opportunity, as a scholarship holder to observe and be able to contribute to the research team, is relevant from the point of view of the possibilities presented. A proposal for recreating a portable laboratory is presented, which establishes a direct relationship with traveling photography and war expedition kits, promoting the necessary conditions for in situ printing.

Evaluation of the practice of intravenous administration of antibiotics at the home of patients in the context of early hospital discharge at the Local Health Unit of Matosinhos

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Abstract

The parenteral administration of antibiotics on an outpatient basis to patients who are discharged early from the hospital is known as "Outpatient Parenteral Antimicrobial Therapy" (OPAT).
Several studies demonstrate that OPAT is safe and effective and provides benefits for patients and healthcare systems, but it involves potential risks.
The Local Health Unit of Matosinhos (LHUM) was one of the first Portuguese healthcare units to adopt the OPAT concept. Although it has been implemented since 2009/10, its scientific evaluation is still incipient. Previously, an appropriate methodology was developed and a preliminary assessment was carried out.
The present work aims to further evaluate the OPAT at LHUM. A retrospective cohort study was carried out, covering the period from 2015 to 2019.
97 cases were recorded, involving 96 patients, mostly elderly and men. Most cases resulted from infections of the respiratory system. 89% of patients had 2 or more comorbidities at the time of admission (mean=5.2), the most prevalent being hypertension and dyslipidaemias. The number of hospitalizations in the 12 months prior to admission ranged from 0 to 5 (median=1). In 72% of cases, 33 different microorganisms were identified, including multidrug-resistant bacteria. The length of hospital stay before early discharge ranged from 1 to 118 days (median=11). The most prescribed antimicrobials were ertapenem (28%), followed by ceftriaxone (19%) and the association of piperacillin with tazobactam (19%). Carbapenems and cephalosporins corresponded to, respectively, 33% and 29% of prescribed antibiotics. The hospital readmission rate of OPAT patients was 24%.
Overall, the results are in line with OPAT programs in other countries, particularly with regard to the readmission rate, which is a relevant clinical outcome. However, there is room for improvement.
In the future, we intend to extend the study period and assess other dimensions, such as adherence to therapy and economic outcomes.

MATERNAL TYPE 1 DIABETES AS A RISK FACTOR FOR AUTISM SPECTRUM DISORDERS - A SYSTEMATIC REVIEW AND META-ANALYSIS

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Abstract

Background: The etiopathogenic mechanisms of ASD are still unclear. Maternal diabetes and autoimmune diseases have been associated with an increased risk of offspring ASD. T1DM shares autoimmune and hyperglycemia etiopathogenic mechanisms and T1DM association with offspring ASD has been poorly isolated in literature. So, we performed a sistematic review and meta-analyses regarding this association.

Methods: We followed PRISMA guidelines. Pubmed and Web of Science databases were systematically searched for eligible literature. Two independent reviewers assessed eligibility, performed data extraction and assessed the risk of bias.

Results: We identified 15 studies, of which eight were excluded. Seven studies (two case-control and five cohort studies) met out inclusion criteria. In the overall analysis we found an increased risk of ASD in children of T1DM mothers, yet not statistically significant (RR 1.32 (95% CI 0.93-1.87)). A random-effects model was used because we found moderate heterogeneity (I2 = 54% and p=0.04) between studies.

Conclusion: T1DM and offspring ASD may be explained by an interplay between genetics, antibodies, inflammation, environmental factors such as prolonged hyperglycemia and others perinatal complications. Despite our results, there is a positive tendency for this particular association and more research is necessary to formulate effective strategies for preventing, screening and treating ASD in children of T1DM mothers.

Keywords: type 1 diabetes, autism spectrum disorders, hyperglycemia, autoimmunity, inflammation.

Abreviations: ASD- autism spectrum disorders, T1DM- type 1 diabetes mellitus, T2DM- type 2 diabetes mellitus, GDM- gestational diabetes mellitus.

P-Cadherin Is Associated with Hybrid Epithelial-Mesenchymal Transition Markers in High Grade Serous Ovarian Carcinoma Cell Lines

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Abstract

Introduction: High-grade serous carcinoma (HGSC) is the most frequent and lethal subtype of ovarian carcinoma. P-cadherin (Pcad, codified by CDH3 gene) expression is associated with collective cell migration, anoikis resistance and stemness, being a candidate marker for hybrid epithelial-mesenchymal transition (EMT) phenotype. We recently observed that HGSC with high Pcad expression is significantly associated with worst overall survival. Thus, we aimed to access whether Pcad associates with expression of hybrid EMT markers in HGSC. Materials and Methods: We performed in silico characterization of EMT-related genes expression profile in HGSC ovarian cancer cell lines using CCLE database. Correlation with CDH3 expression was evaluated using linear regression. Cell lines with endogenous overexpression of P-cad (BG1, OVCAR3 and OVCAR4) were selected for in vitro validation of significantly correlated genes, at the protein level, using western blot. Results: A total of 60 HGSC cell lines were analyzed and 9 EMT-related genes were significantly correlated with the expression of CDH3. A positive correlation was observed with CDH1 and EPCAM (epithelial markers) and with GRHL2, OVOL2 and ITGB4 (hybrid markers). An inverse correlation was verified with ZEB1, ZEB2, TWIST1 (EMT transcription factors) and with VIM (mesenchymal marker). Further, in vitro validation was performed in 3 different cell lines with high CDH3 endogenous levels. Interestingly, all the cell models show high expression of CDH1, EpCAM and GRHL2 and low expression of VIM, ZEB2 and ZEB1. Conclusion: Pcad expression in HGSC cell lines is significantly correlated with expression of epithelial and hybrid phenotype markers, both in silico and in vitro. Based on these results, we hypothesize that hybrid EMT may account for the aggressiveness of this tumor. Further research is needed to unravel the functional role of Pcad in HGSC since its pathway may represent a novel approach for targeted therapy in this setting

A Harvest on Greco-Roman Ground: the classical references and their evolution in Eugénio de Andrade's poems

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Abstract

Eugénio de Andrade declared and confirmed, on several occasions, his great interest in the Greco-Roman world. His poetics and poetry, rooted in the four elements of Empedocles, demonstrate that this was a fertile ground that fascinated him and where he continuously derived inspiration. In light of this observation, the research aims at exploring the glamourous classical culture that shines through Andrade's verses, which could be summarized mainly in the use of figures from the epics, as well as thematic ideas, high values, some typical stylistic elements, and symbols from classical poems that are not only assimilated and recalled but, more importantly, expanded and renewed in his contemporary imaginary structure. The focus of this paper is on analyses of selected poems that manifest their subtle continuity with Homer's epics and Horace's odes. As a result, the classical roots in Eugénio de Andrade are inherited and developed in the following dimensions: 1) a retrieval of Homeric similes, epithets (Wine-dark sea), and symbols of plants, especially a recurring comparison between a palm tree and a young girl's slenderness and beauty, which is not only updated by an erotic implication but also later extended to represent male bodies. 2) In continuation of the previous point, the allusions to Homer's epics are used to elaborate his own representative themes, such as his critical attitude towards the past and present, his pursuit of perfect poetry and inevitable failures in expressions 3) a thematic resonance with heroism and Carpe Diem, that is, the melancholic recognition of human life's fragility and ephemeral nature as "folhas breves", yet at the same time, a luminous celebration of the positive spirit to challenge and surpass this limited condition, and the appeal to "colhe todo o oiro do dia" and "amo o efémero".

Keywords: Eugénio de Andrade, Portuguese contemporary poetry, classical culture, Homer, Horace.

Production of natural bioactive functional additives from wine and olive oil by-products – application of zebrafish (*Danio rerio*)

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Abstract

In response to crowding, vaccination, handling, and other stressors, fish undergo several biochemical and physiological changes that impair zootechnical performance, well-being, and health. The use of functional diets with antioxidant potential to increase fish resistance and resilience to stressful situations are promising and emerging tools.

This study aims to assess the potential of a new range of functional supplements obtained from olive oil and wine by-products on the growth performance, feed utilization, and stress resilience, using zebrafish as a biological model. Two functional additives were produced from a mixture of crude olive pomace, exhausted olive pomace, vine trimming shoots, and exhausted grape marc submitted to solid state fermentation with *A. ibericus* (FWO) or to an aqueous extraction (UWO). FWO characterization showed xylanase and cellulase activity (78 and 21U/g), while both had antioxidant properties (total phenolic of 50 and 46.4 mg GAE/g).

Three low fish meal-based diets were formulated. Two of them were supplemented with circa 1% of each extract, FWO, and UWO, corresponding to a 0.5 mg GAE/g diet of total phenols. The non-supplemented diet was used as a control. Quadruplicate groups of juvenile zebrafish were fed these diets for one month. During this period, zebrafish were submitted to acute net handling stress. The results demonstrated that dietary supplementation with FWO and UWO increased the zootechnical performance and feed utilization efficiency, relative to fish fed the control diet. Before and after the acute stress, the fish's oxidative stress status is being evaluated and will be present to assess the potential of FWO and UWO to modulate the stress response in zebrafish.

Acknowledgments

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Multiple Hr-HPV Infections in Cervical Cancer Screening: New Insights for Future Improvements

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Abstract

Worldwide in 2020, Cervical Cancer was the fourth most frequently diagnosed cancer and the fourth main cause of cancer death in women and Portugal, in 2020 it was estimated a total of 865 new cases and 379 deaths. The cervical cancer screening in the Northern Region of Portugal using full Hr-HPV genotyping as the primary approach for cervical cancer screening was implemented in 2016 for women aged 25-60 years old. Nevertheless, it is imperative to improve the selection women that will benefit of a fast colposcopy and therefore new strategies are being proposed.

The aims of this study are to assess the impact of different Hr-HPV genotypes on multiple infections and its correlation with cervical lesions, and to characterize the microbiome of Hr-HPV positive cervical samples.

Firstly, we have performed a retrospective analysis of data collected from women who participated in the Regional Cervical Cancer Screening Program from the Northern Region of Portugal between 2016 to 2021. Data from 2016-2017 revealed a prevalence of Hr-HPV of 10.2% in a sample of 105,458 women with multiple infections with two or more Hr-HPVs to represent 25.7%. Preliminary results (data not published) revealed that of all Hr-HPV positive women, 57.6% have NILM, 25.6% have ASC-US, 11.3% have LSIL, 2.3% HSIl and were found only 3 Cancers. We will then combine the information regarding the different Hr-HPV genotypes with the cytological analysis and compare the impact of the different Hr-HPVs focused in the multiple infections. Furthermore, we will select cases for analysis of the vaginal microbiome and correlate with the cervical lesions diagnosis.

This study intends to provide important data to improve the algorithm of Cervical cancer screening by allowing a better selection of women that will highly benefit of performing a colposcopy rather than sending all Hr-HPV positive women for a gynaecological evaluation.

Synthesis and bioactivity of two peptides as potential bioinsecticides for the control of *Drosophila suzukii*

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Abstract

Spider venoms represent potential new sources for peptides with insecticidal activity and there are already studies showing their activity against arthropod pests, namely the quarantine pest *Drosophila suzukii*. These peptides consist of molecules of complex structure, supported by multiple disulfide bridges, which impart highest insecticidal activity. Thus, these peptides emerge as sustainable new biocontrol strategies. This work aims to elucidate the potential of spider venom-derived peptides to act as bioinsecticides to control *D. suzukii*.

From a literature search with at least 20 peptides, 2 were selected based on their efficiency and structural features (e.g., disulfide bonds): µ-Theraphotoxin-Hhn2b (hereafter, peptide T), with 33 amino acids (aas) and 3 S-S bridges, and J-Atracotoxin-Hv1c (peptide A), with 37 aas and 4 S-S bridges. These potentially neurotoxic peptides were synthesized by solid-phase peptide synthesis, their native structure was promoted by disulfide oxidation, and the purified peptides were obtained by preparative HPLC. There was reproducibility in the profile of the peptides from different synthesis batches, and 46.1 mg of peptide T and 17.4 mg of peptide A were obtained.

In parallel, a *D. suzukii* colony was maintained in the laboratory for the development of peptide exposure assays by oral ingestion. The dose to be added in the food was calculated based on already reported LD50 doses of peptide A. Preliminary assays point to potentially toxic doses of the peptide T above 800 µg/mL of medium. Based on its structure, we hypothesize that peptide A may have higher toxicity. We also hypothesize that the effect of peptides encompasses neuronal signaling, thus also affecting the expression of genes associated with energetic, reproductive, and developmental pathways. This influence on genetic expression is being studied by real-time PCR quantification of transcripts from the most representative pathways in larvae and adults.

Narrating ataxia: adapting the expressive writing paradigm for ataxia patients in the context of a genetic counselling narrative group intervention

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Abstract

The organization APAHE approached CGPP stating a need for a support intervention. Expressive writing (EW) has been found to improve coping, emotional disclosure and processing, health and social support seeking. However, ataxia's symptoms might impede individuals from partaking in EW. This study describes the adapting of an EW exercise, in a broader genetic counselling intervention for hereditary ataxia.

A pilot, short-term narrative group intervention was adapted and remotely delivered, to foster psychological wellbeing. The intervention included adaptations of Tree of Life and EW paradigms and was comprised of 2 online sessions, facilitated by a psychologist and a genetic counsellour. APAHE recruited the 6 attending participants.

Alterations to EW included the creation of 4 narratives per participant, written or audio-recorded (to accommodate participant's needs) for 10 minutes on non-consecutive days. EW was used as a therapeutic and evaluation tool, to assess intervention impacts on illness-related narratives. Other measures besides EW included GAD-7, PHQ-9 (all taken at baseline, post-intervention, and 2 weeks follow-up), an EW questionnaire and a focus group (at follow-up). Data analysis included descriptive statistics and Friedman test of scores' differences, with thematic analysis of participants' narratives.

23 narratives were collected. Although preliminary results did not show significant differences in anxious (GAD-7: $\chi2(2)=4000$, $p=0.135$) and depressive (PHQ-9: $\chi2(2)=4364$, $p=0.113$) symptoms over time, high satisfaction with intervention was reported. EW questionnaires showed that all participants reported enhanced understanding of their experiences and emotions, and 66.7% indicated feeling better prepared to cope with similar experiences. Ongoing thematic analysis may reveal further psychological impacts.

Findings show that EW may be a viable approach for combined narrative interventions in ataxia, while also having potential as an evaluation tool.

Characterization of take-away/delivery menus during the second lockdown in Portugal

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Abstract

Background: Due to the restrictions demanded by COVID-19, restaurants were forced to include take-away/delivery (TA/D) services to maintain their operation. Therefore, there was an increase in the demand of TA/D meals by the Portuguese population. Our aim was to characterize and evaluate the take-away/delivery food offer in restaurants with these services during the second lockdown and discuss its possible impact on consumers´ food intake.

Methods: Eight restaurants in the Northern region of Portugal were selected, with TA/D services. The information on the food offer was collected during 1 week in March 2021, through online platforms. A qualitative evaluation of the menus was carried out, using the qualitative checklist of SPARE, adapted to the restaurant´s context.

Results: 62.5% of the restaurants had a soup option on their menu, 75% included strict vegetarian dishes and 37.5% had at least 1 egg meal as the main protein source. The prevalent cooking method in the restaurants was grilled (50%). Only 37.5% of the restaurants had more fish than meat dishes and only 50% had fatty fish options. Of the restaurants that offered desserts, all had sweet desserts and only 1 had fruit as an option. No information regarding allergens and nutritional composition of the meals was found on any menu.

Conclusions: In the selected restaurants, the food supply does not follow the recommendations of the Portuguese Food Wheel, prevailing options with low nutritional quality. In Portugal, 67.6% of the adult population is overweight or obese, which highlights the importance of the restaurants' food offer being more varied and nutritionally balanced, as a measure to prevent this condition. Therefore, if the demand for meals in this type of service continues to increase, it is mandatory to improve them nutritionally, in order to create a positive impact on public health in Portugal.

AN EVALUATION OF THE QUALITY OF PARENT–CHILD INTERACTIONS IN VULNERABLE FAMILIES THAT ARE FOLLOWED BY CHILD PROTECTIVE SERVICES

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Abstract

In the current study, an observational procedure, recorded in video, was used to evaluate the quality of parent-child interactions in a sample of vulnerable Portuguese families (n = 47) with school-aged children followed by Child Protective Services (CPS). The study sought to explore if the families presented different profiles of parent-child interaction quality, and to characterize such profiles in terms of discrete behaviors observed, parenting outcome variables, and families´ sociodemographic and CPS referral characteristics. The parent-child dyads took part in a 15-minute structured task and parents completed self-report measures (affection, parenting behaviors, and stress). Discrete behaviors of parents and children during interactions were coded with a micro-analytic coding procedure. The global dimensions of the parents´ interactions were coded with a global rating system. A latent profile analysis, estimated with global dimensions, identified two subgroups, one subgroup in which parents displayed higher quality interactions (n = 12), and another subgroup in which parents displayed lower quality interactions (n = 35). Further analyses comparing the subgroups determined that the higher quality subgroup presented more positive behaviors, and the lower quality subgroup presented more negative behaviors during the interactions. No further differences or associations were found regarding the parenting outcome variables, and the families´ sociodemographic and CPS referral characteristics. The findings are in line with prior studies, suggesting that vulnerable families may frequently present depleted parent-child interactions. However, given the small sample size, future studies should replicate the described procedures and analyses in larger sample sizes.

Keywords: Parent-Child Interaction, Quality, Child Protective Services, Vulnerable Families, Observation, Structured Task, Micro-analytic Coding, Discrete Behaviors, Global Ratings, Latent Profile Analysis.

Does a preparation course has influence on National Access Exam's results?

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Abstract

Introduction: The National Access Exam (PNA) is a ranking exam that determines the order in which residency candidates in Portugal choose the hospital and specialty. This study aims to determine the influence of the participation in Instituto de Ciências Biomédicas Abel Salazar´s preparation course on PNA´s classification.

Methods: A cross-sectional study analyzed 2020´s exam, in which 2639 candidates participated. We evaluated the performance of the 240 graduates from ICBAS, having 120 of those participated in the preparation course. To assess the psychometric properties of the test, we used the Classical Test Theory and the Item Response Theory. Factors such as GPA, gender, professional situation and participation in the preparation course were analyzed to seek their influence on the exam classification using the linear regression method.

Results: The competence analysis revealed that the PNA had a high degree of reliability (alpha of 0.93). The final course classification is the most important factor for the final result of the test. Students who participated in the preparation course had, on average, 7 more questions correct on the test compared to those who did not ($p<0.01$).

Conclusion: Participation in the preparation course allows for a better final classification in the National Access Exam. These findings are relevant for the preparation of students, allowing early intervention in their academic path in order to enhance their performance.

The Global Motor Coordination in Artistic Gymnastics and Basketball Athletes: The Effect of Gender and Sport

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Abstract

Artistic gymnastics is an individual sport and basketball is a group sport, that currently possess countless worldwide known athletes. Strength, balance and motor coordination are fundamental for the success of the gymnasts and basketball players. However, few studies concerning these abilities, specifically involving these sports, were found. So, it is important to investigate motor coordination in gymnasts and basketball players according to the sex and the sport performed. The sample comprised 20 gymnasts (10 females: 5.40 ± 0.52 years old; 10 males: 5.70 ± 0.82 years old) and 20 basketball players (10 females: 5.60 ± 0.52 years old; 10 males: 5.80 ± 0.79 years old). All of these athletes belong to the same club and possess 1 year of previous practice of the respective sport. The motor coordination of the gymnasts and basketball players was evaluated through the KTK Battery - Monopodal Jump (Schilling, 1974), at the end of a training session. The Monopodal Jump Test was performed with the preferred foot (PF) and the non-preferred foot (NPF). The statistical analysis was processed through the SPSS, version 27.0. It was used descriptive statistics and the non-parametric test of Mann-Whitney. P value was set at $p < 0.05$. The results showed that (i) gender and sport had a significant interaction (PF: $p = 0,021$; NPF: $p = 0,017$) on motor coordination of the athletes; and (ii) no statistically significant differences were found according to the functional motor asymmetries between the studied groups. These results may have been obtained by the facts that gymnasts and basketball players were subjected to different stimuli and types of training.

Evaluating the effect of cartilage degeneration at different stages on sensory nerve sprouting

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Abstract

Articular cartilage (AC) is a connective tissue that covers the articular facets of bone in synovial joints. This tissue is avascular, alymphatic and aneural.

Currently, articular cartilage degeneration (CD) and its treatment remains a challenge due to poor understanding of the pathogenesis mechanism and lack of models that can adequately replicate it. Once CD has progressed to severe osteoarthritis (OA), the only alternative is total joint replacement. OA is a major cause of incapacity and economic loss worldwide.

OA is associated with low-grade inflammation and pain but although the role of inflammation in OA is well-defined the pain mechanisms are still enigmatic. Joint-on-chip models may allow the study of OA pathophysiology in an animal-free testing environment with the ability to control multiple variables. Therefore, in this study a microfluidic-based cartilage-innervation chip is proposed to dissect the interaction between CD and innervation in OA.

With the objective of evaluating sensory nerve fibers' sprouting, dorsal root ganglia (DRGs), were exposed to conditioned medium (CM) of 3D human chondrocytes pellets cultured in presence and absence of pro-inflammatory cytokine IL-1β at different time points, to recapitulate CD trigger by inflammation, in compartmentalized microfluidic devices (CMD). CMD were produced as previously described by Neto, E. (2014), embryonic DRGs were obtained and cultured as described by Neto, E. (2022). The DRGs were exposed to 3D pellets CM medium three days after seeding, for 24h. Here, we show that 3D human chondrocyte pellets exposed to IL-1β exhibit lower cell viability and express lower amounts extracellular matrix (ECM) components (e.g. aggrecan and collagen II) when comparing with control. The neurite outgrowth in presence of 3D pellets' CM is currently under investigation. In brief, CD is associated with ECM changes.

Sweet potato leaves (*Ipomoea batatas*): a by-product with potential to contribute to food security

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Abstract

The consume of sweet potato roots became a trend given its nutritional and tasty properties. Portugal is the second largest producer in Europe. However, the leaves of this plant are considered a waste even when literature suggests a rich nutritional profile. Adding value to agro-industry by-products can help to prevent the atmospheric CO2 increasing, ensure food security, and contribute to economic growth (1).

The aim of this study was to analyze the nutritional profile of SP leaves from cultivars "Lira" (L) and "Burguesinha" (B) obtained from Torres Novas, Portugal.

Nutritional analysis was performed by AOAC methods, according to (2), and non-protein nitrogen (NPN) according to (3). Amino acids were quantified by HPLC-FLD (4). An extract of ethanol/water (50:50) was prepared for spectrophotometric quantification of total phenolic compounds, flavonoids, and antioxidant activity by FRAP and DPPH methods (5). Vitamin E (vit. E) levels were determined by HPLC-FLD-DAD (6) and fatty acids profile by GC-FID (ISO 12966-2:2017).

The results (in dry weight) for L and B showed: i) both varieties have high contents of protein (26%), low values of NPN (0.48% -L and 0.57% B) and all essential amino acids; ii) high dietary fiber (39% -L and 41% -B); low fat content (4% -L and 3% -B); high levels of vit. E/α-tocopherol (225 mg/kg -L and 61 mg/kg -B), and of polyunsaturated fatty acids (67% -L and 70% -B). These results confirm sweet potato leaves as a by-product with interesting properties and potential as novel food ingredient.

Acknowledgments

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References

1 Nature, 534 (2016) 320–322.
2. Int. J. of Food Properties, 23 (2020) 178–188.
3. Embrapa Pecuária Sudeste, 4 (2006).
4. Food Chemistry, 326 (2020), 126940
5. Food Chemistry, 267 (2018) 28-35.
6. Food Science and Technology International, 15 (2009) 57–63.

Chasing uncertainty: the viking incursion of 1015-1016

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Abstract

Based on documentation from 1018, it has been recognized a settlement of 9 months (1015-1016) of a group of Normans between the Douro and Ave, which greatly affected the local population. The scientific community associates this Viking settlement with the raid on the Castle of Vermoim in 1016. Nevertheless, there is still uncertainty about the place where they settled, as well as the outcome of the attack on the castle. Through primary sources and by resorting to complementary bibliography, the present written essay intends to understand the level of ingression into the northern territory, considering the possible places where this group, or groups, might have established themselves and the circumstances in which they were found.

Maturation as a Predictor of success in shooting velocity and efficiency in youth water polo player

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Abstract

We aimed to verify if maturation is a predictor of success in water polo shooting velocity and efficiency. Eighty-two male youth players performed shots to the goal with goalkeeper and to a canvas from a fixed position vs with previous displacement. Means ± sd was computed and Pearson bivariate correlation was used to evaluate the relationship with the shooting velocity ($p <= 0.05$). The maturation was moderate correlated with shooting efficiency in different types of shooting ($r=0.567$, $r=0.565$, $r=0.559$ and 0.546, respectively). In contrast with shooting efficiency, velocity had always despicable relation with the variables presented ($r<0.30$). The different types of shooting are strong correlated in terms of efficiency ($r=0.954$, $r=0.867$ and 0.854, respectively). On contrary the correlation in terms of velocity are despicable ($r<0.30$). It seems that maturation is an important predictor of shooting efficiency performance but not from shooting velocity. It also appears that a player who is efficient had more types of shooting available. Focus on precision, the opponent and goalkeeper position are also necessary to score a goal which means that maturation and decision capacity should be considered as a predictor of success. To conclude it was possible to observe that maturation has a role on shooting efficiency but not in velocity and efficiency should appear on the training process. Futures studies should be carried with youth women players and examine the relations between these variables and decision making.

Keywords: water polo; maturation; shooting; efficiency

Lower-limbs recovery process following sports practice: physiotherapist intervention

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Abstract

Physical exercise is essential to improve quality of life, with muscle recovery after exercise being crucial since it reduces the delayed sensation of muscle discomfort and fatigue. The present study aims to identify the methods used by physiotherapists to recover sports practitioners after physical exercise and presents a non-experimental, quantitative and descriptive nature. A questionnaire was filled in by 52 physiotherapists (52% women) with 9.8 ± 7.3 years of experience and different sports backgrounds. Physiotherapists reported that sports practitioners use legging-like garments during training (n=20), after training (n=19), and, in a few cases, physiotherapists were not aware if their athletes use any garment (n=17). The common characteristics of the garments are compression (n=29), heating (n=18), and, in some cases, physiotherapists do not know if their athletes use these types of wearables. Sports practitioners usually report lower-limb localized muscle fatigue after training or competition (90%), and the most affected areas are the entire lower limb (n=12), quadriceps (n=9), and hamstring and glutes (n=7 each). The most common therapy used is massage (n=12), followed by electrostimulation (n=8) and compression (n=5). Physiotherapists believe that electrostimulation should be used to recover quadriceps, hamstrings, and the whole lower limb, and localized heating should be centered in the entire lower limb, hamstrings, and quadriceps. Alternatively, massage is better to recover the whole lower limb, gastrocnemius, and hamstrings. When asked what characteristics the garment should have, physiotherapists reported that comfort (n=44), breathability (n=37), and ease of care and cleaning are vital.

Deep Learning for Physics: new tools for model, coordinates and dynamics discovery

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Abstract

For the past couple decades, Machine Learning has given Physics tools that allow to identify underlying structures from data, as well as discover faint signals from surrounding noise and unwanted effects. However, given the complexity of the systems and the amount of data being studied, these often fall short of what would be desirable. Recently, the introduction of Physics-informed neural networks, where conservation laws (like energy or mass), symmetry relations and known physical laws are added to the loss function, has changed this paradigm. This novel approach provides a much faster and more accurate convergence to the true solution in a wide range of cases, promising to deeply impact several areas, like astrophysics, quantum physics or fluid dynamics over the next few years.

Besides this model-to-data application, we will also present a new data-to-model approach: sparse non-linear model regression, that allows to obtain previously unknown models from data. Several examples of chaotic dynamical systems, such as the double pendulum and the Lorenz attractor, where finding the right embedding and relevant system coordinates, followed by finding the dynamic differential equations is the primary goal, will be discussed.

Educating Cities and Heritage: Spaces of Memory and Knowledge

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Abstract

This investigation aims to understand the expansion potential of the cultural horizons of the human being, based on heritage awareness, through the taste for knowledge enhanced by the surrounding space, in a re-reading of sources - tangible and intangible - that express values, beliefs, knowledge and unique traditions. Considering as a starting point the question - How does heritage become an instrument at the service of understanding the urban phenomenon? -, it is intended to comprehend the operational character of heritage and heritage education for urban development through the comparative reading between the international norms of Cultural Heritage and the axes of action applied in the projects of the Educating Cities. For this purpose, five geographically distinct experiences of Educating Cities (E.C.) were analyzed, synthesizing the objectives and methodologies of each case study, emphasizing the application of the values of the Charter of the International Association of Educating Cities (IAEC) in accordance with the normative instruments of the Cultural Heritage. In this sense, the exemplifying cases can serve as models of reflection and action to be applied in the future in a national context, promoting socio-cultural dynamics. The methodology was developed around the concepts - Educating City (transcendent to the entity) and Cultural Heritage - and how they culminate in the field of action. In this regard, this study is divided into: 1) Doctrine of Educating Cities; 2) City, Culture and Education; and, finally, 3) Networks of cities. Primarily, the idea of city and city that educates is addressed, up to the concretization of the international entity. From here, the role of cultural life in city life is explored, i.e., its impacts and influences. Finally, current case practices are presented, justifying the aforementioned relationship by pointing out the path of action in the field of art history and heritage studies internationally under discussion. For this purpose, the synergies between the city that educates and the debate on heritage are highlighted by the normative instruments of the respective institutions, reflecting similar concerns and applications that become guidelines for the creation and development of spaces of memory and knowledge for the benefit of the community.

POSTER SESSIONS

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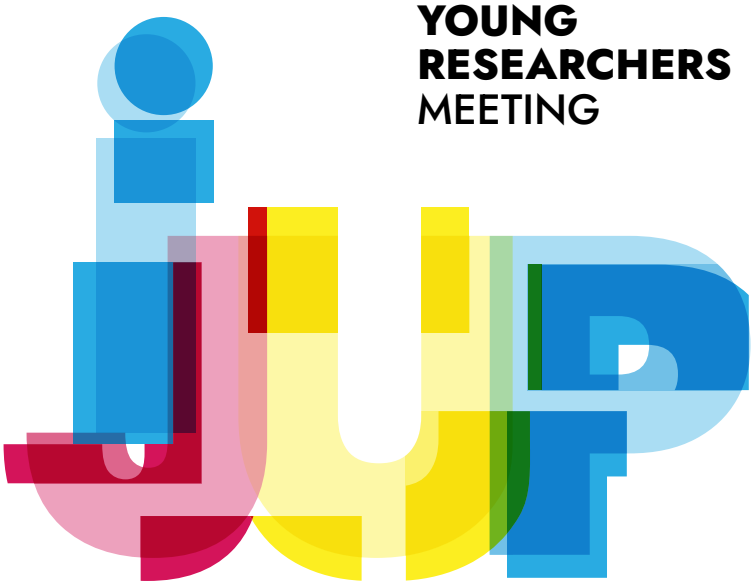

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Anthropomorphic Graffiti

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Abstract

Graffiti comes from the Italian word "Graffito" which means art in the form of an inscription calligraphed with complex elaboration. For the construction of a photographic series around the theme "Animalia", I decided to focus on capturing photographs of graffiti scattered around the city. The purpose of this project would be the collage/assembly of the animals present in the graffiti, in order to give wings to creativity and imagination, and create a new animal that, in a way, does not exist, that is, a "hybrid". Between the play between bodies and heads with different scales, the mixture between deformations, the multiplication of a component of the body, or the rough or precise cuts in the images, I carried out several experiments, to study what worked well together, or what would be necessary eliminate or highlight.

For the background, I explored between pastel tones and different, more vivid palettes, which contrasted well with the original colours of the graffiti chosen. From an overview, we can observe a colourful and fun composition, coherent and rational among themselves.

The irony in this visual narrative of "utopian animals" is clearly present, in an attempt to arouse the mood in the audience with these bizarre, eccentric and abnormal, but harmonious examples. This photomontage project aims to explore the context of the animal world, in a more creative variant that does not exist. This work contains several relationships with the photographic image, adopting the content and contexts of the original images to convey a witty and poignant new meaning, in order to explain to the public that there are many ways to explore, play and work with photography, not just the simple process of capturing an image. As a photography student, it was a fun new way to explore these techniques. I intend to arouse mixed feelings in the viewer about what seems familiar and what seems completely artificial and between what seems to be natural and at the same time extremely unnatural.

Figure 1. Anthropomorphic Graffiti

LEM3: A Promising Anticancer Agent for Neuroblastoma Therapy by Targeting Tap73

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Abstract

Introduction: Neuroblastoma (NB) is a pediatric tumor of the sympathetic nervous system, with high-risk patients still having low survival rates [1]. TAp73 is a tumor suppressor protein that regulates several genes involved in processes like cell proliferation and apoptosis. NB is also associated with MYCN amplification, which is associated with poor outcome [2]. Recently, the xanthone LEM2 was disclosed by our group as a TAp73 activator in NB cells, through inhibition of its interaction with MDM2 and mutant p53 [3]. However, its low aqueous solubility compromised further investigations. A new derivative, LEM3, was selected based on its improved drug-like properties.

Methods: The growth inhibitory activity of LEM3 was tested in the SK-N-BE(2) and SH-SY5Y NB cell lines using the MTT assay. The molecular mechanism of action and antitumor activity of LEM3 was investigated, in SK-N-BE(2) cells, after 48h of treatment with LEM3 through analysis of the expression levels of TAp73, Bcl-2 and N-MYC by western blot and of microRNAs involved in TAp73 pathway by TaqMan miRNA assays.

Results: The results showed that LEM3 has a high antiproliferative activity in SK-N-BE(2) (GI50 = 0.52 ± 0.09 µM, n=4) and SH-SY5Y (GI50 = 0.30 ± 0.003 µM, n=4) cells, which significantly decreased in HFF-1 fibroblasts (GI50 = 2.80 ± 0.14 µM, n=4). LEM3 also increased TAp73 and Bcl-2 levels, and decreased N-MYC levels, in SK-N-BE(2) cells. Additionally, it was demonstrated that LEM3 increased miR-143, in SK-N-BE(2) cells.

Conclusions: The potent antitumor activity of LEM3 towards NB cells may predict promising clinical applications in NB therapy. Additional studies are underway to further elucidate the mode of action of LEM3.

Acknowledgments

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References

[1] Zafar A. et al. Cancer Lett.,2021;
[2] Wolter J et al. Futur. Oncol.,2010;
[3] Gomes, S. et al.. Cancer Lett.,2019

A new control scheme for neuromuscular blockade with optimal initialization time

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Abstract

To provide surgery without pain, unconsciousness, and absence of movement it is necessary to deliver a precise dose of anesthesia to the patient, otherwise, it may bring adverse effects and complications during and after the procedure.

In recent years, control systems have received increasing importance and achieved important advances in biomedical applications. One example of application is the automatic control of drug administration in the context of general anesthesia, which aims to make the surgical procedure more precise, supporting the anesthesiologist and overcoming the inconveniences and limitations related to manual control, which consequently brings greater safety for the patient.

Despite all the work that has been done in this area, there are still problems related to continuous infusion. Therefore, a new strategy is proposed for the automatic control of the neuromuscular blockade (NMB level) during general anesthesia by means of the continuous infusion of rocuronium. This consists in the design of a controller based on steady-state model inversion with pole placement to be put into action at an optimal initialization time.

This state feedback control allowed, as desired, to accelerate the convergence to the desired level. However, since the acceleration of convergence is achieved at the expense of a higher drug dose, a trade-off between these two factors needs to be made. It was also found that by setting the controller to start at the optimal time, there was a reduction in the average dose that would have to be administered to the patient.

Where might the other rare plants be? - Biogeographic analyses of Portuguese threatened vascular flora kept at the PO Herbarium (MHNC-UP)

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Abstract

The Herbarium of the Natural History and Science Museum of the University of Porto (PO Herbarium) includes in its vast collection threatened Portuguese species, which are represented in the Red List of Vascular Flora from Continental Portugal. The Red List of Vascular Flora from Continental Portugal was made by a specialized team and from the data provided by the Portuguese herbaria, germplasm banks, living plant collections, and by the Flora-On that is a data portal coordinated by the Portuguese Botanical Society. This portal contains photographic, geographical, morphological, and ecological information for all vascular plant species in Portugal. The curatorship work realized in this study consisted of analyzing the PO Herbarium data of the species that are present in the Red List of Vascular Flora from Continental Portugal, updating the Herbarium database with new information, comparing the museum´s database with the information from Flora-On, and georeferencing the geographic data of the most relevant specimens. By comparing the PO´s with the Portuguese Red List´s data, we found new information regarding the location of the target species. This new information will now be available, allowing to improve the knowledge of threatened species in continental Portugal. We will present some of the most relevant results of this study, mostly of biogeographic nature. We will also talk about the important mission that Herbaria have in the conservation of current and historical data from flora and allowing the use of this potential for scientific acknowledgment.

Beta-Cells senescence in the beginning of Type 2 diabetes (T2D)

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Abstract

T2D is an age-related chronic disease characterized by an impairment in glucose metabolism. Pancreatic beta-cells are highly responsive to the alterations in blood glucose levels due to their crucial role in insulin production. In T2D, insulin resistance is observed and beta-cells are unable to respond to glycemia demands leading to hyperglycaemia. Cellular senescence is considered a key mechanism in the complexity of ageing. Senescent cells are associated with chronic fibrosis and systemic inflammation.

Even though the nature of beta-cells dysfunction in T2D is not fully understood, a link between the induction of beta-cells premature senescence and its metabolism alteration is suggested. In this study, we aimed to better understand the association between T2D and pancreatic senescence, particularly in the beginning of the disease. To this end, the effects of diet-induced diabetes and its relation with cellular senescence in beta-cells function were evaluated in an animal model.

C57BI/6J mice were subjected to a Normal Diet (ND) and a High Fat Diet (HFD) for 16 weeks. Food consumption, weight, glycaemia and lipidic profile were monitored. Alongside, pancreatic histomorphology analysis, quantification of beta-cell insulin expression, inflammation status, and senescence biomarkers were assessed at weeks 12 and 16.

T2D onset occurred at week 16 on the HFD group, corroborated by the glycaemia levels together with the weight and the lipidic results. At this time point, there was an increase in islets size and number accompanied by increased insulin expression. Also, an inflammation status of the diabetic group with increased pancreatic fibrosis was noted. Finally, increased GLB1 expression in beta-cells was observed.

Our findings indicate that increased GLB1 expression, a senescence marker, is directly proportional to insulin expression levels in islets cells of diabetic mice, suggesting an important role for senescence in the initiation of T2D.

Mineralogy and fluid inclusion studies in quartz from the Li-rich pegmatite veins from Segura

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Abstract

The study focused on samples from Li-rich aplite-pegmatitic veins hosted by metamorphic rocks of the Schist-Greywacke Complex that outcrop near the Segura granitic massif.

The studied samples show an aplitic texture predominantly constituted by albite in which the albitization of k-feldspars is present. The presence of phosphates such as apatite, fluorapatite, amblygonite-montebrasite with the intergrowth of lacroixite, aluminium and iron-manganese phosphates, minerals of the souzalite-gormanite series, columbo-tantalite, topaz, tourmaline and lepidolite were observed.

Fluid inclusions were studied in quartz from the samples in order to estimate the composition of the fluids involved in the formation of these veins. Three types of quartz were found in the studied veins: large and very fractured quartz, mosaic quartz with subgranulation and xenomorphic quartz with recrystallization. Petrographic, microthermometric and micro-Raman spectrometry characteristics of fluid inclusions in these quartz reveal the presence of an early aqueous carbonic H2O-CO2-(CH4-N2-NaCl) fluid. This fluid has been modified in a reducing context, by the interaction with the C-rich metasedimentary host rock, resulting in its enrichment in CH4 and N2. The significance of the trapped fluids is, at present, difficult to establish since fluid inclusions can correspond to relatively late events of fluid trapping.

The research was carried out under the scope of A. Yakovenko MSc thesis and was supported by Project ERA-MIN/0003/2019: Predictive models for strategic metal rich, granite-related ore systems based on mineral and geochemical fingerprints and footprints. ERA-MIN Joint Call 2019 on Raw Materials for Sustainable Development and the Circular Economy. The authors would like to thank Professor A. Mateus for providing the samples.

Alcohol Consumption in University Students: Relation with Self-Esteem and Sensation-Seeking

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Abstract

Alcohol is the most consumed substance in Portugal, that presents several direct and indirect consequences for health. Thus, alcohol consumption in university students is an area of investigation and intervention with great scientific interest. This study aimed to comprehend the relation between alcohol consumption and the variables self-esteem and sensation seeking, as well as to understand the possible differences according to gender. Through the use of a more general protocol that includes the Alcohol Use Disorders Identification Test (AUDIT), Rosenberg Self-Esteem Scale (RSES) e Brief Sensation Seeking Scale V (BSSS-V), we obtained a sample of 553 students from several Portuguese universities.

We concluded that Portuguese university students have a low risk of alcohol consumption, with men presenting a higher risk of alcohol consumption when compared to women. Regarding self-esteem, no relationship was found with the risk of alcohol consumption. In contrast, a positive correlation was found between the risk of alcohol consumption and sensation seeking, which could mean that greater sensation seeking may be related to a greater risk of alcohol consumption.

Keywords: Alcohol; Self-esteem; Sensation Seeking; Gender; University Students; Psychology.

Hydroxytyrosol from olive by-products and its use in cosmetic and hygiene products: a review

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Abstract

The future of economic and environmental sustainability relies on a circular economy model, saving resources and reusing wastes. The agro-industrial field produces, annually, large amounts of residues, some of them with significant and negative environmental impacts due to their high organic load and phytotoxicity. These phytotoxic by-products are extremely rich in bioactive compounds, namely phenolics, that can become a source of possible active ingredients for many industries [1].

The cosmetic industry is a growing economic sector, and the pressure to innovate in a highly competitive market and meet the needs of consumers and new consumption patterns of sustainability is real [2]. Each cosmetic or hygiene product has a life cycle significantly dependent of the designing stage and the nature of the raw materials used. It is essential to ensure that sustainability concerns have been considered when raw materials are selected and that they are capable of producing a formulation with good performance, safety, stability and aesthetic qualities [2].

An overview of the scientific literature on the cosmetic use of a specific food by-product, the olive pomace, and its main phenolic compound hydroxytyrosol, is presented. It focuses on the challenges of introducing olive pomace extracts into these products, as well as on new potential cosmetic formulations to be developed, increasing the value of this by-product and promoting waste reuse.

Acknowledgments

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References

[1] Rodrigues, F., Pimentel, F.B., Oliveira, M.B.P.P., 2015. Olive by-products: Challenge application in cosmetic industry. Ind. Crop. Prod. 70, 116-124

[2] Bom, S., Jorge, J., Ribeiro, H.M., Marto, J., 2019. A step forward on sustainability in the cosmetics industry: A review. Journal of Cleaner Production 225, 270-290

Assessment of contamination potential and environmental risk characterization- the case study of water resources affected by former Sb mine of Montalto

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Abstract

The present work is included in a multidisciplinary project that aims to identify a former Sb mine environmental effects by assessing soil and hydric resources contamination in that area.

Antimony is a critical material and is considered a priority pollutant by the EU and the US Environmental Protection. Adding to the hazards of Sb to humans are the environmental risks caused by Sb to the water, soil, and sediments.

Nine soil samples were collected, and several tests were performed: granulometric analysis, XRF analysis, soil pH, identification of the amount of organic carbon, and dynamic leaching.

Soil pH was acid for most samples, so it was not a suitable contamination indicator. Compared to samples from other sites, samples in tailings contained a low organic carbon (>1.5%). Only in the vicinity of the mine facilities Sb and As concentrations were higher than APA recommended guidelines, 1 mg/kg and 11 mg/kg, respectively. However, it is essential to assess the contamination of hydric resources for future research. Still, the preliminary results showed that even in a closed mine, environmental problems persist, even because there was not as much environmental awareness of the procedures as nowadays. So, it is necessary to carry on mitigation strategies to restore soil and hydric resources quality.

This work is a result of the project "SHS - Soil health surrounding former mining areas: characterization, risk analysis, and intervention", with the reference NORTE-01-0145-FEDER-000056, supported by Norte Portugal Regional Operational Program (NORTE 2020), under the PORTUGAL 2020 Partnership Agreement, through the European Regional Development Fund (ERDF). This work was financially supported also by Base Funding - UIDB/04028/2020 and Programmatic Funding - UIDP/04028/2020 of the Research Center for Natural Resources and Environment - CERENA - funded by national funds through the FCT/MCTES (PIDDAC).

Creating materials and strategies adapted to the target audience for teaching PLE articles: a distance learning experience at the University of Ljubljana

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Abstract

Several studies and qualitative and quantitative analysis of errors centered on the acquisition of the article by learners whose mother tongue (MT) lacks a morphological mark of the article, confirm that this acquisition may be one of the most persistent problems in the teaching and learning process of a foreign language. Regarding Portuguese as Foreign Language (PFL), this subject is complex, with deviations in the use of articles persisting even in learners on advanced levels of proficiency. The most frequent deviant occurrences reveal that the complexity that characterizes the uses of Contemporary European Portuguese (CEP) resides mainly in the ambiguity of the language input, as there is no stable standard. Moreover, there is the transfer of the learner's MT, who, in many cases, translates into omissions, either because of the lack of articles in their MT, as confirmed in this study, or because it works as an "escape strategy" to the learners when faced with the complexity of the uses. During a pedagogical internship, a need emerged to create teaching materials that would help in this process, as neither the books seem to respond to this problem, nor most existing studies propose specific materials. A total of 22 PFL learners from the University of Ljubljana attending level A1 whose MT, predominantly Slovenian, has no articles, participated in the study. Beforehand, its results, obtained from the students' written productions, confirmed the difficulty in acquiring and learning the use of articles in PFL, as well as allowed to carry out a qualitative analysis of the most critical and recurrent structures. For better understanding the results, we also investigated the intra- and extralinguistic characteristics that Slovene has to express definition and proposes an explicit description of the values of articles in CEP.

Regeneration of cork adsorbents used in the treatment of water contaminated with arsenic

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Abstract

Iron-coated cork granulates (ICG) are low-cost adsorbents developed to remove toxic arsenic from drinking water. This work studied the possibility of regeneration of ICG saturated with arsenic, through the chemical desorption of the element, allowing the optimization of the adsorption process and the extension of the useful life of the adsorbent.

For this, several eluents (bases, acids, salts and complexing agents) were tested in batch mode to select the one that best fulfilled the objective. For the detection of the amount of desorbed arsenic, spectroscopic methods (atomic emission and absorption) were used.

The eluent that obtained the best desorption efficiency (90%) was NaOH 0.1 M. However, due to the yellow colour of the samples, tests were carried out to determine the Total Organic Carbon (TOC), which showed that this eluent was very aggressive to cork, leading to the release of organic compounds to solution. The eluent NaOH 0.01 M achieved a desorption efficiency of 70%, which was lower compared to NaOH 0.1 M, but the release of organic compounds was also lower.

The kinetic curves of the NaOH 0.01 M and 0.1 M eluents were analysed, to find the best contact time that would allow the maximum removal of arsenic and the minimum release of iron and organic compounds. The kinetic model that best fitted the two curves was the Elovich model ($R^2 > 0.98$).

Consecutive adsorption and desorption cycles were also carried out using NaOH 0.1 M and 0.01 M. For the stronger base, the adsorption capacity dropped from 5.0±0.7 mg/g to 0.6±0.1 mg/g after the first regeneration cycle, which confirms that the adsorbent is degraded by the eluent. For NaOH 0.01 M, cork suffered a lower loss of organic matter, and this allowed a greater adsorption capacity of arsenate even after 4 cycles (1.0±0.1 mg/g).

Thus, the iron-coated cork granulates proved to be able to be regenerated by several eluents and the eluent that proved most suitable for large-scale application was NaOH 0.01M.

Effect of time and temperature on the alkaline degradation of a polyester geogrid

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Abstract

The application of geosynthetics in civil and environmental engineering works (e.g. roads, railways, reservoirs, waste landfills or coastal protection structures) is nowadays a common practice. During their service life, these materials may come in contact with many different agents, which can induce undesirable changes in their properties. Examples of degradation agents include: liquids (water, seawater, or leachates), high temperatures, oxygen or solar radiation. In many applications, geosynthetics are expected to last a long time (up to 100 years) and, therefore, they must have a high resistance to degradation.

This work studies the degradation of a geosynthetic (a polyester geogrid) in alkaline media. For that purpose, laboratory accelerated tests were performed. These tests consisted of immersing the geogrid in a solution of sodium hydroxide, 0.5 mol/L, at different temperatures (up to 90 ºC) and during different periods of time. The damage suffered by the geogrid during the immersion tests was assessed by monitoring its mass per unit area and tensile behaviour.

The immersion of the geogrid in a solution of sodium hydroxide, 0.5 mol/L, caused relevant reductions in the mass per unit area and tensile strength of the geogrid, which can be ascribed to the hydrolysis of its polyester filaments. The rate of hydrolysis depended on the temperature, being higher with the increase of temperature. The increase of time also resulted in a higher degradation of the geogrid. Finally, it was possible to find a correlation between the decrease of the tensile strength of the geogrid and the reduction of its mass per unit area.

This work was financially supported by: (1) project UIDB/50006/2020 and UIDP/50006/2020 funded by FCT/MCTES through national funds, and by (2) Base Funding - UIDB/04708/2020 of the CONSTRUCT - Instituto de I&D em Estruturas e Construções - funded by national funds through the FCT/MCTES (PIDDAC).

Unearthing SARS-CoV-2 receptors and proteases in human testicular tissues

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Abstract

SARS-CoV-2, the virus associated with COVID-19 pandemic, belongs to the Coronavirus family known for two pandemics in the past, namely SARS-CoV in 2002 and MERS-CoV in 2012. Thus the emergence of a new variant of this family cannot be excluded in the future. It is now known that the disease caused by SARS-CoV-2, COVID-19, is not just respiratory as initially thought, but is considered a systemic pathology, as it has been shown that several organs can be affected. The focus of this study was the human testis due to its vulnerability to viral infections. The blood-testis barrier, formed by tight junctions between adjacent Sertoli cells, has not been shown to be able to completely prevent viruses such as Zika, Ebola, HIV, and HPV from entering the testis adluminal compartment and thus infecting human semen. Hereupon, it is important to unravel the coronavirus ability to invade human testis and its further implications for male fertility and subsequent progeny. Hitherto, we aimed to study the presence and distribution of SARS-CoV-2-receptors, ACE2 and CD147, and their S protein priming-host cell proteases, TMPRSS2 and CTSL, respectively, involved in virus entry into host cells.

The expression of these proteins was determined in three testicular pathologies, namely, hypospermatogenesis, maturation arrest, and Sertoli cell-only syndrome, by immunohistochemistry. Testicular biopsies were obtained from men undergoing infertility studies and after patient written and informed consent. This study was approved by the ICBAS/CHUP Ethics Committee.

Our results revealed the expression of all four proteins in the human testicular tissue, demonstrating that SARS-CoV-2 can use both SARS-CoV receptors for entry and both proteases for priming the S protein for testicular infection. Nevertheless, further determination of specific cellular and subcellular location is necessary to ascertain the potential for infection and transmissibility via semen during unprotected sexual intercourse.

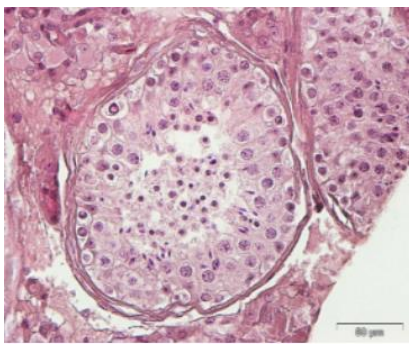

Figure 1. Section of the human seminiferous tubule, showing the cells of the spermatogenic cycle, Sertoli cells and germ cells (optic microscopy, hematoxylin-Eosin staining)

tereological analysis of human donor oocytes

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Abstract

During Assisted Reproduction Treatments, supraphysiological doses of gonadotropins are used to ensure that a desired number of mature oocytes is obtained. However, not all oocytes retrieved are at the mature stage of metaphase II (MII). Although in vitro maturation of immature oocytes, at germinal vesicle (GV) and metaphase I (MI), may be performed, these do not always acquire the competence to support embryonic development. Indeed, this competence requires synchronized nuclear and cytoplasmic maturation from the prophase I stage to the MII stage, involving the reorganization of organelles and chromosomes in the oocyte cytoplasm.
While by light microscopy inspection the nuclear competence of the retrieved oocytes (presence of the first polar body) can be evaluated, the same is not possible for the cytoplasm.
Our research group previously performed the stereological analysis of immature human oocytes, at the GV and MI stages. In the present study, we aim to first describe the ultrastructure of human MII oocytes and the organelles cytoplasmic relative volumes (Vv) and distribution, and secondly to compare the results with those obtained previously for GV and MI oocytes.
After written and informed consent, 5 donated MII oocytes were processed for transmission electron microscopy under the Ethics Committee approval (2019/CE/P017 (266/CETI/ICBAS)). A classical manual stereological technique based on point-counting was used to evaluate the cytoplasmic Vv of the organelles and their distribution. The Kruskal-Wallis and Mann-Whitney U tests with Bonferroni correction are being used to compare the means of Vv occupied by organelles.
At the moment, oocytes were fully processed and several organelles were described, such as mitochondria, smooth endoplasmic reticulum (SER) elements, cortical vesicles, lysosomes,

dictyosomes and SER tubular aggregates. Data suggests that even donor mature oocytes may present compromised cytoplasmic maturity.

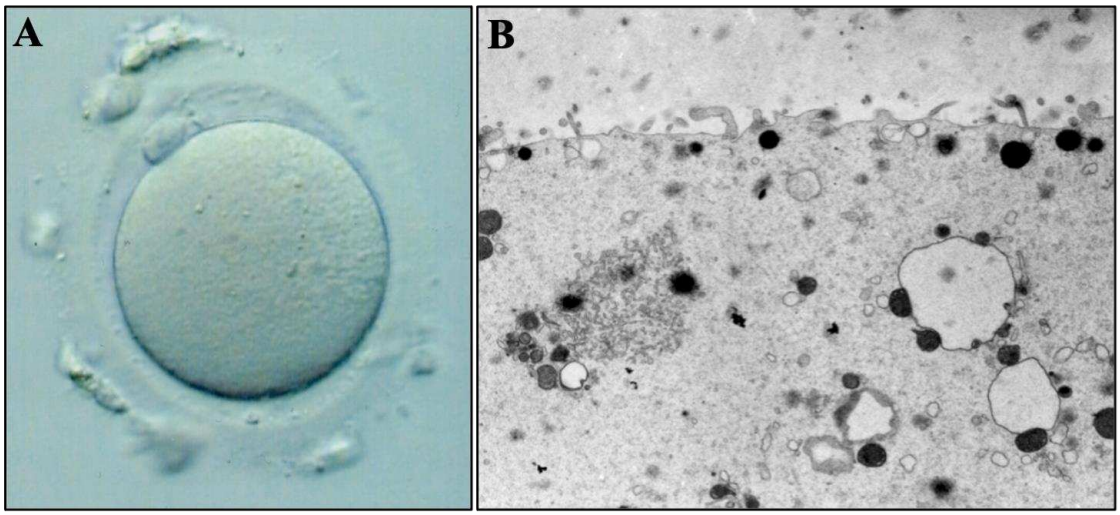

Figure 1. A. Live human MII oocyte (inverted microscopy). B. Ultrastructure of the cortical region of a mature MII human oocyte (transmission electron microscopy)

Electrochemical determination of cholecalciferol (vitamin D3) in water-ethanol mixtures using a glassy carbon electrode and unmodified screen-printed carbon electrodes

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Abstract

Vitamin D, one of the many nutrients essential for the body´s normal functioning, can mainly be found in two forms: ergocalciferol (vitamin D2), found in plants and acquired through ingestion, or cholecalciferol (vitamin D3), produced by the body when exposed to sunlight.

In this project, an electrochemical method was developed and optimised in order to determine vitamin D3 based on its irreversible oxidation at +1,2 V (vs. Ag/AgCl, 3 mol L-1 KCl). For such, a glassy carbon electrode (GCE) and a platinum electrode, as working and auxiliary electrodes, respectively, completed the three-electrode system. Furthermore, unmodified screen-printed carbon electrodes (SPCE) were also used.

Cyclic voltammetric studies carried out on the GCE led to conclude that the optimised electrolyte solution was of equal parts water: ethanol (1:1) and 0,100 mol L-1 of lithium perchlorate. Square wave voltammetry was the most suitable voltammetric method for vitamin D3 determination, when the amplitude is 50 mV, the potential step is 5 mV and the frequency is 50 Hz. This method showed to be precise and had a linear response under constant stirring between 1,40 and 123 µmol L-1 of cholecalciferol. The limits of detection and quantification obtained were, respectively, 0,587 µmol L-1 and 1,96 µmol L-1. The optimised method was then applied on commercial tablets of vitamin D3.

The method was also adapted and optimised for unmodified SPCE, where it showed to be precise and had a linear response when using different drops of the same solution between 0,103 and 1,63 mmol L-1 of cholecalciferol.

Acknowledgements

This work received financial support from PT national funds (FCT/MCTES, Fundação para a Ciência e Tecnologia and Ministério da Ciência, Tecnologia e Ensino Superior) through the project UIDB/50006/2020 and UIDP/50006/2020. Additionally, RMR would like to acknowledge the support through the Individual Call to Scientific Employment Stimulus (Ref. CEECIND/04259/2017).

Microtubule reorganization in epithelial tissue by optogenetic clustering of basolateral proteins

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Abstract

Epithelial tissues ensure organism homeostasis by maintaining the inside-outside organ compartmentalization. The loss of epithelial integrity is associated with diseases such as gastric ulcer, bacterial infections, and cancer. Epithelial function relies on spatial asymmetry, often termed apical-basal polarity, which is necessary to orient vesicle trafficking and to distribute proteins, lipids, and organelles to confer specialized functions to distinct cellular regions. Apical-basal polarity is defined by a set of evolutionarily conserved polarity determinants, including the aPKC/Par-6/Cdc42 and Crumbs-Stardust complexes in the apical membrane domain and Scribble (Scrib), Lethal giant larvae (Lgl), and Discs large (Dlg) in the basolateral side. However, the molecular coordination between the core apical-basal polarity machinery and the cytoskeleton is poorly understood. Using an optogenetic tool (Light Activated Reversible Inhibition by Assembled Trap) to induce timely controlled protein aggregation upon blue light exposure, we have previously found that optogenetic clustering of basolateral proteins in the Drosophila follicular epithelium induces microtubule-dependent accumulation at the apical-lateral border. This raised the hypothesis that the polarized microtubule cytoskeleton could contribute to further functional regionalization of the lateral membrane. We are thus using optogenetic clustering to study the interplay between microtubule organization and the membrane polarity machinery. Our preliminary results suggest that optogenetic clustering of Scribble-GFP causes microtubule reorganization by itself. This finding has driven us on a curiosity-driven journey that may have implications for the design of optogenetic technologies and to our understanding of polarized microtubule organization in epithelia.

Aquaglyceroporins in Sertoli cells: a target of male hypogonadism?

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Abstract

Male hypogonadism is a hormonal pathology characterized by low plasma testosterone (T) levels. Decreased circulating T levels are known to be directly related to poor fertility outcomes and decreased sperm quality. Sertoli cells (SCs) ensure an adequate ionic and nutritional environment for spermatogenesis. These cells are highly responsive to multiple hormones, with several of their membrane transporters being modulated by hormonal fluctuations. Glycerol is crucial for the maintenance of the blood-testicular barrier, with high concentrations negatively impacting the spermatogenic event. Aquaglyceroporins (AQPs) mediate the passage of glycerol through the biological membranes and their activity is known to be regulated by hormones. Nevertheless, the effects of chronic hormonal changes on the expression and function of AQPs in SCs have not yet been fully elucidated. This work aims to explore comparatively the impact of hormonal dysregulation associated with hypogonadism in the expression and function of AQPs in human and mouse SCs (TM4 cell line). Mouse and human SCs were chronically exposed (during 72 hours) to different concentrations of follicle-stimulating hormone (FSH) and T mimicking primary hypogonadism, secondary hypogonadism, and physiological situation. Then, AQPs gene expression was assessed by conventional PCR and quantitative PCR, and AQPs function by analysis of glycerol membrane permeability via Stopped-Flow Light Scattering. The first results of this work show a lower expression of AQPs and alteration in glycerol permeability in human and mouse SCs when faced with hormonal mimicry of secondary hypogonadism. This suggests that, despite the preliminary nature of these findings, AQPs seem to contribute to infertility in cases of secondary hypogonadism and may be an important target in cases of male (sub)infertility.

Contamination of natural water streams with antibiotic resistant bacteria in rural areas near Porto

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Abstract

Enterobacteriaceae producing extended-spectrum β-lactamases (ESBL), AMPc beta-lactamases and carbapenemases, are increasingly being reported in the environment. This is a matter of concern mainly due to the possibility of transmission in different ecological niches and humans.
The aim of our work was the detection of antimicrobial resistant bacteria in small water streams and rivers (Douro and Tâmega) in a rural area near Porto.
Seven water samples from the south region of Marco de Canavezes, were collected and different volumes were analyzed. The membranes were placed in MacConkey agar and MacConkey agar with ampicillin, cefotaxime and meropenem (separate plates) and incubated overnight at 37ºC. Isolates of lactose fermenting Gram negatives were chosen from MacConkey agar with cefotaxime and meropenem and colonies were randomly selected to further phenotypic characterization. Isolates were tested for antimicrobial susceptibility by agar diffusion method according to EUCAST. Additionally, AMPc-producers, ESBL-producers and carbapenem resistant isolates were presumptively identified in Chromagar Orientation. AMPc producers were confirmed by inhibition tests, ESBL producers by double disk-synergy-test and carbapenemase producers by the Carbapenem Inactivation Method (CIM).
Fecal contamination was found to be a common occurrence in the studied water streams. From a total of 44 Gram negative isolates, 37 were Enterobacteriaceae, 8 *Escherichia coli* isolates, 6 KESC (*Klebsiella, Enterobacter, Serratia, Citrobacter*) and 7 *Pseudomonas spp*. isolates were included due to relevant antimicrobial resistance. Ten of this 44 isolates are ESBL producers, 4 are AMPc and 5 are carbapenem resistant.
These findings reflect intestinal colonization of the population with antimicrobial resistant Gram negatives. Such contamination was unexpected reflecting fecal contamination of these areas with antimicrobial resistant threats.

The casual language of architecture: studies on immanence

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Abstract

This research relates the field of Architecture to the branch of philosophy called Tragic Thought and to the practice of postmodern dance known as Contact Improvisation. Through the concepts of authorship, materiality and chance, it elucidates the process of production and development of buildings over time. The purpose of the conceptualization is to defend and illustrate the possibility of conceiving the architect's role not as a creator of objects, but as a trigger for processes. In this sense, the tragic affirmation of existence, deriving from the tragic thought, as well as the resignification of the author's role, arising from the Contact Improvisation, are subsidies for the construction of the argument. Thus, the path of an architecture inseparable from its immanent logics is advanced - that is, a designed reliance on contextual aspects and flows.

The examination of the process of formation of the current way of conceiving the craft, through a historical overview focused on the invention of the architect in the West, as well as the analysis of three case studies of contemporary practices - including interviews with their authors, namely Lacaton and Vassal, Georges Descombes and Carla Juaçaba - demonstrate the viability of a notion of authorship not based on the concentration of agency on one subject, but on it´s programmed dilution between its circumstance and its actors. In that regard, the theoretical path explored here greatly resembles the investigations promoted in the 1970´s, in the field of dance, by the north american choreographer Steve Paxton, who was also interviewed for this dissertation. What is explored here, then, as a causal language of architecture, is the possibility of establishing a common ground to catalyze the inevitable transformation of the environment caused by the unpredictability of life in such a way as to enhance the qualities of the built world.

Humoral Immune Response Induced by An Intranasal Immunization with *Toxoplasma Gondii* Membrane Antigens Plus Cpg Oligodeoxynucleotides Using the Mouse Model

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Abstract

Toxoplasmosis, the disease caused by the obligate intracellular protozoan parasite *Toxoplasma gondii*, has an important impact in human health worldwide, especially in pregnant women. Primary infection in the first or second trimester of pregnancy may lead to stillbirth, premature birth or abortion, whereas in the third trimester a high risk of congenital transmission occurs, which may lead to diverse clinical manifestations such as neonatal malformations resulting in mental retardation, blindness, epilepsy or even death. This disease can develop into cerebral or ocular toxoplasmosis especially in immunocompromised patients, such as those with HIV/AIDS, undergoing cancer chemotherapy, newly transplanted, or in the elderly. At present, the usual treatments against toxoplasmosis are not effective and there are no available vaccines preventing human toxoplasmosis. Thus, the development of a safe and effective vaccine for human use remains urgent.

Previous work by us has demonstrated that intranasal immunization using membrane antigens from *T. gondii* (TgMP) plus CpG adjuvant conferred protection against murine acute *T. gondii* infection. The main goal of the present work was to characterize the systemic (IgG1 and IgG2a) and mucosal (IgA) humoral immune responses of TgMP-immunized and sham-immunized mice, at different time-points after immunization, by Enzyme-Linked Immunosorbent Assay (ELISA). The obtained results demonstrated that immunization with TgMP plus CpG adjuvant induced a significant increase of TgMP -specific IgG1, IgG2a and IgA compared to CpG immunization, at both short and long term after immunization. These data are promising and allow the conclusion that this formulation could be a good option for the development of an effective vaccine against toxoplasmosis. Future experiments will allow the evaluation of cell-mediated immunity induced by TgMP plus CpG immunization, which is essential in the protection against infection by *T. gondii*.

Scientific and historical data of INA Herbarium: cataloging as a means of botanical and patrimonial research

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Abstract

The Instituto Nun´Alvres (INA) has a remarkable collection of herbarium specimens that remain deeply understudied. It is composed of a vast quantity of specimens collected primarily by Jesuits, including Alfonso Luisier, who were pioneers in the experimental teachings of the natural sciences in Portugal and contributed to the national and international dissemination of the discovery and classification of new plant species during the end of the 19th and beginning of the 20th centuries. After the expulsion of the Jesuit order in 1910, the new Portuguese Republic seized Jesuit scientific collections and A. Luisier was able to retrieve part of his material thanks to the intervention of the Swiss consul. This material can now be found at the Instituto Nun'Alvres Herbarium (INA), but is currently at the facilities of the Natural History and Science Museum of the University of Porto (PO Herbarium) for a thorough curatorship.

The specimens of this collection are from all over the country being organized in folders according to their families. Most of the specimens are originals from Herbário do Colégio de Campolide and Herbário do Instituto Nun'Alvres - Caldas da Saúde. There are also a variety of duplicates from other Herbaria, such as Estação Agronómica Nacional - Herbário, and Jardim Colonial de Lisboa. In terms of affiliated collectors, A. Luisier, Arnaldo Rozeira, and Gonçalo Sampaio were some of the most prolific ones.

The main objective of this study is to create an inventory based on the taxonomic classification and historical information provided by these specimens in such a manner that this collection can be part of the Portuguese scientific and cultural heritage and it can also be a source for future research that aims to further investigate and promote the local flora.

Autophagic proteins ATG5, Beclin-1, Rab7A and LC3 are altered by Synthetic *Cannabinoids in NG108-15 brain-derived cells*

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Abstract

Introduction & Aim: Synthetic Cannabinoids (SCs) comprise a chemically heterogeneous group of new psychoactive substances (NPSs) that have gained popularity as drugs of abuse over the past decades. Despite being frequently involved in fatal and non-fatal intoxications, the underlying toxicological mechanisms are far from being completely understood. Our group recently showed that 11 out of 14 SCs tested (from different classes) increased autophagy, as indicated by the higher number, compared to control, of autophagosomes in NG108-15 neuroblastoma x glioma hybrid cells, following 24h exposure. Herein, we aimed to assess the effects of the 11 SCs that proved to increase autophagic flux in the expression of proteins involved in autophagy in the same neuronal cell model. Methods: The expression of ATG5, Beclin-1, Rab7A, LC3, and ubiquitin was analysed by Western blot, after incubation of NG108-15 cells with the 11 SCs at 1 nM and/or 1 µM (the concentrations eliciting autophagy) during 24h. Results were normalised against β-actin and expressed as mean ± SD of the fold-change relative to the solvent control. Statistical analysis was performed using one-way ANOVA, followed by Dunnett's post-test. Results: Despite the lack of statistical significance ($p>0.05$), our preliminary data consistently showed an increase in ATG5 for all tested SCs, and in Beclin-1 for all except 1 nM AB-CHMINACA and 1 nM 5F-AMB. Furthermore, increases in Rab7A protein levels were observed for 1 µM AB-FUBINACA, 1 nM AB-PINACA, 1 nM AB-CHMINACA and 1 µM SDB-006; and in LC3 for all SCs except 1 nM AMB-FUBINACA, 1 µM AB-FUBINACA and 1 µM JWH-122. Conclusions: Although further experiments are being conducted to confirm these results, the distinct patterns of expression of proteins involved in nucleation (as assessed by Beclin-1), elongation/ maturation (ATG5 and LC3) and fusion (Rab7A) steps, indicate different mechanisms of autophagy triggered by the tested SCs.

Synthetic Cannabinoids in Differentiation and Proliferation of NG108-15 Cells in vitro

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Silva, João Pedro, REQUIMTE
Dias da Silva, Diana, REQUIMTE

Abstract

Introduction: Synthetic Cannabinoids (SCs) are the largest group of new psychoactive substances monitored by the EMCDDA through the EU Early Warning System. The abuse of these substances embodies major public health and social risks as they have been responsible for numerous intoxications and deaths. In particular, their abuse by adolescents and young adults (including pregnant women and women of childbearing age), is concerning as the exposure of the developing brain to these substances may lead to the onset of neurodevelopmental disorders.
Aim: Thus, this work hypothesizes that the abuse of SCs may also exert profound negative effects during neurogenesis.
Methods: To test this hypothesis, a neuroblastoma x glioma hybrid cell line NG108-15 was exposed to 3 SCs, AMB-FUBINACA, AB-CHMINACA and HU-308 (a selective agonist of CB2), at concentrations considered biologically relevant (1pM, 1nM and 1µM). Cell differentiation was assessed by measuring the differentiation ratios (i.e., percentage of primary neurites per total cell number) and the total length of neurites, after 72h incubations in differentiation medium. Cell proliferation was evaluated by the sulforhodamine B assay (SRB) up to 72h.
Results: AMB-FUBINACA ($p<0.01$, at 1pM and 1µM) increased the differentiation ratios and the total length of primary neurites ($p<0.05$, at 1nM). On the other hand, neither AB-CHMINACA nor HU-308 significantly affected neuronal differentiation. Since NG108-15 cells do not express the CB2 receptor, data obtained with HU-308 suggest that SC-induced neurodifferentiation in these cells does not depend on CB2 activation, although this hypothesis still needs to be clarified. None of the drugs affected cell proliferation at the concentrations tested.
Conclusion: These results show that one of SCs most consumed worldwide impacts in vitro neuronal differentiation, suggesting that significant post-exposure effects that depend on the abused SC may also occu

Single case study on the possible influence of the deviant trajectory of the parents in the deviant behaviour of a young teenage girl

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Abstract

The investigation to be presented aims to explore whether the deviant behaviour of parental figures did or did not have influence in the deviant trajectory of an adolescent girl, exploring the broader set of factors associated with her deviance onset and progression. The intergenerational transmission of crime was used as the main theoretical-conceptual reference for this study. A single case study methodology was used aiming at the in-depth exploration and analysis of the past and recent life events, through the biogram technique (an autobiographical research tool), of a 16-year-old Portuguese institutionalized girl. Study participants also include her mother and two professionals of the institution (psychologist and social worker) who collaborated through semi-structured interviews. In data analysis it was adopted an analytical strategy of systematization and graphical mapping of the factors and events that emerged from the collected material as the most prominent in the young woman´s trajectory. A diagram was then constructed with a holistic and comprehensive representation of the dimensions that were identified as being (de)structuring of the past and future personal experience of the girl. This case study showed to be a good example of the intra-family mechanisms of crime reproduction described by Farrington, such as intergenerational exposure to multiple risk factors, mediation through environmental risk factors, and the mutual and direct influence of family members. Evidence also points to the direct and indirect influence of family dysfunction (along with economic, moral, emotional, and educational precariousness of the girls´ psychosocial environment) in the deterioration of her conduct towards delinquent expressions.

474: JACARÉ-COPACABANA The project of a beach line

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Abstract

Usually, drivers like to drive on days without rain. With us the opposite happens: we love to drive when it's raining, because we know we´ll work without stress.
474's driver.
The 474 (read quatro sete quatro) is a bus line of Rio that connects the neighborhood of Jacaré - one of the most dangerous and miserables in the city - to the rich and touristic zones of Copacabana and Ipanema. Conceived primarily as a mean to feed downtown and the south zone with cheap workers, the line assumes a subversive character during weekends when it is appropriated as a vector by the poors to go to the beach.
Baptized as hell´s line, the 474 has acquired the status of urban myth. It would rely on it the responsibility of the chaos and insecurity that disturbes the tranquility of the decent folks. Its large number of robberies is responsible by a path of terror that serves as plataform for discriminatory speeches that criminilizes the access of the marginalizated population to the beach.
This work is concerned in revealing and registering the dynamics and processes of partition, porosity and identity of a portion of Rio reduced to the crime in its representations. Through an approach by different types of drawing we pretend to represent this line as a large system of spaces, representative of the inequalities of access to the leisure structure of the city, its schemes of forces and negotiations included.
The dissertation recognizes from scratch a referencial direction in its approach and structuring - from Jacaré to Ipanema. Its path leads to a project essay in the line former terminal. The project, more than a solution, is understood as a means of discussion of the possibilities of architecture towards a such well-conceived oppression system.

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Figure 1. Sunny weekend in the 474

From the blue ocean to the test tube: Chemical profile and biological activity of *Stypocaulon scoparium L.*

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Abstract

With the need to discover new compounds and their functions, the pharmaceutical industry has focused, over the past decades, on the study of different biomatrices, such as seaweeds. Seaweeds or macroalgae are autotrophic living beings that present in their chemical composition important elements for their development and support in the oceans, also producing secondary metabolites that are equally crucial for their survival having also a huge interest for scientific community for their therapeutic potential. Therefore, our aim was to perform both chemical and biological characterization of the brown alga *Stypocaulon scoparium L.*, that can be found over the Mediterranean and Atlantic North, in which case it was collected in Aguda beach, Vila Nova de Gaia.

Ethanol extract of *S. scoparium* was chemically characterized concerning fatty acid composition (determined by GC-FID), as well as phenolic and pigment profiles (by HPLC-DAD). In addition, it was also evaluated the antioxidant potential of the extract through the DPPH and NO radicals scavenging assays.

Despite the mild antioxidant effect observed, ethanol extract of *S. scoparium* revealed the presence of beneficial molecules with possible therapeutic applications, namely: i) monounsaturated fatty acids, such as oleic acid and ii) polyunsaturated fatty acids, such as α-linolenic acid and linoleic acid and iii) pigments, including fucoxanthin and chlorophyll a derivatives, proving that further studies are needed to explore the full potential of this seaweed species.

This work was developed within the optional curricular unit “Bioactivity of Natural Matrices” of the 4th year of the Master Degree in Pharmaceutical Sciences of the Faculty of Pharmacy, University of Porto, under the responsibility of Paula Andrade (Head) and Patrícia Valentão.

Salicornia ramosissima: A possible green alternative with valuable bioactive properties for cosmetics

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Abstract

The cosmetic industry has been continuously growing worldwide, being one of the biggest and successful industries. In recent times, consumers have been more aware of the cosmetics origin and production process as well as their ecological implications and safety. Since consumers correlate botanicals with safeness, these ingredients began to constitute desirable compounds over synthetic ones for cosmetic formulations. *Salicornia ramosissima* is a halophyte plant widely distributed. Despite its human consumption, halophytes remain under valorized regarding its bioactive composition, being rich in antioxidants and lipid components. This study aims to extract and validate a new active ingredient from *S. ramosissima* through in-vitro assays, to highlight its potential use in skin formulations. The halophyte's extracts were obtained by subcritical-water extraction (SWE) at different temperatures (110, 120, 140, 160 and 180 ºC) and the antioxidant and radical scavenging activities as well as the phenolic profile were screened. The sample extracted at 180 ºC presented the highest phenolic content (1739.28 mg/100 g dw), along with phenolic acid predominance (1054.77 mg/100 g dw). Despite not being efficient in the sequestration of the radical ABTS+., this extract was the only that reasonably sequester the DPPH• (IC50 = 824.57 μg/mL). The scavenging capacity of superoxide (O2•−) and hypochlorous acid (HOCl) were also considerable (respectively, IC50 = 158.87 µg/mL and IC50 = 5.80 µg/mL). Cell viability assays (through MTT) on keratinocytes, and fibroblasts showed that the keratinocytes viability was not affected after exposure to the extract, while the fibroblasts viability slight decreased. The results obtained support the bioactivity of *S. ramosissima* and its possible use as a cosmetic ingredient. Further studies, particularly enzymatic activity assays and ex-vivo permeation, should be performed to ensure this new application.

Perceptions of incarcerated women regarding their mothering experiences: a qualitative approach

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Abstract

For a long period of time, female imprisonment did not constitute a social concern, above all, due to its reduced statistical expression. However, recently, as the female prison population increases, scientific research about it has been facing a great development. Within this research field, the study of maternal reclusion is considered to be a central theme. In fact, despite holding the status of mothers and the expectation for them to meet universal standards of maternal behavior, female inmates experience difficulties in achieving those traditionally defined motherhood goals, since the physical separation between mother and children not only limits the exercise of most practices associated with motherhood, but also challenges the mother-child relationship, compromising the maternal identity. Thus, combining qualitative and quantitative strategies, this study sought to analyse the mothering experiences of Portuguese incarcerated women. Specifically, using a brief questionnaire, it aims at exploring questions related to mother´s sociodemographic data and legal information; the children relation between them and their children; and their compliance within the custodial measure. Also, using semi-structured interviews, this study aims at exploring the interviewees perceptions regarding the reproduction of intensive motherhood principles while in prison; the pathways available for female inmates to assist their children;; the experience of mother-child separation; the strategies employed with regard to the maintenance of the maternal role; the importance of the inmates´ family support; and the experiences developed within the prison context that seek to promote the preservation of affective ties between mother and child during the length of the sentence. This paper seeks to discuss the study´s methodology and preliminary results in order to deepen the subsequent data analysis.

Dissecting unexplored mechanisms underlying transthyretin neuroprotection in Alzheimer's Disease

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Abstract

Transthyretin (TTR) is a neuroprotective protein with angiogenic properties that can assist brain Aβ elimination at the blood-brain barrier (BBB), therefore being studied in the context of Alzheimer's disease (AD) where its levels and stability are decreased.

Our work aims to further study the role of TTR on the elimination of Aβ at the BBB, and to investigate if TTR also participates in Aβ clearance across the blood-cerebrospinal fluid barrier (BCSFB). We also aim to clarify how TTR stability influences our group's previous findings, namely its angiogenic properties and the expression of the main Aβ receptor for brain elimination, LRP1 [1].

We assessed if TTR stability influenced the angiogenic capacity by comparing the effect of L55P, an instable isoform of TTR, with wild type TTR using the in vivo chick chorioallantoic membrane (CAM) assay. Both proteins displayed angiogenic capacity, with no significant difference between them and therefore the angiogenic properties of TTR are not stability dependent.

We quantified the levels of LRP1 in the hippocampus and cortex of transgenic AD animals with different TTR backgrounds, to assess the role of TTR on Aβ clearance. The analysis did not reveal any significant difference, although a tendency was observed with LRP1 signalling decreasing with the decreased expression of TTR.

The effect of TTR tetramer stability on LRP1 expression was also studied by comparing the same AD animal model subjected or not to an IDIF (TTR tetramer stabilizer) treatment. The LRP1 quantification did also not reveal any significant difference although a tendency was observed, where the stabilization of TTR would lead to an increased LRP1 signal.

Regarding the BCSFB related studies, at the present we are characterizing a human choroid plexus epithelial papilloma (HIBCPP) cell line.

References

[1] Gião, T., et al. (2020). "Undiscovered Roles for Transthyretin: From a Transporter Protein to a New Therapeutic Target for Alzheimer's Disease."IJMS 21(6):207

Exploring the GDME extraction process for the determination of formaldehyde in wood-based panels

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Abstract

Formaldehyde is a volatile organic compound used in many industries and has for long been considered one of the most relevant indoor air pollutants, because of its carcinogenic and toxic properties. As one of the main constituents of adhesives and resins used to produce wood-based panels (WBPs), formaldehyde can be released from these products through time. Considering the hazardous effects to human health, it is important to develop tools that can simply and accurately measure its content in different materials.

For the formaldehyde extraction, the GDME (Gas-diffusion microextraction) method was used: a technique developed for the extraction of volatile and semi-volatile compounds, which allows the simultaneous extraction and derivatization of analytes. For this purpose, as acceptor phase, an acetylacetone solution was used since it is quite selective for formaldehyde and forms a greenish yellow derivative that can be analysed in a spectrophotometer at a wavelength of 412 nm.

In this work, different experimental parameters and extraction configurations were evaluated to optimize the extraction of formaldehyde from model solutions and from WBPs. These include the evaluation of possible matrix effects affecting the extraction, performed under different conditions, by comparing two quantification methods: calibration curves and standard additions. Furthermore, it was studied the effect of changing the concentration of the derivatization solution or the time required to reach a plateau on the extraction process.

Acknowledgements

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Consumption of psychoactive substances in outpatients at Hospital Magalhães Lemos

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Abstract

Introduction: The frequency of the consumption of psychoactive substances in people with mental illness are a public health concern, with impact in patients´ outcomes.

Objectives: The aim of this study is to explore among the frequency of consumption of psychoactive substances in outpatients of Hospital Magalhães Lemos and identify what are the individual characteristics associated with different consumptions.

Methodology: Application of the ASSIST (Alcohol, Smoking and Substance Involvement Screening Test) questionnaire to users at the outpatient clinic of the Hospital Magalhães Lemos. Data will be analysed through SPSS. Expected

Results: It is expected to obtain from the outpatients of Hospital Magalhães Lemos reports of their experiences in the consumption of psychoactive substances.

Conclusions: These findings will raise awareness to the patterns and frequency of consumption of psychoactive substances in people with mental illness, helping to identify solutions for the reduction of their consumptions

Positive body image and emotion regulation in bariatric surgery candidates

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Abstract

Obesity is a chronic disease of multifactorial etiology, which has reached alarming proportions worldwide. Interventions in this pathology rely on a multidisciplinary professional and methodological collaboration, including behavioural programs for dietary and lifestyle changes, pharmacological interventions or, ultimately, surgical treatment. Although bariatric surgery is, to date, the most effective treatment, weight regain a few years after surgery is a matter of great concern. This recovery proves the surgical limitation regarding the psychological aspects of this disease, so the physical resolution of the problem is not enough. In addition, other studies also report an increase in post-surgical psychological disorders, according to the severity of obesity. Candidates for surgery tend to show more serious clinical conditions, from a physical and psychological point of view, namely in terms of depressive and anxious symptoms, low self-concept, low quality of life and social, family and professional instability. The body image construct has been explored in recent decades, recently emerging a new paradigm of Positive Body Image (PCI), already explored in some pathologies and in some conditions of obesity, pointing to a relationship between lower values of PCI and a higher BMI. Thus, the study of PCI in the population candidate for surgery is imperative to expand the application of this construct and to explore new potentialities and psychological approaches within the surgical treatment of obesity. This study aims to compare individuals who are candidates for bariatric surgery in pre-surgical and post-surgical situations, and also individuals who are not candidates for surgery but with a diagnosis of obesity, regarding PCI, emotional regulation difficulties, levels of anxiety and depression and some sociodemographic variables.

Salt content in meals served in university canteens - results of an intervention to reduce and control the added salt

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Abstract

Background: The reduction of salt consumption by populations has been recognized as a priority by the World Health Organization and governments around the world to reduce the prevalence of non-communicable diseases. Previous studies demonstrated that the salt content of foods available in the market and restaurants is high and varies greatly, making it difficult for consumers to comply with dietary recommendations. Indeed, most food handlers of canteens recognize that they use a random amount of cooking salt based on personal flavour.

Objective: Analyse the amount of total salt and added salt present in meals served in university canteens and implement an intervention to control and reduce up to 30% the added salt levels in meals using an innovative dosage equipment – SALT CONTROL C, and evaluate the impact on consumers satisfaction.

Methods: Baseline period - the salt content of meals (soup, meat/fish/vegetarian main dishes) served in two university canteens was analysed on five random days through atomic emission spectrophotometry. Intervention period - the canteens were randomized into a control canteen and an intervention canteen. The Salt Control C device was used in the intervention canteen to gradually reduce added salt by 0.5%/day over eight weeks. Throughout the study, the consumers' acceptance was evaluated by an online satisfaction questionnaire and food waste was evaluated by weighing the leftovers on consumers' plates. The content of total salt in meals was compared with the WHO recommendations of less than 5g/day.

Results: The average total salt content per meal (soup and main dish) of both canteens was 5.9 ± 1.9 g/portion, which corresponds to 118% of the WHO maximum daily intake recommendations. The added salt corresponded between 84% to 94% of the total salt analysed in the dishes. Through the use of the Salt Control C device in the intervention canteen, there was a reduction of more than 30% of added salt. On the last intervention week, a complete meal provided a total salt value of 3.9 ± 1.1 g/portion, corresponding to 77% of the recommended daily salt intake. There was no decrease in consumer satisfaction, and no significant differences were found in food waste.

Conclusions: This work showed a great variation in the values of added salt within and between canteens, revealing the inexistence of a standard of cooking salt addition. Also, consumers of university canteens can easily exceed the WHO maximum daily salt intake recommendations. Salt Control C device may be a good and practical tool to help food handlers control and approximate the added amount of cooking salt to values that respect the WHO recommendations.

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This study is included in the iMC Salt project supported by Fundação para a Ciência e Tecnologia (Grant POCI-01-0145-FEDER-029269).

Determination of formaldehyde in wood-based panels by GDME with spectrophotometric analysis

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Abstract

Formaldehyde is classified by IARC as a human carcinogen and a toxic substance. For that matter, it is considered one of the most important indoor air pollutants by the World Health Organization. Adhesives and resins used in the production of WBPs (wood-based panels) contain formaldehyde, which is why it is important to measure and diminish the amount of this substance in those materials. The reaction between formaldehyde and acetylacetone in the presence of ammonium salt forms DDL (3,5-diacetyl-1,4-dihydrolutidine). The reaction´s product has a yellow colour that can be detected spectrophotometrically at 412 nm. The acetylacetone method is a great option to determine formaldehyde due to its sensibility and selectivity towards formaldehyde.

GDME (Gas-diffusion microextraction) was the technique used in this work for the extraction of formaldehyde. It was developed to extract volatile and semi-volatile compounds from liquid and solid samples. In this case, formaldehyde is extracted from the WBPs to the headspace of a glass flask and then it reacts with the acetylacetone and ammonium salt present in the extraction module.

In this work, different parameters and their influence in the extraction of formaldehyde were evaluated, such as temperature and time of extraction, matrix effects, emission variability throughout the panel, among others. Furthermore, the methodology was used to determine formaldehyde in different WBPs, and the results were compared with those obtained with international standard procedures, such as EN 717-3 and JIS A1460.

Acknowledgements

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Dissecting the role of B3gnt7 as a novel enhancer for axon regeneration

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Abstract

The nervous system is a highly complex network formed by the brain, spinal cord and peripheral nerves, which are susceptible to injuries and neurodegenerative diseases. Despite the efforts that have been made in the last decades, adult central nervous system (CNS) regeneration remains extremely incompetent or nonexistent. As such, humans often remain permanently impaired or incapacitated after CNS trauma or disease. Even though adult regeneration is quite rare, spiny mouse emerges as a curious exception. Spiny mouse – Acomys genus - is a small rodent originally found in dry open habitats that has shown the peculiarity of being able to regenerate different tissues after injury (ear, skin, skeletal muscle, heart and kidney) without fibrotic scarring, in contrast to what is observed in other adult mammals.

Recent work from our group has shown that Acomys is capable of regenerating and gaining function after complete spinal cord injury (SCI) with a rewired extracellular matrix glycosylation pathway, that culminates in a pro-regenerative proteoglycan signature at lesion site. In this respect, B3gnt7, a crucial enzyme in keratan sulfate proteoglycan synthesis, arises as a novel enhancer of axonal regeneration, possibly being the key for the Acomys regenerative capacity.1

This project aims at exploring the functional relevance of B3gnt7 during Acomys CNS regeneration. The identification of the specific cell type that expresses B3gnt7 will be evaluated by FISH-HCR coupled with immunofluorescence techniques, and in vitro studies will be performed to explore the effect of B3gnt7 in axon growth. Finally, the overexpression of β3gnt7 in non-regenerative species such as Mus would be investigated to validate the role of Acomys ECM in spinal cord regeneration. This project may be a starting point for future research leading to the development of novel genetic therapeutic approaches for nervous system injuries in humans.

References

1.Nogueira-Rodrigues, J. et al. Dev.Cell 57,440-450.e7(2022)

The impact of Tamoxifen therapy on the expression of neurotransmitters in the Hippocampal Formation of adult female rats

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Abstract

Breast cancer is one of the most common forms of cancer in Europe and in Portugal, presenting a great rate of morbidity and mortality. Tamoxifen (TAM) is a modulating agent of estrogen receptors (ERs) that has been used for the last years in the treatment of ER-positive breast cancer and in the prevention of the development of this disease. Although being the best therapeutic approach for the pathology, TAM is associated with many adverse side effects, including decrease in cognitive performance. The rising levels of steroid hormones in female rats promotes structural and physiologic variations in the hippocampal formation (HF), leading to an improvement of learning and memory. Considering that this mechanism depends on the activation of ERs and knowing that TAM is a selective modulator of these receptors, enhancing or inhibiting their action, long-term therapies with this drug may hinder the action of steroid hormones on cognitive processes. We have studied the effects of long-term therapy with TAM in the HF-dependent mechanisms of learning and memory, as well as the impact of this drug on the biochemical plasticity on the HF. Young adult (3-month old) Wistar female rats were subjected to a daily dose of 50µl of TAM. Solid and liquid consumption, corporal weight and estrous cycle were recorded regularly. At the end of 3 months of treatment, the animals were anesthetized and the animals were sacrificed by intracardiac perfusion with paraformaldehyde. The brains were removed, weighted and secionated. The sections containing the interest areas were selected randomly, in a sampling of 1/12, and processed by immunohistochemistry to detect the expression of Calbindin (CB), Calretinin (CR), Neuropeptide Y (NPY) and Parvalbumine (PV). The administration of TAM induces variation in the expression of neuropeptides in the hippocampal formation, namely CB, CR, NPY and PV. More studies are needed to improve the definition of long-term therapeutics.

What can sociology say about former mining areas? – a study on mining heritage, collective local identities and oral stories

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Abstract

The research carried out within the scope of the SHS project - Soil health surrounding former mining areas: Characterization, risk analysis, and intervention, immediately highlighted the need to adopt a qualitative methodology. In fact, analysing the mines (in this case, Regoufe and Pejão) from a sociological perspective that starts from the perceptions of local social actors, implies accessing memories and stories associated with specific territories in order to understand how the emotions of the past and present shape local and collective identity, handed down from generation to generation. It also implies considering the dimension of the risk: we live in a world in which risks are manufactured by society.

Conducting nine interviews in the municipalities of Arouca and Castelo de Paiva with several key informants allowed us to conclude that the mines are an element of structuring collective identities and oral histories. Regarding the dimension of risk, it was found that, in both municipalities, there is a lack of knowledge and people tend to live carefree, performing tourism and leisure activities next to deactivated mines. There is a common association of risks to the past, relating them to mining work.

The work already carried out has highlighted the need to continue the investigation. Effectively, it is relevant that the results obtained further are, in the future, deepened through interviews with new key informants, especially ex-miners (who have important knowledge and memories to capture) and with the analysis of relevant documents on the territories under study.

To conclude, our investigation proves to be relevant for sociology, as it focuses on the impact of past mining practices on the communities involved. In another sense, it raises clues for a more practical applicability of these results, intervening with the populations, in the sense of preserving memories and raising awareness of risky practices.

iCoV2PLUS – Increased Production Levels Universal Sequence in SARS-CoV-2 vaccines

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Abstract

Our research group discovered a short, pyrimidine-rich, noncoding sequence, capable of increasing mRNA stability and protein levels. This 28-nucleotide long sequence was first discovered in Drosophila Melanogaster´s polo gene and has an important role in the modulation of alternative polyadenylation, affecting polo´s protein levels. Further experiments revealed that this sequence, when subcloned downstream of a reporter gene, was able to increase the respective protein production in zebrafish, yeast and mammalian cell lines. This sequence was then patented as iPLUS, which stands for increase Protein Levels Universal Sequence (WO/2020/076174). Recently, iPLUS was subcloned downstream of an antibody used in immunotherapy, and this led to a two-fold increase in the respective recombinant protein production, and in the mRNA levels, compared to controls that lacked the iPLUS sequence.

We hypothesized that the iPLUS technology could be applied to COVID-19 mRNA vaccines by subcloning iPLUS downstream of the Spike protein from the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) virus leading to an increase in protein production and in mRNA stability. For the mRNA vaccine producing industry, the instability of this molecule is a well-known bottleneck, and increasing protein production is also of great interest to improve people´s immunization.

We will subclone iPLUS and a variant of this sequence downstream of two Spike sequence variants: the original variant from Wuhan and the new Omicron variant. Two types of studies are going to be carried out: in vitro transcription studies to evaluate mRNA stability, and protein studies using ExpiCHO cells, to evaluate the yield of protein production. This will allow us to understand if iPLUS can in fact promote an increase in Spike´s mRNA stability, as well as in its protein production, making the COVID-19 vaccine production more efficient and with less production costs, both properties crucial for the Pharma industry.

Cilia morphometric axoneme evaluation in patients with Primary Ciliary Dyskinesia: a preliminary report

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Abstract

Primary Ciliary Dyskinesia (PCD) is a heterogeneous genetic disease caused by anomalies in biogenesis, function, and structure of cilia. The diagnosis is based on a combination of tests including transmission electron microscopy (TEM) analysis of respiratory cilia and cilia motion analysis by high-speed video microscopy (HSVM). This study aims at a descriptive analysis of patients submitted for PCD diagnosis and the relation between the different diagnosis tests. TEM analysis of the axoneme, gives information on 3 morphological grades: class-1 defects (diagnostic of PCD), class-2 defects (indicate a diagnosis of PCD in association with other supporting evidence) or normal axoneme structure. TEM evaluation of the variation in ciliary beat axis and ciliary deviation, gives the grades of clinical severity: severe (PCD type), moderate (Bronchiectasis type, BQ type) or normal. HSVM measures ciliary beat frequency (CBF) and quantifies dyskinetic cilia (CBP, DK cilia).

Of the 61 cases analysed, 24 belong to class-1, 62.5% of which with BQ-like severity and 37.5% with DCP-like severity; 6 cases belong to class-2, 66.7% with BQ-type severity and 33.3% with DCP-type severity; and 31 cases were classified as normal, 71% with BQ-type severity and 9% with DCP-type severity. Within class-1, 15 cases were evaluated by HSVM, with all evidencing decreased CBF and 14 with >= 50% of DK cilia. In class-2, all 4 cases evaluated by HSVM presented decreased CBF and >= 50% of DK cilia. In cases with normal axonemes, all 8 cases analysed by HSVM had reduced CBF and >= 50% of DK cilia.

It is noticeable that different classes have a similar distribution of the level of severity, which supports the idea that the symptoms severity may not depend on morphological anomalies. This shows that a normal ciliary morphology does not exclude a possible diagnosis of PCD, highlighting the need for a combination of tests.

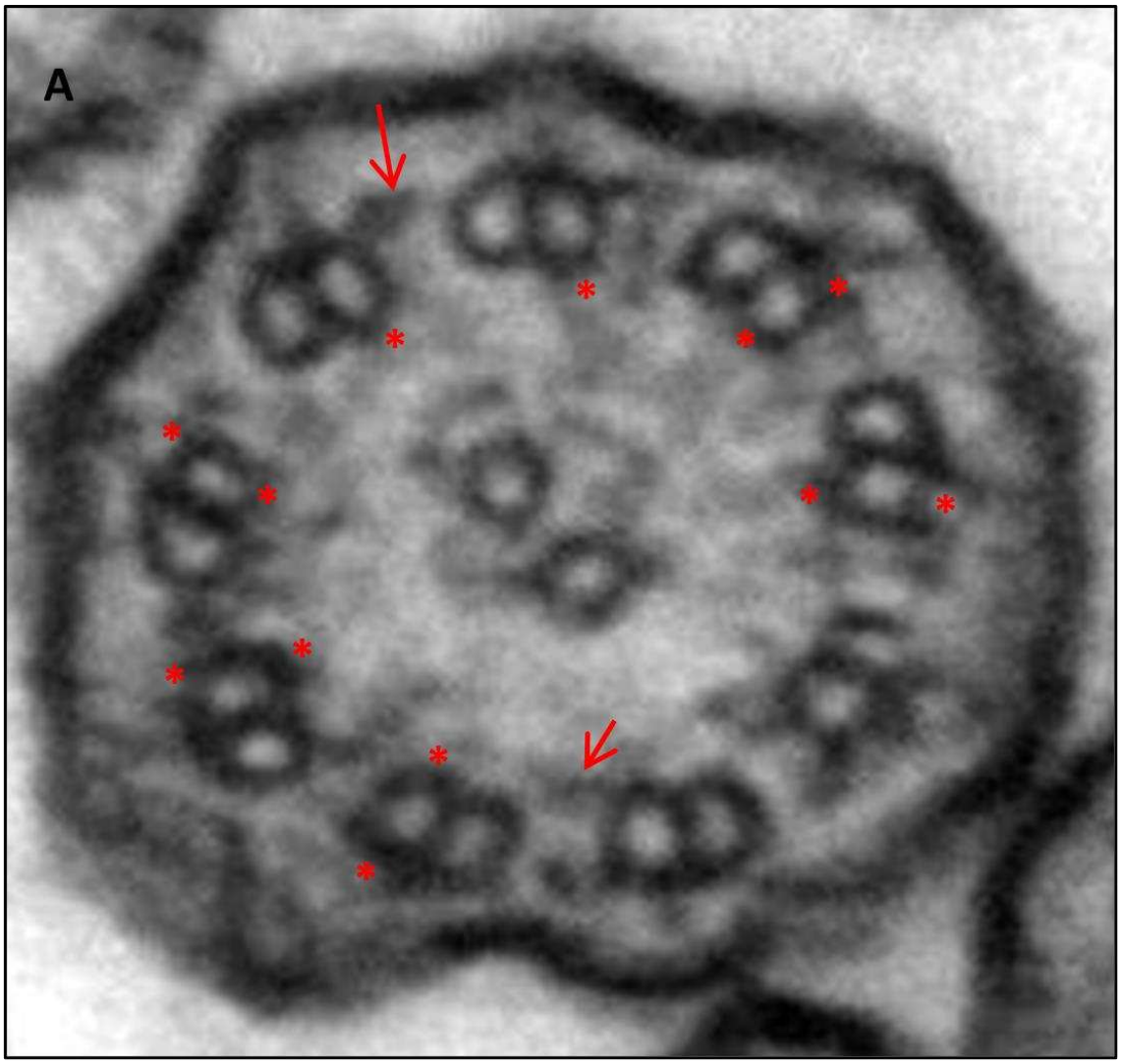

Figure 1. Ultrastructure image of a patient axoneme, where arrows indicate outer (ODA) and inner (IDA) dynein arms that serve as a pattern for this axoneme and asterisks indicate the doublet microtubules with absence, decrease in dimensions or poor definition of dynein arms. In this case, there is a disturbance of 5 ODA and of 7 IDA, which renders it pathological.

The role of RNA-binding proteins in USE-containing genes expression

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Abstract

In order to be translated, most pre-mRNAs go through a processing step, at their 3´ ends, which includes the addition of a poly(A) tail. This process is controlled by many cis-regulatory sequences that bind several trans-acting factors, like RNA binding proteins (RBPs). Our research group identified, in Drosophila melanogaster, a 28 nt upstream sequence element (USE), essential for polo´s polyadenylation site selection and that increases Polo levels and also increases GFP protein levels in zebrafish and luciferase activity in HeLa cells. Our group has unraveled how this sequence modulates gene expression in zebrafish, determining that the USE RNA, when microinjected in zebrafish embryos, works as a "sponge", recruiting numerous RBPs, such as PTBP1, influencing gene expression. The USE is also present in the 3´ UTR of a subset of human genes. In order to understand if the USE has the same action mechanism on human cells, HeLa cells were transfected with plasmids containing the USE sequence or a mutated USE sequence. Then, the mRNA levels of several endogenous USE-containing genes were assessed. Preliminary results show a decrease in the mRNA levels of some of the USE-containing genes upon transfection with the USE-containing plasmid, comparing with the USE-mutated plasmid, demonstrating that, in human cells, the USE also acts as a "sponge" recruiting factors that influence gene expression. Then, to study if the USE regulates GFP mRNA levels, HeLa cells were again transfected with the aforementioned plasmids and GFP mRNA levels were assessed. Preliminary data show an increase in GFP mRNA levels demonstrating that the USE is able to regulate GFP mRNA levels in HeLa cells. We will also investigate how the knock-down of PTBP1 affects the mRNA expression of USE-containing genes. Taken together, this project intends to study the mechanisms of action of the USE in a human cell line and unravel the role of PTBP1 in the regulation of gene expression of USE-containing genes.

Psychopathy and Fear of COVID-19 as modulators of interpersonal distance: a behavioral and psychophysiological study

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Abstract

The crowded conditions of the urbanized world are known for their effect on the spread of infectious agents and disruptive behaviour. This calls attention to the frequent disregard of personal space - a dynamic construct intertwining social, cognitive, and affective factors. Recent studies have devised new methods to study the difficult matter of personal space and individual variables affecting it. For example, Psychopathy (Psy) traits have been found to be negatively correlated to preferred interpersonal distance (IPD) when participants are asked to choose a comfortable distance for social interaction - a paradigm known as Stop-Distance Task (SDT). This effect may lie in amygdala dysfunction underpinning a lack of emotional processing that would normally lead to discomfort upon intrusion. The clarification of the affective process behind the maintenance of personal space, and how it may be modified by Psy, can be achieved via Psychophysiological (Pphy) indices, e.g. measures of Electrodermal Activity and Heart Rate Variability. Currently, the Fear of COVID-19 (FoC) is another variable that may modulate IPD, although its effect is expected to be lower in low-Fear individuals, a core trait of primary Psy. These two modulators, most likely playing opposite roles within a multiple regression model, may produce results concerning the variation of affective response in relation to personal space during the pandemic. This novel application of PPhy measures grants the opportunity to further examine the supposed reduced affectivity that individuals with higher levels of Psy experience as they select their preferred distance, since previous Pphy SDT studies have only tested individuals lying down in constrained recording environments and using computerized paradigms. Additionally, Psy traits may influence the development of FoC, meaning that FoC may act as a mediator between Psy and IPD, compromising the compliance of high Psy scores with the social distancing.

Housing, for and with the people: Participatory design process in the rehabilitation of an "island" in Porto, through the public program Primeiro Direito

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Abstract

In its 3rd edition, the workshop Arquitectos de Família, promoted by the NGO Habitar Porto, maintained its innovative character in providing technical support that establishes a bridge between learning and social action. Motivated by the request of the landlord, the rehabilitation process of the "island" was distinguished in its multidisciplinarity.

The work was conducted by final-year students from the Faculty of Architecture of the University of Porto, alongside two master students from the Escola Superior de Educação - Porto, and integrated in three master´s theses, one in Architecture and two in Social Education. Throughout the project, students met with technicians from different specialties involved in the application processes for clarification sessions. The thesis in Architecture will be the one presented.

The methodology adopted was based on the social praxis approach and on the "re-ensamblar" (Laclau, 2005 or Latour, 2005) of actors. Such participative methodologies motivate the reflection on possibilities of action and contribution of architects, institutions, and citizens in understanding and attending the problem of access to decent housing. This method offers innovative approaches to overcome the physical and psychological barriers associated with the implementation of projects and public policies on access to dignified housing.

The project took place in two phases: first, the workshop for the elaboration of a base program, which is part of the application to Primeiro Direito. The second phase was the creation of something new, through fieldwork, that over several months provided technical and social support, after the workshop.

This project contributed in a concrete way for the advancement of the application, to the construction of scientific knowledge in the field of affordable mass housing, facilitated the mobilization of human and institutional resources and had a positive impact on the people´s lives and in the functioning of the institutions.

Development and validation of the SPE-HPLC-UV method for determination and quantification of antibiotics in natural water

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Abstract

Antibiotics is one of the most important groups of pharmaceuticals with antibiological function extensively used for treatment and prevention of infectious diseases in human, aquaculture and veterinary medicine. Due to their removal inefficiently by conventional wastewater treatment plants, they are commonly detected in the natural aqueous environment at low levels (ng L-1 to µg L-1) and may be sufficiently to cause adverse toxic effects to the environment.1

In this work, optimized solid phase extraction (SPE) method using high performance liquid chromatography (HPLC-UV) have been developed for simultaneous (multi-test) detection and quantification analyse of Ciprofloxacin (CFX), Metronidazole (MTZ), Sulfamethoxazole (SFX), Trimethoprim (TMP) in river water samples.

The separation was performed by Acclaim™ 120 C18 column using mobile phases of 8 mM ammonium acetate aqueous solution, methanol, acetonitrile and acetic acid (74 : 15 : 10 : 1; v/v) by isocratic elution (0,65 mL min-1). The SPE analyses were carried out using Oasis® HLB 500 mg cartridges. The present method showed good linearity for all antibiotics in the concentration range of 0.5 – 5.0 mg L-1 and correlation coefficients (R2 > 0.999) were obtained. Also, detection and quantification limits (LODs, LOQs) were calculated. The values for LOD / LOQ were (ppm): CFX – 0.13 ± 0.05 / 0.37 ± 0.05; MTZ – 0.06 ± 0.03 / 0.17 ± 0.03; SFX – 0.11 ± 0.04 / 0.33 ± 0.04; TMP – 0.06 ± 0.03 / 0.18 ± 0.03. Antibiotic recovery rates after sample preparation using the SPE technique range from 80 to 103%. In the analysis of the water of the Douro River, the antibiotics CFX, SFX and TMP were found in amounts of 0.50 ± 0.27 µg L-1 (CFX), 0.39 ± 0.12 µg L-1 (SFX), 0.57 ± 0.13 µg L-1 (TMP).

Antibiotic resistance – "One Health" perspective – Environment as an impacted area

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Abstract

Antimicrobial resistance is one of the greatest global public health challenges currently affecting humans, animals and the environment, compromising the medical advances made in the last century. The emergence of multidrug-resistant microorganisms (MDR) is worrisome worsening this problem with the Enterobacteriaceae family being of enormous importance. Among these, the extended-spectrum β-lactamase and the carbapenemase producing Enterobacteriaceae (ESBL-E and CPE), negatively impact global morbidity and mortality rates.

Ten million annual deaths are predicted by 2050 and big losses in global economy, due to antimicrobial resistance.

Several countries have implemented national actions based on the "One Health" approach, a global and multidisciplinary approach that integrates epidemiological aspects that contribute to the understanding of the relationship between human and animal health and the environment.

Based on this approach we proceeded to study water samples from river Douro. River water was analyzed by membrane filtration method and direct spread in Gram negative selective culture media supplemented with adequate antibiotics. Subsequently, colonies were purified in chromogenic medium and susceptibility tests were performed in order to assess the resistance mechanisms of the isolates through the disc-diffusion method, according to EUCAST and CLSI standards. Finally, standard PCR protocol was performed to confirm the resistance mechanism associated to the isolates that produce degrading carbapenemases. The results of the sample under study demonstrated the presence of KPC producing *Klebsiella pneumoniae* isolates and *E. coli* producing extended-spectrum β-lactamases.

As a consequence of selective pressure from the misuse of antibiotics in humans and animals, CPE and ESBL-E have rapidly raised compromising medical care, so an international and multidisciplinary approach based on the "One Health" approach is central in order to address this global threat.

2’,4-Dihydroxychalcone is a selective scavenger of hydrogen peroxide

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Abstract

During inflammation, an imbalance between an overproduction of reactive prooxidant species by inflammatory cells, and an insufficient response by the body´s antioxidant systems may occur, leading to oxidative stress. This state often results in tissue harm and promotes the development of chronic diseases (e.g. rheumatoid arthritis).

As precursors for flavonoids (with known antioxidant effects in inflammatory processes), chalcones present promising scaffolds for anti-inflammatory drug design. Hence, to evaluate chalcones´ antioxidant activity, the ability of two structurally related hydroxylated chalcones (2´,3-dihydroxychalcone and 2´,4-dihydroxychalcone) to scavenge physiologically relevant reactive prooxidant species, namely hydrogen peroxide (H2O2), superoxide anion radical (O2o-) and nitric oxide (oNO), was assessed using chemiluminescence, colorimetric and fluorescence methods. Ascorbic acid, quercetin and tiron were used as positive controls. Chalcones´ maximum tested concentrations were defined through preliminary assays based on their solubility and absorbance spectra interferences.

From the studied chalcones, only 2´,4-dihydroxychalcone was active, as scavenger of H2O2, with an IC50 value of 463.9 ± 19.3 µM. This antioxidant effect was higher than that achieved by ascorbic acid or quercetin (IC50 = 919.8 ± 42.7 and 1194.0 ± 45.1 µM, respectively). Thus, the presence of a hydroxy group on the B-ring, namely at C4´, seems to contribute to the activity. These results indicate that specific chalcones, like 2´,4-dihydroxychalcone, may be used as scaffolds for the development of selective scavenging of H2O2.

Acknowledgments

This work was supported through the project UIDB/50006/2020, funded by FCT/MCTES through national funds; and received financial support from the European Union (FEDER funds through COMPETE POCI-01-0145-FEDER-029253) and National Funds (FCT) through project PTDC/MED-QUI/29253/2017. Mariana Lucas thanks FCT for her PhD grant (2021.06746.BD).

RNA and spermatozoa motility: what is the relation?

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Abstract

Asthenozoospermia (ATZ) is characterized by less than 25% of sperm with rapid progressive motility or <30% progressive motility. ATZ can be caused by sperm ultrastructural/functional defects or other diseases. Mutations in genes coding for structural constituents of the sperm flagellum are known causes of ATZ. Some coding RNA and non-coding RNAs, such as microRNAs (miRNA), have been identified as important for sperm function, with RNA dysregulation leading to male infertility. However, the role of RNA in sperm motility is not so clear as is gene mutations. With this work, we aim to contribute to increase knowledge about the relationship between RNA dysregulation and ATZ.

We obtained purified spermatozoa from ejaculate samples of 14 patients with reduced sperm motility and of 20 normozoospermic cases (controls). Upon an extensive literature review, we selected 20 genes associated with sperm immotility, designed primers, and confirmed through polymerase chain reaction (PCR), that they were expressed in spermatozoa. This is crucial, as most studies or databases usually refer expression in the testis, which includes a more diverse cell population. Then, we selected 11 of those 20 genes to perform gene expression analysis by quantitative real-time PCR (qPCR), using sperm RNA extracted from both patients and control individuals. We observed that 4 genes are specifically downregulated in samples from patients with low sperm motility. Next, we will determine the expression profile of miRNA that are predicted to interact with those 11 genes previously selected according to databases (mirDIP database) and perform immunofluorescence studies to study proteins whose mRNA are downregulated.

The knowledge gained will promote the identification of molecular pathways and regulatory mechanisms and contribute to discovery of new infertility biomarkers. Ultimately, it could foster the development of novel therapies for male infertility, improving the patient´s wellbeing.

The effectiveness of Public International Law: an analysis from the war between Ukraine and Russia

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Abstract

Public International Law, as a legal institution with a regulatory character at the international level, presents a premise of practical effectiveness vis-à-vis the subjects of International Law. This premise concerns its legitimacy in exercising conduct in favor of peace and international security. Therefore, the present research, which has been developed in order to develop an academic article, intends to verify the practical effectiveness of Public International Law from the actions and sanctions in the face of the war between Ukraine and Russia.

The investigation intends to identify if the Public International Law, through its international subjects, develops functions of effectiveness before the mentioned countries in a situation of war. As well as, it also aims to analyze the effects of their conduct under the internal and external sovereignty of each State, bringing to the fore general principles of an international nature.

As a methodology, this research has a theoretical character, the bibliographic review is used as a methodology, which includes the use of books, articles and national and international research. The method employed was the hypothetical-deductive, undertaking an exploratory research of the specialized doctrine.

Finally, it is important to mention that the present is still the subject of investigation and analysis, so that at the end of the research, in view of the conclusion of the situations put in vogue, it is intended that this work be published.

Synthesis and structure elucidation of new compounds containing nitro groups

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Abstract

The nitro group is considered to be a versatile and unique functional group in Medicinal Chemistry [1]. It possesses a strong electron attracting ability that creates localized electron-deficient sites within molecules and has the ability to interact with biological nucleophiles present in living targets, such as proteins, amino acids, nucleic acids, and enzymes. Over the years, compounds containing nitro groups have been broadly studied and valuable bioactive compounds are used in therapeutics as antibacterial, antiparasitic and antitumoral agents [2]. Currently, drugs containing nitro groups are being investigated in detail as part of a drug repurposing program for previously failed drugs as well as for currently used clinical candidates, along with simultaneous efforts to develop new bioactive compounds [3].

In this study, the total synthesis of new compounds containing nitro groups is described. The structure elucidation of the referred compounds, as well as all the intermediates, was established by spectroscopic methods (1H NMR, 13C NMR, and IR).

Acknowledgements

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References

[1] Ju, K. S. et al. Microbiol Mol Biol Rev. 2010, 74, 250-272.
[2] Paula, F. R. et al. Quim Nova. 2009, 32(4), 1013-1020.
[3] Nepali, K et al. J Med Chem. 2019, 62, 2851-2893.

Sperm chromatin condensation: the evaluation of the idiosyncratic seminal parameter

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Abstract

Affecting millions of men worldwide, male infertility is a disease that can be caused by genetic, environmental and lifestyle factors. Evaluation of semen parameters (SP) is paramount to aid in diagnosis and outline treatment strategies. Yet, infertile men may have normal SP, making it pertinent to evaluate sperm genetic integrity. Normozoospermic (NZ) infertile males with immature chromatin condensation (CC) are unable to conceive naturally and, though they may resort to medically assisted reproduction, immature CC has been shown to induce genetic aberrations in embryogenesis and been linked to an epigenetic role of retained histones. Withal, there is a lack of accord on the threshold value to predict reliable sperm chromatin and this may be associated with its incorrect determination.

To overcome this issue, and after patient informed and written consent, we evaluated sperm CC of 120 semen samples from NZ and non-normozoospermic (N-NZ) males by the Aniline Blue (AB) technique. The study was approved by the ICBAS/CHUP Ethics Committee. Given that men with more sperm with normal morphology, the more likely they are to be fertile, we evaluated 200 sperm/sample by two procedures, blinded and attentive to morphology.

Our preliminary results showed that between NZ and N-NZ males there are no significant differences in the percentages of immature (AB+) and mature (AB-) sperm by both sperm counting procedures (Mann-Whitney U-test). However, within NZ and N-NZ, there were significant differences ($P<=0.0001$) between blind (median 18.8% and 22%, respectively) and attentive (median 11%) procedures (Wilcoxon test).

In conclusion, although data suggested that, like SP, CC is not a sufficient test to clarify idiopathic infertility, still, CC assessment, considering the morphological evaluation of the sperm, can detect a lower percentage of sperm with chromatin immaturity. Additional studies are being implemented to better understand CC implication on male fertility.

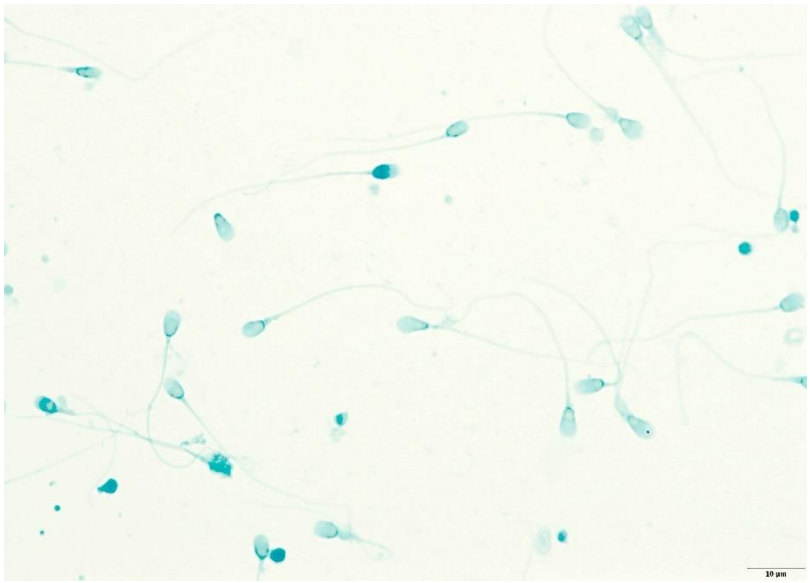

Figure 1. Status of human sperm chromatin compaction by the Aniline blue method (optic microscopy)

The pandemic resistance movements: a threat to national security?

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Abstract

The present investigation aims to contribute to the study of resistance movements for national security, from the current situation of pandemic crisis by SARS-Cov-2, which has had a high cost in terms of number of deaths and infections in Portugal. As a way to combat the spread of the coronavirus, the Portuguese Government adopted a set of measures restricting the freedoms of citizens, contested by various resistance movements, which have publicly manifested and taken some actions against State figures. As a result, these movements have contributed to the instability of democratic institutions, social cohesion and public health responses.

The action of these groups was boosted by the Internet, which allowed the flourishing and propagation of these resistance movements. The online environment has created a perfect ecosystem for the rapid and extensive dissemination of propaganda and digital disinformation related to the pandemic.

This investigation analyzes three previously selected resistance movements. It aims to characterize the discourse, including hate speech, the motivations and self-image of these resistance groups, through a descriptive analysis of the content of posts on their Facebook pages. Some preliminary results will be presented. In addition, it is intended to contribute with reflections on the challenges of studying this subject and leave clues to consider in future investigations.

The effects of delta-9-tetrahydrocannabinol administration in the regulation of female rat sociosexual behavior

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Abstract

In the past few years, Cannabis has been legalized in many countries, for recreational and medicinal consumption. Through interaction with the endocannabinoid system and influence by the sex hormones (estrogen and progesterone), tetrahydrocannabinol (THC), which is the main psychoactive compound of cannabis, modulates female motivated behaviors. There are two hypothalamic nuclei that modulate female behavioral responses: medial preoptic nucleus (MPN), that triggers proceptivity, and ventromedial nucleus of the hypothalamus (VMN), that triggers receptivity. These nuclei are regulated by glutamate, which inhibits female receptivity, and GABA, that has a dichotomous action in female sexual motivation. The present study evaluated how THC modulates social and sexual female rats´ behaviors, and THC-induced signaling pathways changes in the MPN and VMN and how sex hormones influence these parameters. After administration of estradiol benzoate and progesterone, and THC to young ovariectomized female rats, behavioral testing was conducted. Following testing the animals were sacrificed and immunofluorescence was used to detect vesicular glutamate transporter 2 (VGlut2) and GAD (glutamic acid decarboxylase) 65/67. The results showed that, in the behavioral testing, EB+P females had a higher preference for the male partner, and a higher proceptivity and receptivity than Oil or EB females, which can be justified by, when in the presence of both sex hormones, there is a female´ sexual response facilitated; EB females presented the lowest values, due to estradiol alone inhibiting female sexual behavior. In all evaluated parameters, it was also verified that females treated with THC had similar or even more facilitated behavioral responses than the ones that didn´t receive THC. Present data suggest that THC induces a male preference and increases sexual behavior by reducing the inhibitory action of MNP over VMN and by increasing excitation and diminishing inhibition of the VMNvl

A New Methodology for the Synthesis of N-functionalized Glycines: Assembly of Melanostatin-Based Peptoids

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Abstract

The use of peptides as potential drugs is limited by the low metabolic stability and reduced absorption characteristic of this class of compounds.[1] The development of peptidomimetics is important to overcome these limitations in bioactive peptides with therapeutic potential.[2] Melanostatin (MIF-1, Fig. 1) is an endogenous neuropeptide that displays anti-Parkinson's activity by acting as a positive allosteric modulator (PAM) of dopaminergic D2 receptors and thus potentiating the effect of dopamine [3]. Despite its potential, MIF-1 has reduced intestinal absorption and a short biological half-life [3].

Peptoids are a class of peptidomimetics in which amino acid side chains are attached to the nitrogen atom rather than the α-carbon, leading to an achiral flexible oligomeric structure devoid of hydrogen bond donors. As polymers, peptoids are completely resistant to proteolysis, thus increasing biological half-lives in comparison with the native peptides [4]. Hence, peptoids are becoming a valuable molecular tool in biosciences, in particular its applications in drug designing. The main advantages of peptoids as research and pharmaceutical tools include the ease and economy of synthesis and side-chain chemical variability.

In this work, ten N-functionalized glycines were synthesized and used for the assembly of MIF-1-based peptoids (Fig. 1). These MIF-1 analogues are currently under functional pharmacological assays to characterize their PAM activity. This work is expected to obtain useful structure-activity information for the design of new MIF-1 peptidomimetics with improved half-lives and intestinal absorption profiles.

References

[1] Trabochi, A., et al., Amino Acids, 2008, 34, 1-24.
[2] Souers, A.J,.et al., Tetrahedron, 2001, 57, 7431-7448.
[3] Sampaio-Dias, I E., et al., J. Med. Chem., 2021, 64, 6209-6220.
[4] Young, S.C., Molecules, 2018, 23(2), 96.

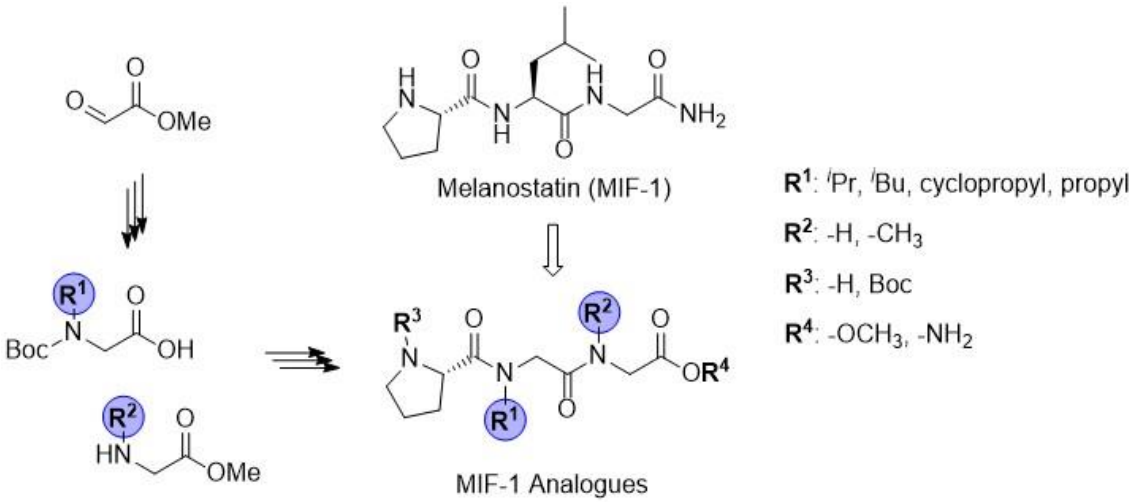

Figure 1. Structures of Melanostatin (MIF-1) and MIF-1-Based Peptoid Analogues.

Effects of distinct blood preservatives and processing on monocyte function

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Abstract

Human monocytes are competent antigen-presenting cells (APC) that can be obtained from Buffy Coat (BC) or blood tubes. The BC is a product of whole blood processing after donation. Two distinct processing protocols give rise to Fresh Blood BC (blood collection and processing happen on the same day) or Overnight BC (processed the day after the blood harvest). Also, blood tubes can have different preservative solutions, like ethylenediaminetetraacetic acid (EDTA) or citrate-phosphate-dextrose solution with adenine (CPDA), which is similar to the one in blood bags (CPD). The aim was to assess if different processed BC and anticoagulants influence monocyte function as an APC. To do so, monocytes were incubated with lipid antigens and a CD1d-restricted invariant natural killer T (iNKT) cell line. The iNKT activation was measured by cytokine release.

We found that monocytes from BC Fresh Blood processed have in general a better capacity to activate iNKT than those from BC Overnight processed.

To compare the capacity of monocytes stored in different anticoagulants to activate iNKT, BC Overnight processed, freshly collected CPDA, and EDTA blood tubes (each condition from a different subject) were examined. The results were highly variable between the three conditions. To reduce variability, we used blood from the same subject collected in EDTA, CPDA, or BC. Results suggest that monocytes stored in EDTA have a lower capacity to present antigens to iNKT cells.

Our results show that various BC processing protocols and anticoagulants influence monocytes´ function as APC. Therefore, these aspects should be considered in daily research.

RE(forma)ALIZA: A proposal for a psychological intervention aimed at supporting the preparation of and for the transition to retirement

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Abstract

With the progressive extension of the official retirement age, and the progressive increase in life expectancy, the longevity of the post-retirement period reinforces the need of a consistent planning of retirement transition. It is a complex transition that is experienced in a highly subjective way, involving several social, psychological, economic, vocational and health factors. Despite this, in general, the end of working life occurs without prior reflection and/or definition of a post-retirement personal project. The main aim of this work is to present a psychological intervention that intends to motivate and support the construction of personal plans for retirement transition. From a theoretical and methodological point of view, this intervention borrows and seeks to enhance some features of other programs related to retirement preparation and adaptation identified in the literature. However, it incorporates new aims and strategies in line with the contributions of the Dynamic Resource Perspective, the Selection, Optimization and Compensation model, and, finally, the (Re)Constructive Exploration Model of Vocational Investment. The intervention plan has eight monthly modules which are individually chosen after a previous exploration of the participants´ personal needs and interests. Each module is focused on themes corresponding to the taxonomy of retirement resources (emotional, motivational, social, cognitive, physical, and financial). The internal structure of each module foresees (i) an initial, face-to-face in group, session to explore past and current experience of people with the modules themes; (ii) a period of direct and autonomous exploration (in pairs/trios) based in experiential activities related to the theme; (iii) a final session for reflection and signification of the previous exploratory experience, with a prospective focus. The intervention ends with a moment for supporting the final planning of the transition to retirement personal project.

Physical performance of youth volleyball players: the INEX study

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Abstract

As part of the work developed in the INEX project (In Search of Excellence in Sport), the present study sought to characterize the physical performance of volleyball players between 11 and 16 years old. A total of 247 young volleyball players were analyzed in muscle strength tests (handgrip, sit-ups, horizontal jump, vertical jump without countermovement, vertical jump with countermovement and seated medicine ball throw), running speed (Sprint 5m and Sprint 20m), agility (T-test) and aerobic performance (Yo-Yo). Data were analyzed through One-way ANOVA to verify differences among groups (i.e., between age cohorts). In general, the performance of young volleyball players improved in all tests as age increased. This finding means that, in all tests, older players performed better when compared to younger ones. Specifically, linear development trajectories (i.e., gradual and constant increments) were observed in muscle strength tests (handgrip, vertical jump without countermovement, vertical jump with countermovement, and seated medicine ball release), running speed (5m and 20m sprint) and aerobic performance (Yo-Yo IR1). However, non-linear trajectories were observed in the development of muscle strength in the sit-ups and horizontal jump tests, as well as in the agility test (T-test), which means that despite performance has increased, such increments were not uniform overtime. The present study thus provides a concrete perspective on the development of the physical performance of volleyball players over time, offering to coaches and sport agents relevant practical guidelines for the sport selection and preparation process of athletes.

Keywords: Volleyball. Young. Physical Performance. Performance. Longitudinal Analysis.

Plasma levels of oleoylethanolamide in patients with feeding and eating disorders

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Abstract

Purpose: Oleoylethanolamide (OEA) is a bioactive endogenous ethanolamide fatty acid that reduces food intake and suppresses appetite. Dietary intake of oleic acid (OA) can modulate OEA circulating levels in humans. Feeding and eating disorders (ED) are serious mental illnesses with dramatic changes in patterns of food intake. The present study aims to evaluate plasma levels of OEA in patients with anorexia nervosa restricting subtype (AN), bulimia nervosa (BN), and binge-eating disorder (BE).

Methods: An observational cross-sectional study was conducted with 68 women, 48 patients with eating disorders according to DSM-5 criteria, and 20 control women. Plasma levels of OEA (in pmol/ml) were quantified using liquid chromatography and mass spectrometry.

Results: The plasma levels of OEA were found to be significantly reduced in BE patients (7.1± 1.1) compared to age-control women (28.2± 2.8). In contrast, AN patients with more than 10 years of disease presented a significant increase in OEA plasma levels (35.7± 4.7). BN patients did not present changes in OEA plasma levels.

Conclusion: Since OEA, a fatty acid with an anorectic effect, is considerably reduced in BE patients, supplementation with OEA appears to be an attractive choice for a complementary therapeutic approach in BE.

Potential effects of Cannabigerol and Cannabidivarin in placental extravillous trophoblast cells

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Abstract

Placental development is a regulated process that depends on the normal turnover of trophoblasts. *Cannabis sativa* consumption during gestation has a well-known impact in pregnancy outcome, such as prematurity, intrauterine growth restriction and low birth weight. We previously demonstrated that the phytocannabinoid cannabidiol (CBD) induces trophoblast apoptosis. However, the actions of the minor cannabinoids cannabigerol (CBG) and cannabidivarin (CBDV) on placental development are still unknown. Therefore, this work aimed to investigate the effects of CBG and CBDV in placental extravillous trophoblasts (EVTs). For that, it was used the HTR-8/SVneo cells, which were treated with CBG and CBDV at different concentrations (1-20 µM), for 24 and 48 h. The impact in cell viability was assessed by MTT and LDH assays. Morphological alterations were evaluated by Giemsa and Höechst staining. Additionally, alterations in the mitochondrial transmembrane potential (Δψm) and production of reactive oxygen/nitrogen species (ROS/RNS) were measured through fluorescence assays. The activity of caspases-3/-7 and -9 was determined by a luminescence assay (Caspase-Glo® kit). Results show that CBDV and CBG at 10 µM caused a significant loss of cell viability after 24 and 48 h, with LDH release occurring only at 48 h of treatment. Morphologic alterations such as chromatin condensation and fragmentation were observed, which are typical morphological features of the apoptotic process. Both compounds at 5 µM promoted a significant release of ROS/RNS and a decrease of Δψm after 48 h of treatment. At 48 h, only CBDV at 5 µM showed an increase in caspase-9 activity. Nevertheless, neither CBDV nor CBG increased caspases-3/-7 activity. Therefore, CBDV and CBG affect EVTs viability, an effect that may be due to apoptosis or other cellular processes, with potential consequences in the normal placental development that need further investigation.

Evaluation of Macro Litter and Microplastics in the Ave Estuary

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Abstract

In recent decades, anthropogenic pollution has become a threat to ecosystems and human health, being a widely studied and global key-topic. Marine debris are mostly discharged into the water and transported by currents to diverse areas. These are composed of a wide variety of materials from various sources; however, plastics are by far the most abundant material recorded. Rivers act as pipelines to the ocean, channelling the waste that is dumped into the estuaries. Thus, acquired data on those ecosystems contribute to a better understanding on the entry of litter into the ocean from terrestrial sources. Particularly, plastic marine debris are exposed to physical, chemical and biological stressors, resulting in smaller fragments, known as microplastics. This study aims to characterize and quantify macro litter in the Ave estuary. Additionally, we intend to evaluate and characterize microplastics in the water column, as well as identifying the main sources of such debris. The evaluation of macro litter was performed through visual monitoring, while microplastic particles in the water column were sampled by a horizontal trawl using a planktonic net. The samples collected were processed following international guidelines. Microplastics were identified, measured and sorted by type (fragment, pellet, fiber, film) and colour. Overall results indicated that the Ave River estuary has considerable contamination by macro litter (e.g. styrofoam, bags, plastic bottles) and a great diversity of microplastics, with a significant prevalence of fibers (>60%). This study represents a contribution to the urgent need of temporal and spatial monitoring on plastic pollution in estuaries and other coastal ecosystems. This scientific knowledge is essential for adequate management of litter and of marine and coastal ecosystems.

Acknowledgments

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Burnout in police work

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Abstract

A burnout is an occupational phenomenon that strongly impairs any professional´s mental health. The burnout syndrome is a reaction to a chronical working stress exposure, and whose signs of the disease affect a person in their emotional, cognitive, physical behavioral and motivational dimension.

Comprehensibly, police activity occurs under stressful and dangerous risky situations, which allows the development of the burnout syndrome since the police deal with many challenges, uncertainties, problems and emergency situations that require a high physical and mental response.

This study had as its main goal the identification of the burnout levels among the Municipal Police of Porto and to check if those levels vary according to professional and sociodemographic characteristics. The data were collected online using a professional and sociodemographic questionnaire and the Maslach Burnout Inventory (MBI). One-hundred and nineteen police agents collaborated voluntarily and anonymously.

The results showcased low incidence of burnout. Yet, 46.2% of the agents involved showed levels of medium to high levels of burnout, 27% high levels of emotional exhaustion,18.5% high rates of depersonalization and 43.7% low personal accomplishment levels. Higher rates of depersonalization and burnout were found among road traffic police agents, more depersonalization and burnout among paid agents, a higher level of emotional exhaustion, depersonalization and personal accomplishment among agents who work 10 or more hours per day. A correlational analysis pinpointed that emotional exhaustion is the core dimension of the burnout syndrome.

The high rates of burnout among 22 agents, emotional exhaustion among 33 of them and depersonalization in 22 other members of the taskforce, as well as low personal accomplishment among 52 of them call for a quick quick prevention based on individual, collective and organizational strategies.

Unveiling Structural Determinants for the Discovery of New Antidotes Against the *B. asper* Viper

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Abstract

In 2017, the WHO has recognized snake-bite envenoming as a neglected tropical disease (NTD), resulting in over 2.7M accidents annually and ~100k deaths. Due to few medical resources and a weak health system, this NTD affects mostly tropical and rural areas where access to hospitals are limited. Nowadays, the only cure available is an antivenom made by horse antibodies in response to small amounts of injected venom. Because it is a high-cost treatment, it is crucial to develop a less expensive alternative urgently. In addition to that, these antidotes need to be easily stored, and effective against many species because of the lack of expertise needed to recognize the snake species in remote areas. Moreover, proteomic analysis of viperidae venoms identified two targets as drug candidates: the metalloproteinases and the phospholipases A2 (sPLA2).

The central point of this work is the development of novel sPLA2 inhibitors against the *Bothrops asper*, a well-known viper in South America.

Our pipeline comprised two stages:

First, we collected all the sPLA2 inhibitors information tested in vitro and in vivo. Then, we performed molecular docking calculations of the compounds and determined their pattern of interactions, in order to find the structural-activity relationship.

Second, we performed a virtual screening using a chemical library of approved-drugs and drug candidates in clinical trials. The best compounds were selected based on their docking score and on the know-how obtained in step1. At this point, we selected 50 compounds to be tested in vitro and in vivo by viper´s venom experts from South America and Asia.

Figure 1. *Bothrops asper*. Photo taken by Sebastian Di Domenico.

E. coli in the aquatic environment: Different approaches different outcomes

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Abstract

Escherichia coli is a commensal bacterium of warm-blood animals, and is considered a microbiological indicator of fecal contamination in the aquatic environment. Several *E. coli* strains can cause both extra-intestinal and intestinal diseases to humans, being of public health concern. This study aimed to understand how well different standard microbiology methods discriminated *E. coli* from different aquatic origins. Surface water samples were collected from estuarine and coastal beaches locations, and treated wastewater, i.e. with different levels of contamination and environmental characteristic. The enumeration of *E. coli* was performed using selective and differential culture media - Membrane Fecal Coliform (mFC), Chromocult Coliform Agar (CHR), and by the Most Probable Number method with Colilert-18. E. coli mFC presumptive isolates were confirmed by PCR approach. Although being in the same order of amplitude as CHR, Colilert-18 presented higher *E. coli* numbers regardless of the contamination level. Indeed, Colilert-18 even exhibited higher numbers than the fecal coliforms (FC) in the majority of the samples. The same trend was observed when CHR was used in low contaminated water (FC < 50 CFU/100 mL), whereas in higher contaminated water (FC > 3 Log CFU/100 mL), CHR counts represented about 50% of the fecal coliforms. Moreover, 62% of the presumptive isolates from mFC were confirmed by PCR as *E. coli*. The convergence of the *E. coli* to FC percentages, in the different methods, at higher contamination levels, can potentially be justified by the presence of a large source of contamination (like sewage), where the microbial community is more homogeneous. The results highlighted the pivotal relevance of the chosen method to apply in different scenarios since it can lead to different outcomes. This work was funded by the project ATLANTIDA (NORTE-01-0145-FEDER-000040), supported by NORTE2020, PORTUGAL 2020 and ERDF.

The impact of Chromium Picolinate on Sertoli Cells viability

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Abstract

Trivalent chromium is fundamental for the normal functioning of the human organism. Chromium picolinate (CrPic) is a supplemental form of trivalent chromium, popularly consumed for the supposed benefits on the treatment of metabolic disorders. Studies suggest that high amounts of chromium (III) can potentially cause oxidative stress in body tissues and cells. Oxidative stress is one of the main causes of male infertility. So far, no studies have explored the impact of CrPic supplementation on male fertility potential. This work aims to explore the impact of CrPic in Sertoli cells, the main mediators of spermatogenesis, and its contribution to male infertility through oxidative stress. To do this, a Sertoli cell line from Mus musculus (TM4) was treated with increasing doses of CrPic (in µM: 0, 0.135, 1.92, 3.85, and 160) for 24 hours. The group treated with 0 µM of CrPic in 1 % DMSO medium was used as control. 2,5-diphenyl-2H-tetrazolium bromide (MTT) and Sulforhodamine B (SRB) assays were used to test the cytotoxic damage sustained during the treatment. The Seahorse XF Cell Mito Stress Test was used to evaluate a mitochondrial respiratory chain function. Our preliminary results demonstrate that Sertoli cell viability decreased with the increase of CrPic concentrations. More specifically, cell proliferation and cell viability appeared to increase at the lowest concentration of CrPic (in µM: 0.135, 1.92, 3.85) in comparison to the control group. The highest concentration (160 µM) of CrPic decreased both cell proliferation and cell viability. Currently no effects regarding the function of the mitochondrial respiratory chain have been found. These preliminary results suggest that CrPic diet supplements do not have a negative impact on male fertility. In fact, it suggested that, at lower concentrations, CrPic supplements could have a beneficial effect on the fertility potential of males.

Possibili(ci)ties. Multiple Strategies for a more Porous Drawing

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Abstract

Cities are strings of endless territories. Fields of contradiction, constant turmoil and ambivalence. Communities interweaving different lifestyles, cultural upbringings, and ways of communicating. Divergent possibilities mingling unpredictably. The sociologist, Richard Sennett, regards cities as cells - elemental life-shifting organisms. Around them hover several particles of such complexity, moved predominantly by other agents. The chance to imbue all these characteristics into the membrane generates chaos, but also order within diversity.

There is no linear process to this approach. Nor should we take it lightly. In order to deconstruct its density, four keywords lead this contemplation stage: Multiplicity. Dialogue. Ambiguity. Openness. This order is not arbitrary; rather it induces an endless cycle of (re)actions. Each one of them is the cause and consequence of the other; they stand on their own and interconnected throughout a complex network of relations. By diving into study-cases of different natures, these four elements will be perceived in their various stages of mutation.

Possibili(ci)ties is to some extent a dreamy vision of what our cities could become. However, it also seeks to set foot in a raw reality. The aim of this investigation is therefore not about finding an ideal even scenario, instead to optimize its current imbalance. It is about grasping its diverse, incomplete and ambiguous nature, so to better understand the role of each participant. Bearing this in mind, mouldable strategies for an inclusive city can be openly defined. This requires a transdisciplinary and multileveled mindset. In close articulation with specialists and communities, we can start rethinking city as a safer, educative, dynamic field of interaction. Only within this rhythm of dialogue do we find the possibility for a porous urban condition.

Figure 1. Possibili(ci)ties.

Characterization of a potential new Actinomycetota genus isolated from the macroalgae Codium tomentosum

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Abstract

Actinomycetota are Gram-positive bacteria able of colonizing a variety of terrestrial and aquatic ecosystems, and represent one of the largest and most diverse bacterial phyla. Some of these bacteria have the ability to grow in association with various organisms, including marine organisms, like sponges, corals, fish, macroalgae, among others.

In a previous study, a collection of Actinomycetota isolates was obtained from the macroalgae species *Codium tomentosum*, collected from the northern Portuguese coast. According to 16S rRNA data, used to perform taxonomic identification of these isolates, it was found that one of them, strain CT-R167, might constitute a potential new genus. Phylogenetic analyses have shown that strain CT-R167 is close to *Salinactinospora qingdaonensis* and *Lipingzhangella halophila*. At the moment we are performing various physiological tests, such as determining the optimal culture medium, temperature, salinity, and pH for the growth of this isolate, in order to characterize our potential novel taxa. Our main objective is to taxonomically validate a new genus of Actinomycetota and find a new potential source of pharmaceutical compounds.

Remote sensing techniques for identification of NYF pegmatites in Tysfjord, Norway

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Abstract

With technological advances increasingly focused on green energy, it is no surprise that the raw materials needed to develop this technological sector are a growing concern among countries intend to save or increase their reserves of materials considered critical to their development. These factors, combined with an effort by the European Union to reduce its dependence on critical materials and Rare Earths Elements from foreign powers, have given rise to the Greenpeg project, a project formed by partners in the European Union, including academic institutions and the private sector. This project has among its specific objectives, the development of new methods focused on the identification of NYF and LCT pegmatites in 3 study areas, being Tysfjord (Norway), Leinster (Southern Ireland) and Wolfsberg (Austria). The main objective of this work is to evaluate and adapt remote sensing methods to identify NYF pegmatites in Tysfjord, Norway. To this end, traditional image processing methods (RGB combination, Band Ratios (BR) and Principal Component Analysis (PCA)) were applied, these methods, previously developed to identify LCT pegmatites, were adapted to idetify NYF pegmatites in Tysfjord. Finally, machine learning algorithms (Random forest (RF) and Support Vector Machine (SVM)) were applied to the Sentinel-2 satellite, with the same objective of identifying the pegmatites in the study area. The results of this work are promising and make a great contribution to Remote Sensing applied for prospective purposes.

Evaluation of antifungal activity of eucalyptus extracts in fungi species

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Abstract

The use of plant protection products for combating pathogenic fungi in vines has resulted in decades of soils contamination, which caused high levels of accumulated elements such as copper. This problem, amplified by climate change and the growth of organic farming in the past years, lead to limitations imposed by the EU for the application of Cu-based products in vines. Therefore, it´s important to find sustainable options to reduce or mitigate Cu and other product application, as biofungicides. In this way, a product development based on *Eucalyptus globulus* biomass, an exotic species with an invasive behaviour and high environmental impact in Portugal, can be a viable option. Thus, the aim of this work is to assess the antifungal activity of *E. globulus* to reduce or replace the use of fungicides, especially Cu-based products, combating vine pathogenic species *Plasmopora viticola* (downy mildew), *Uncinula necator* (powdery mildew) and *Botrytis cinerea* (grey mold). The aqueous extract of *E.globulus*, obtained from dried young leaves, is being used, alone or in combination with different concentrations of nanoparticles of SDS/DDAB, a stable complex of sodium dodecyl sulphate (SDS) and didodecyl dimethylammonium bromide (DDAB) surfactants, known for their effects in pharmacology and as fungicides. Mycelial growth inhibition assays of fungi species are being carried out under controlled conditions, by measuring their radial growth. Later, the aqueous extract will be also tested in combination with different percentages of a Cu-based formulation. In this way, it is expected to contribute to the development of a more ecological and economical phytosanitary product for a more sustainable wine production and protections of soil and ecosystems.

Flavonoids Hinder Human Neutrophils' Oxidative Burst Induced by Silver Nanoparticles

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Abstract

Silver nanoparticles (AgNP), are considered the most marketed nanosystems worldwide, being applied in diverse sectors, from medicine to food industry. After being absorbed, AgNP can enter the bloodstream and interact with the cells of the immune system, including neutrophils. Therefore, it becomes imperative to understand the possible interaction mechanisms between neutrophils and AgNP.

Flavonoids are polyphenolic compounds of natural origin, known for their antioxidant and anti-inflammatory properties. Therefore, this work had two main objectives: firstly, to study the effect of AgNP, per se, on human neutrophils´ oxidative burst; and secondly, to evaluate the hindering potential of a panel of structurally related flavonoids (luteolin, flavone, quercetin and quercetagetin) against the corresponding production of reactive prooxidant species. Neutrophils, isolated from human blood, were stimulated with AgNP, in the presence and absence of the flavonoids. The production of reactive prooxidant species was followed using the fluorescence probe dihydrorodamine 123.

The results showed that AgNP induced human neutrophils´ oxidative burst, in a concentration-dependent manner. The studied panel of flavonoids demonstrated to be able to hinder this effect. Quercetin and quercetagetin were the most potent compounds.

Despite the promising results of this work, further studies are needed to deeply understand the mechanisms involved in flavonoid protection against AgNP-activated neutrophils.

Acknowledgements

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In vitro activity of polyphenols against pancreatic lipase and α-amylase inhibition

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Abstract

The World Health Organization has classified obesity as an epidemic of the 21st century. Lipids and carbohydrates from diet are central on the development of obesity. Thus, their absorption offers a series of targets whose modulation can be explored for obesity treatment. Those include pancreatic lipase (PL) and α-amylase activities for their role on the absorption of lipids and carbohydrates, respectively. Despite inhibitors of these enzymes are already known, namely orlistat for PL and acarbose for α-amylase, both are associated with limited efficacy and undesirable side effects [1]. Thus, the search and development of new effective and safer agents able to control caloric intake is of great importance on obesity management and control. Polyphenols are naturally occurring and structurally diverse compounds, with many biological activities. In this study a panel of structurally related polyphenols, including flavonoids and chalcones, were chosen and its inhibitory effect against these enzymes were evaluated. The results obtained showed that the studied flavonoids demonstrated a greater inhibitory activity for α-amlyase while chalcones produced a more significant effect on pancreatic lipase. Results also showed that the presence of -OH groups as well as the presence of a catechol group on the B-ring seems to confer greater inhibitory effect to the compounds against α-amylase, while the -Cl group in the B ring of chalcone is crucial for the inhibitory effect against PL.
Thereby, polyphenols should be further explored as potential anti-obesity molecules.

Acknowledgements

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Characterization of a novel scFv antibody against the hERG potassium channel

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Abstract

Human ether-à-go-go related gene (hERG) is a voltage gated potassium channel essential for normal electrical activity in the heart, especial for cardiac action potential repolarization. Changes in hERG channel function cause long QT syndrome (LQTS) resulting in cardiac arrhythmias and sudden death. Arrhythmia can also be provoked by a blockage of the hERG channel as a secondary indication of many drugs.

Functional hERG channels are tetrameric that result from the co-assembly of four individual subunits. which can contain mixtures of two isoforms, hERG 1a and 1b, which are identical except for their cytoplasmic N-terminal. The hERG1b isoform does not have the first 376 amino acids of the 1a isoform but contains a unique 36 amino acid sequence. A single chain variable fragment (scFv) antibody has been generated using phage display that recognizes the N-terminal sequence of the hERG1b. The objective of this project is to biochemically identify the amino acids that are recognized in hERG1b by the scFv30 antibody.

Results: (1) We have created deletions in the hERG1b sequence and expressed and purified these proteins from *Escherichia coli*. Using an affinity pull-down assay, we have shown that scFv30 binds within the epitope GALRPRA of hERG1b. (2) In addition we mutated the residues R15A, R17A and R15AR17A and are currently using the affinity pull-down assay to further define the binding epitope. We expect that these residues when mutated will result in loss of scFv30 binding.

Keywords: potassium channel; hERG; scFv

The impact of Chromium Picolinate in Diabetic Nephropathy disease

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Abstract

Diabetic nephropathy (DN) disease is one of the serious complications of diabetes and the leading cause of end-stage renal disease. The early detection of this condition is challenging since the main diagnosis markers are masked in diabetes. Thus, further research is urgently needed aiming at the prevention and control of DN. Chromium picolinate (CrPic) is an essential trace element that has been shown to reduce blood glucose levels and enhance insulin function and sensitivity. CrPic has also been known to have antioxidant properties. Nonetheless, the impact of CrPic has not been studied in the prevention of diabetes-induced DN. In this study, we aim to explore the effects of CrPic in Kidney cells, particularly on mitochondria physiology and function. To do this, a Human Kidney cell line (HK-2), was treated with increasing concentrations of CrPic (0, 0.135, 1.92, 3.85 and 160 in µM), using two different concentrations of glucose, to mimic diabetic (22mM) and non-diabetic (5mM) conditions, for 24 hours. Sulforhodamine B (SRB), 2,5-diphenyl-2H-tetrazolium bromide (MTT), and Lactate dehydrogenase (LDH) assays were used to test the cytotoxic and viability effect of CrPic in these cells. Preliminary results demonstrated that cell proliferation is not affected in all CrPic conditions tested. Cell viability was demonstrated to be improved at non-diabetic conditions (5 mM), while the opposite is observed in diabetic conditions (22 mM) when the highest concentration of CrPic was tested. LDH assay demonstrated that cell integrity is compromised in a non-diabetic situation and the opposite is observed in a diabetic situation when the highest concentration of CrPic was tested. These preliminary results suggest that in vitro exposure of CrPic has an impact on HK-2 cells. Notably, it was noted an effect in improving cell integrity in a situation of high glucose (diabetic) leading us to hypothesize that it can be a plausible option in treating DN but further studies are needed.

The tomato miner caterpillar, *Tuta absoluta*, monitoring and risk estimation on two tomato cultivars

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Abstract

Tuta absoluta, originally from South America is a pest that affects Solanaceae crops, namely tomatoes, having spread in Europe, as a result of its high adaptability. In order to estimate the risk of incidence of the pest and to provide information that can evaluate the effectiveness of the control procedures used in the greenhouses of the farm Frescura Sublime, in Famalicão, a sample monitoring of plant development and incidence of the pest in two cultivars of tomato, Runner and Bigram, was applied. After characterizing the growth of the plants and the climatic conditions in which they developed, indirect sampling was carried out by counting male adults captured in pheromone traps, complemented by direct sampling from the visual observation of galleries with live larvae in the plant organs and determination of the incidence levels of the pest in the geometry of the plant.

The data collected showed regular growth of the plants and an incidence of the pest, predominantly in the lower third of the plant, where larval density was high. The estimate of the risk of damage showed results that indicated a very high risk (with several live larvae). For greater control of the pest, some changes can be suggested in the procedures that are currently applied and that have shown to be not very effective. These suggest changes in some pest control procedures, such as sealing the sides of the greenhouse and more localized spraying in the lower part of the plants, closer to the substrate.

Keywords: Attack intensity, Pheromone, Sampling, Solanaceae, *Solanum lycopersicum*, Tomato moth.

Selective Attention Towards CCTV and its Effect on Fear of Crime: An Eye Tracking Study

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Abstract

The use of video surveillance cameras, or CCTV, is proliferated in the most varied places nowadays (e.g., city centers, shopping areas, car parks). Their presence aims, in addition to preventing crime occurrence and increasing its detection, to reduce the individual´s fear of crime and, thus, to encourage their presence in public spaces (Phillips, 1999; Welsh & Farrington, 2019). However, mixed results have been observed in the literature regarding its effectiveness on reducing fear of crime. A previous study, developed at the School of Criminology (Pereira, 2020), aimed to analyze, through a set of photographic stimuli, the influence of the presence of CCTV on the fear of crime reported by individuals. Results observed showed that, although the presence of CCTV led not only to an increase in the reported levels of perceived safety but also to a decrease in the levels of perceived crime, participants often did not notice the presence of cameras in the visualized stimuli.

Following these results, the present study, of experimental nature and developed in a laboratory context, aims to analyze the selective attention of individuals towards video surveillance cameras through an innovative method - the Eye Tracker. Therefore, it intends to analyze if participants focus their attention on CCTV devices presented in photographic stimuli, representative of different urban environments. The photos used in the present study were selected from the Urban Security Image Database (USID) (Guedes, Moreira & Cardoso, 2021).

Moreover, it aims to analyze whether selective attention to CCTV is associated with the perceived insecurity of the image reported by individuals, and whether, in images with CCTV, individuals report higher or lower levels of perceived insecurity, in comparison to images without CCTV. Since this is an innovate study, the results and its implications for crime and fear prevention will be outlined.

Unravel the role of hypoxia on immunomodulation at the colon cancer microenvironment

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Abstract

Background: Due to aberrant cancer cell growth and abnormal vascularization, the solid tumors microenvironment (TM) is generally hypoxic, which is associated with immune suppression, angiogenesis, invasion, metabolic reprogramming and therapy resistance. Nevertheless, hypoxia is often overlooked in cancer research, and the mechanisms through which interferes with the non-malignant components within the TM are still a matter of study. Macrophages are profusely represented at TM, and increased infiltration is associated, in several malignancies, with poor prognosis and therapy resistance. Depending on the stimuli to which they are subjected, macrophages can play pro and anti-tumor functions, being, therefore, interesting therapeutic targets. In colon cancer, the role of macrophages is still controversial.

Aim: Clarify the role of hypoxia on immunomodulation at the colon cancermicroenvironment.

Methods: Cocultures of 6 colon cancer cell lines, macrophages, and T cells were performed at 20% and 1% O2, and the RNA used to analyze differences in expression using the Nanostring Tumor Signaling 360 Gene Expression Panel. The clinical relevance of the results was assessed through The Cancer Genome Atlas (TCGA), and the validated molecules were studied at the protein level by Western Blot. Moreover, correlation of the expression of the validated molecules with expression of immune checkpoints were evaluated using TCGA.

Results: Analysis revealed substantial gene expression alterations under hypoxia (92 genes up and 34 downregulated). After TCGA analysis we end up with 18 upregulated genes, which alteration in expression at protein level are being validated. From the genes analyzed ITGAV, CD86, GPNMB, CSF3R, CAV1, FLIT, GREM1, FCAR and CXCR4 were shown to be correlated with immune checkpoints expression.

Conclusion: Hypoxia significantly alters the gene expression program at the colon cancer microenvironment, which most likely impacts on immune checkpoints regulation.

Marine Litter Monitoring on Matosinhos Beach

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Abstract

Education and awareness initiatives are becoming increasingly relevant in the environmental context. One of the biggest ecological issues caused by human activity is marine litter, particularly marine plastic pollution. This has a significant impact in marine ecosystems, as it disrupts the food chain and leads to the death of countless marine species. Plastics are especially relevant, as they represent about 90% of this litter and are not biodegradable, causing them to exceed the average human life expectancy, which causes problems for future generations.

CMIA (Centro de Monitorização e Interpretação Ambiental) of Matosinhos has been carrying out fieldwork with highschool students on the beach of Matosinhos, aiming to collect and catalog the litter found in this coastal area and improving their awareness of this topic.

This monitoring program is promoted by Agência Portuguesa do Ambiente, which implements the protocol established by the OSPAR Commission "Guideline for marine litter monitoring on the Beaches in the OSPAR Maritime Area" as a tool to collect data on these wastes in marine and coastal ecosystems.

Since November, the monitoring program in Matosinhos beach revealed that the most frequent litter found were plastic fragments (ID OSPAR 1171), lollypop sticks (ID OSPAR 192) and cigarette butts (ID OSPAR 64). Data from the OSPAR Commission reveals that the residues found most abundantly in OSPAR beaches are plastic fragments, fishing gear and packaging. This difference can be explained by the areas studied: CMIA of Matosinhos studies are restricted to the coastal area of Matosinhos, while OSPAR studies comprehend the coast of fifteen different countries of the North-East Atlantic. These have different customs and are more developed, compared to Portugal.

This initiative by CMIA of Matosinhos has drawn attention to the amount of litter found in the beach of Matosinhos, as well as the environmental problems associated with them.

Relationship between exposure to community violence and youth aggressive behaviour: the role of social information processing and sex

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Abstract

Over the last decades, children and youth aggressive behaviours have become a great social concern, being understood and accepted that these behaviours have a great impact not only at an individual level, but also from a social and economic point of view. Thus, it is not surprising that this research field continues to grow, mostly aiming to better understand this phenomenon and its relation with different variables and outcomes so that it is possible to mitigate the short and long-term adverse effects of this type of behaviour. Following this rationale, the current research project seeks to further explore the relationship between youth exposure to community violence and the adoption of aggressive behaviours, controlling for the influence that, social information processing and sex play in this relationship. In order to do so, a quantitative approach and a cross sectional design will be adopted, using self-report questionnaires directed at youth attending high school and aged between 15 and 17 years old. Ultimately, this research project seeks to contribute for the knowledge produced around youth problematic behaviours that is crucial for informing the conception and implementation of early developmental prevention programs that largely seek to enhance children and youth social adjustment. Thus, this paper seeks to present and discuss the research goals and methodology adopted in this study, in order to deepen the subsequent data analysis and interpretation.

Synthesis of chiral flavone derivatives with potential antitumor activity

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Abstract

Flavones are a class of natural and synthetic flavonoids based on the backbone of 2-phenylchromen-4-one well known for their potential antitumor activity (1). Recently, it was demonstrated that the combination of flavone with chiral moieties resulted in the enhancement of their antiproliferative activity on tumor cell lines (2). Moreover, the combination of these flavonoids with amino acids was associated with the improvement in bioavailability (3). This work aims to obtain chiral derivatives (CD) of flavones by the association of achiral flavones to enantiomerically pure building blocks using established protocols (4). Briefly, flavones obtained by direct thermal cyclocondensation will be combined separately with pure enantiomer pairs of amino esters. The novel entities will be structurally characterized by NMR, IR, and MS spectrometry. The enantiomeric purity will be evaluated by liquid chromatography using chiral stationary phases.

Finally, the antitumor activity of the novel molecules will be screened using in vitro human tumor cell lines assays.

Acknowledgments

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References

1. Pinto, C., Cidade, H., Pinto, M. & Tiritan, M. E. Chiral flavonoids as antitumor agents. Pharmaceuticals 14, (2021).
2. Song, X. et al. Synthesis of novel amino acid derivatives containing chrysin as anti-tumor agents against human gastric carcinoma MGC-803 cells. Med. Chem. Res. 24, 1789-1798 (2015).
3. Xu, Q., Deng, H., Li, X. & Quan, Z.-S. Application of Amino Acids in the Structural Modification of Natural Products: A Review. Front. Chem. 9, (2021).
4. Pinto, C. Enantioselective synthesis of new flavonoids with potential antitumor activity. Master's Thesis, FFUP, (2021).

Occurrence and characterization of microplastic ingestion by fish larvae

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Abstract

Plastic waste has been one of the main actual environmental concerns, specially microplastic (MPs). MPs are plastic particles with less than 5 mm, and due to MPs size, these particles can be ingested by a wide variety of organisms, as larval stages of fishes. In fact, these early stages of fishes can ingest MPs, which can lead to digestive tract blockage, limiting food intake, having a negative repercussion in growth, development and ultimately survival. This study aims to optimize a digestion protocol to quantify MPs ingestion in fish larvae. To do that, preliminary tests were conducted to identify the best laboratorial procedures to preserve water samples and biota collected in estuarine and coastal areas. Two different reagents used for sample fixation and preservation, as Formaldehyde and Ethanol, were tested in 13 different types of MPS to evaluate their effects in microplastics integrity. MPs integrity was measured in terms of size, weight, structure, and colour. Other tests were performed with Hydrogen Peroxide at 65ºC for sample digestion at different times of incubation. Results showed that there was no alteration in size, weight, structure, or colour of MPs, when preserved with Formaldehyde or Ethanol for a period of 7, 30 and 60 days. The tests with Hydrogen Peroxide at 65ºC had slightly different results, since when exposed for more than 24 hours, it can lead to discoloration in some MPs, such as low-density polyethylene (PE-LD), rayon synthetic fibers, and acrylic fibers. In resume, to quantify MPs ingestion by fish larvae, samples can be either preserved in Formaldehyde or Ethanol, no more than 60 days; and digestion with Hydrogen Peroxide should not exceed 7h incubation to guarantee MPs integrity.

Acknowledgments

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The Impact of the pandemic on financial management: A Study on Fitness Centers

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Abstract

COVID-19 has spread all over the world and was considered a pandemic (WHO 2020). For that, when infection numbers started to rise quickly, some lockdown measures were taken as a strategy to fight and reduce those rates. These measures forced some businesses to close their doors temporarily including Fitness Centers (FC).

The aim of this study was to analyze the impacts of Covid-19 on financial management, such as the turnover and financial plans, during the periods that the FC were closed forced by decision of Portuguese government.

The sample included 10 FC´s Technical Directors (TD): 2 from a gym box, 2 from studios, 2 from Health Clubs, 2 from traditional gyms, and finally 2 from Low Cost Gyms.

The instrument used for the study was the semi structured interview, based on the literature review, however the focus was on the financial management. The interviews were made face-to-face in the FCs where the participants performed their activities.

The anonymity and confidentiality were ensured, the interviews were recorded and then transcripted. The data were analyzed with MaxQda (v20.4.0).

The results showed that the FCs suffered a huge impact during the lockdown with significant reductions of the income as referred by Pedragosa and Cardadeiro (2021), the FCs had a reduction on the number of members by 29% and a decrease by 42% on their turnover incoming volume during the year 2020. Nevertheless, the pandemic allowed the FCs to challenge themselves from a strategic point of view.

Aimed to improve their financial performance, different FCs had different approaches to their membership monthly fees.

The pandemic has caused enormous financial difficulties, nonetheless it has improved the FC´s abilities to adapt and has created a unique opportunity to grow.

Keywords: Fitness; COVID-19; Sports Management; Strategies; Financial Impact.

Assessment of Antimicrobial Strategies against Intra-Osteoblastic *Staphylacoccus aureus*

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Abstract

Most bone and join infections are caused by *Staphylacoccus aureus*. These infections are treated with antibiotics; however, it is becoming increasingly difficult to eradicate and treat them once *S. aureus* is able to invade osteoblasts by cell internalization and, consequently, be protected from the immune system and antibiotics that don´t penetrate osteoblasts. This strategy plays a significant role in persistence and recurrence of infection. Besides, internalization bacteria may also impair cell functionality, contributing to a sustained tissue destruction. Therefore, it is essential to test new therapies in order to prevent and eradicate these infections.

With this in mind, the aim of this study is to assess if metal oxide nanoparticles, antibiotics and their combination, are effective in the intracellular eradication of *S. aureus* in an in vitro model of osteoblastic infection. Initially, it was optimized the concentration of lysostaphin necessary to eliminate extracellular bacteria after the infection period, without elicit cytotoxic effect. For that, MG63 osteoblast cultures were exposed to different concentrations of lysostaphin. Additionally, the effect of these concentrations on *S. aureus* ATCC 49230 was also determined by the number of cultivable bacteria.

Therefore, co-cultures were performed as a single-species infection on MG63 cells with *S. aureus* ATCC 49230, with the concentration of lysostaphin previously determined. Different metallic oxide nanoparticles (e.g., AgO and ZnO) were added to co-culture. The effect of nanoparticles in the elimination of intracellular bacteria was compared to that of antibiotics. Nanoparticles are expected to have a greater ability to eliminate this intracellular microbial population.

Cladodes flour as a rich source of dietary fiber for bakery production

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Abstract

Food production for a growing population negatively impacts the environment due to waste accumulation and increased pollution, creating sustainability concerns that are likely to worsen in the future. That is why, consumers are now adopting more sustainable diets. Sustainable food production will benefit the environment, economy, and society. They are also more concerned about nutrition, preferring low-fat and high-fiber diets [1].

In Portugal, prickly pear (*Opuntia ficus-indica (L.) Mill.*) production has gained importance since the fruit is eaten raw and used in foodstuffs; and seeds are used for oil extraction. Unlike other countries, cladodes are still not consumed in Portuguese diets, because they are considered an agro-industrial waste (by-product) [1]. However, we propose that cladodes are used for food applications.

Thus, in this work, a cladodes flour was produced according to INIAV (2018) with slight modifications [2], its chemical composition evaluated by AOAC methods [3] and its sugars profile determined by HPLC-ELSD [4].

Results revealed that this flour is a rich source of dietary fiber, it presents a high content of ash (total minerals) and is a low-fat ingredient. Several sugars were determined with sucrose as the major one.

To conclude, regarding its nutritional composition, cladodes flour is a promising ingredient for food formulations, namely in bakery. Since it is produced from a by-product it makes prickly pear production more sustainable. Also, it can be a gluten-free alternative to wheat flour.

Acknowledgments: EXPL/BAA-AGR/1382/2021, UIDB/50006/2020 and NORTE-01-0145-FEDER-000041.

References

[1] Espírito Santo, L. (2020). Opuntia ficus-indica (L.) Miller: valorização dos cladódios para consumo alimentar.

[2] Sapata, M.M., et al. (2018), INIAV.

[3] AOAC (2019). Official methods of analysis (21st ed.), USA.

[4] Ma, C., et al. (2014). Food Chem, 145, 784-788.

Print Mischief: Development of a system applied to the creation of album covers to be printed in letterpress

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Abstract

Letterpress and other analog printing practices have been threatened with obsolescence several times, as David Jury says in his book Reinventing Print. However, there has also been a growing interest in these practices. In this post-digital age, the coexistence of analog and digital design processes is increasingly important, due to this era of constant change and evolution. New technologies are shifting the printed materials panorama and there is a need of exploring different visual languages, which points to the hybrid process as the most interesting in this context.

This project aims at exploring different materials and technologies, such as letterpress and programming, to develop a sound-responsive system applied to the creation of graphic images for album covers. These experiences fit in a hybrid printing approach, relating composition semantics to music and programming.

Letterpress is a printing technique whose plasticity, obtained through its manipulation and composition, enables several layers to be explored. In music, these layers are explored through varied sounds, rhythm, positive and negative spaces. A link between these two areas is established not only through the constraints of their systems, but also through an experimental and iterative process.

This work presents a literature review and an analysis of relevant case studies, establishing a connection between the areas being studied and evaluating possible approaches for the problem at hand. Later, as a case study, the system is developed in Processing to create the album cover images. The composition is designed with modules and shapes created by the user in the system, to be printed afterwards. In the final phase, this system is evaluated in a workshop activity.

This project intends to promote awareness on the opportunities presented by returning and combining the analog process with emerging digital technologies, as it makes the creation of new experimental spaces and forms of expression possible.

Juices from Southeast Asian fruits act as anti-inflammatory agents through 5-lipoxygenase inhibition and antiradical capacity

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Abstract

Due to a vast biodiversity and specific phytogeographic conditions, Thailand remains as one of the richest hotspots in fruits that simultaneously ensure a nutritional intake and health-promoting properties. Indeed, these so called `superfruits´ are known to produce and accumulate bioactives, with antiradical and anti-inflammatory properties. In this matter, our research group selected juices from two Thai superfruits, *Sandoricum koetjape* and *Salacca zalacca*, as both species remain unknown on their bioactive properties and content in bioactives.

Both juices were investigated on their scavenging ability towards nitric oxide and superoxide radicals, significant effects being observed. *S. zalacca* juice reduced nitric oxide levels down to 86% at the highest concentration tested (1000 µg mL-1). While inactive on the scavenging ability upon nitric oxide radical, *S. koetjape* juice significantly neutralized superoxide radical at the range of concentrations 125 to 1000 µg mL-1, with an EC50 value of 200.02 ± 32.69 µg mL-1 being estimated.

Impact upon the eicosanoid-metabolizing enzyme 5-lipoxygenase has been also investigated, and while *S. zalacca* juice did not lead to significant inhibitory effects, exposure to *S. koetjape* juice led to significant inhibitory effects at the full range of concentrations (31.25 - 1000 µg mL-1), reducing the activity of the enzyme down to 44% at the highest concentration.

To attempt the identification of bioactives underlying the recorded effects, phenolic profiling has been carried out by HPLC-DAD analysis. *S. zalacca* fruit juice is characterized by the occurrence of six phenolic constituents, including a hydroxycinnamic derivative. Qualitative characterization of S. *koetjape* juice allowed to detect ten phenolic compounds, six of which corresponding to hydroxycinnamic derivatives.

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New chiral flavonoids with potential antitumor activity

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Abstract

Nowadays cancer is the second worldwide cause of death (8.97 million deaths) after ischemic heart disease, and it is likely to become the first in a few decades [1]. Although there are already some anticancer treatments, the development of new drugs capable of increasing the effectiveness of these treatments or leading to completely curing the disease remains very important.

Flavonoids comprise a class of natural phenolic compounds with promising antitumor properties as previous demonstrated in our research [2].

Chirality is of great importance in drug discovery and development because the association with a chiral moiety can improve the biological response [3].

Recently, it was demonstrated by us that the association of a chiral moiety to a chiral flavone is associated to an increase of their antiproliferative activity against tumor cell lines. Therefore, in this work the enantiomers of two different amino acids were bonded to 6-hydroxyflavone (6-HF) resulting in four different chiral derivatives for further evaluation of the antitumor activities and mechanism of action. The enantiomeric purity will be evaluated by liquid chromatography using a chiral stationary phase.

Acknowledgements

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References

[1] Mattiuzzi, C. et al, Journal of Epidemiology and Global Health, 2019.
[2] Pinto, P. et al, Eur. J. Med. Chem., 184, 2019.
[3] Pinto, C. et al., Pharmaceuticals, 14, 1267, 2021.

Synthesis of nanobioconjugates for detection of IgG using Nanoparticle Tracking Analysis

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Abstract

Parasitic diseases, as malaria, cause multiple deaths each year. Early and correct diagnosis is paramount to stop the spread of these diseases and to prevent antimalaria therapy resistance. For these reasons, new efficient, quick and cheap tests are important to enable easy access to proper care. Gold nanoparticles are an interesting tool to develop new detection methods, due to their unique physical, chemical and optical properties.

This work developed nanobioconjugates between spherical gold nanoparticles (AuNPs), functionalized with 11-mercaptoundecanoic acid (11-MUA), to bind antibodies G (IgG). Bovine albumin serum (BSA) was used as a blocking agent, to prevent non-specific binding to functionalized nanoparticles, improving its specificity (Figure 1). These nanobioconjugates were detected using nanoparticle tracking analysis (NTA), through the increase of the hydrodynamic diameter upon binding. NTA is a recent tool for nanoparticle detection and quantification at very low concentrations (within picomolar range), an advantage for our work. All the results from NTA show efficient binding between nanobioconjugates, allowing its detection.

In the future, this method will also be optimized for the specific binding of *Plasmodium falciparum* (malaria) antigen, that will allow the relative quantification of antigen in a biological media.

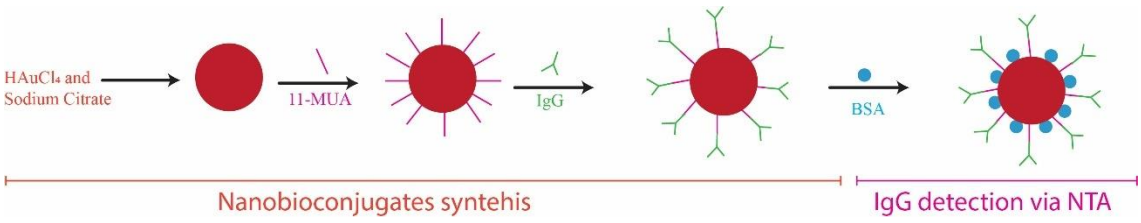

Figure 1. Schematic representation of the synthesis of the nanobioconjugates and respective detection via NTA.

Unravelling the effect of combined salinity and heat stress on the photosynthetic performance of cherry tomato

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Abstract

Nowadays, salinity and heat are amongst the major environmental issues threatening food security worldwide, with an emphasis in the Mediterranean region, where tomato production has been declining in the latest years and climatic instability is expected to be severely aggravated. Although both abiotic stressors have been extensively studied individually, in a realistic scenario, plants are exposed to several environmental conditions and their response to the combination of them is yet to be unravelled. Thus, in this study, the photosynthetic performance of tomato plants (*Solanum lycopersicum*) exposed to the combination of salinity (100 mM NaCl) and heat (42 ºC;4 h/d) was evaluated. After 21 days of stress, all treated plants presented diminished growth, being the harsher effect observed upon combination. In vivo gas-exchange studies revealed a distinct pattern between plants under saline conditions and the control and heat-treated tomato plants. Stomatal conductance, transpiration and net CO2 assimilation rates were decreased upon salt exposure, individually or in combination. Concerning RuBisCO, only the individual treatments repressed the expression of RbcS. However, while the heat and the co-exposure treatments diminished RbcL transcript accumulation, salinity led to an enhanced gene expression of the large subunit. As such, and considering that the harsh reduction in growth imposed by the stress combination is not accompanied by a severe impairment in the photosynthetic machinery, at least in comparison with the individual stressors, further studies are needed to complement the aforementioned data. In this sense, molecular biology analyses - namely detection and quantification of important photosynthesis-related proteins, as well as transcript accumulation of genes related to relevant defence pathways - are currently underway to better understand the impacts of combined heat and salinity on the performance of tomato plants.

SafeBladder: a device for monitoring bladder filling

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Abstract

Neurogenic bladder (NB) is a clinical condition related to urinary bladder malfunction due to neurologic dysfunction, preventing normal bladder control. This can occur due to several causes, like trauma, disease, or injury. A regular plan for bladder drainage that compiles intermittent self-catheterization usually performed on a timed basis, is one of the strategies to manage this condition. This intermittent catheterization has a schedule that can be improved through the monitoring of the bladder volume. Nowadays, after analysing the existent products used to solve this issue, it is possible to affirm that there is no solution to monitor the bladder volume in a wearable and portable way, compromising the patient´s daily life.

In this way, a non-invasive method is proposed, facilitating daily monitoring, without the need of going to the hospital. This portable device, SafeBladder, involves an optical sensor with near-infrared recognition, connected to a software system for data acquisition and analysis. It is composed by an emissor and a detector, placed next to each other. The main function of the device is to warn the patient through a non-intrusive system when a pre-defined volume is reached. The limit value for when this notification is activated is previously defined by the physician with the aid of complementary examinations.

This notification must be activated given enough time for the patient to act, and be autonomous of external devices, such as smartphones, to ensure that the user receives the warning. Then, the design of a platform for data visualization should be carried out, to facilitate the data visualization and analysis.

A proof of concept was developed, namely hardware and software components to evaluate the possibility of measuring the volume of urine in the bladder. This work is still being developed, with no relevant results at this stage. The prognosis is that there will be a viable device at the end of the project, capable of making life easier for patients.

Comparison of the clinical outcomes between using testicular sperm and ejaculated sperm in patients with recurrent implantation failure

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Abstract

Background: High levels of sperm DNA fragmentation (SDF) lead to poor clinical outcomes in Assisted Reproduction Treatment (ART) cycles using ejaculated sperm and intracytoplasmic sperm injection (ICSI). Previous works suggested that in those cases the use of testicular sperm instead of ejaculated sperm yields better clinical outcomes, as testicular sperm presents lower SDF than ejaculated sperm.

Aim: To determine if with testicular sperm is possible to improve the clinical outcomes of patients with recurrent implantation failure in ART cycles using ejaculated sperm.

Methods: We evaluated 63 patients with recurrent implantation failure after ICSI with ejaculated sperm. These patients accepted to perform testicular sperm aspiration (TESA) in the next ART cycle. The study compares 127 ART cycles, 80 with testicular sperm and 47 with ejaculated sperm from the same patients. Patient showed normal karyotypes, absence of Y chromosome microdeletions, and normal SDF levels.

Results: The mean ages were 35.5±3.4-female and 38.1±5.7-male. Female characteristics and testicular evaluation were normal. Testicular sperm showed higher rates of fertilization (64% vs 73%-p=0.005), blastocyst development (47% vs 62%-p=0.010), implantation (6% vs 27%-p=0.000), pregnancy (10% vs 39%-p=0.001), live birth delivery (5% vs 28%-p=0.005) and newborn (5% vs 32%-p=0.000) than ejaculated sperm. No significant differences were observed in the rates of embryo cleavage and high-quality embryos, in the number of transferred embryos, or in the abortion rate. Cases using testicular sperm had 22 frozen-thawed embryo transfer cycles, enabling per transfer cycle a cumulative pregnancy rate of 45%, live birth delivery rate of 31% and newborn rate of 38%.

Conclusion: In conclusion, these results show that the embryological, clinical and newborn outcomes can be improved with the use of testicular sperm instead of ejaculated in cases of recurrent implantation failure using ejaculated sperm.

Semi-preparative enantioresolution of MDPV enantiomers and racemization study by liquid chromatography

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Abstract

New psychoactive substances (NPS) represent a public health threat since they are not controlled by international conventions, are easily accessible online and are sold as a legal alternative to illicit drugs. Among them, synthetic cathinones, such as MDPV, are widely abused due to their psychostimulant effects [1]. Being chiral compounds, studies reporting the influence of stereochemistry in their biological/toxicological properties [2, 3], as well as the conditions of temperature or acidic/basic environments by which pure enantiomers undergo racemization [4] are necessary. To this, many methods of enantioresolution have been developed over the years being liquid chromatography using chiral stationary phases (CSPs) the technique of choice [5].
In this work, the semi-preparative enantioresolution of MDPV and a racemization study were performed by liquid chromatography using polysaccharide-based CSPs. The enantiomers were separated with a good resolution and enantioselectivity, being collected with high enantiomeric ratio and recovery rates. While no racemization occurred after 3 hours for all tested conditions, signs of racemization started to appear after 48h at 37ºC and after 24h at 70ºC. The potential enantioselectivity in neurotoxicity will be further evaluated.

Acknowledgements

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References

1. Valente MJ, et al., Arch Toxicol. 2014;88(1):15-45.
2. Silva B, et al., Toxicol Appl Pharmacol. 2021;416:115442.
3. Silva B, et al., Toxicol Appl Pharmacol. 2020;395:114970.
4. Huang Z, et al., J Sep Sci. 2020;43(7):1240-7.
5. Silva B, et al., J Anal Toxicol. 2018;42(1):17-24.

Study of Ni2In hexagonal systems (MnCoGe1–xInx alloy)

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Abstract

The magneto-structural coupling, which in a simplistic way, can be translated by a coincidence of crystallographic and magnetic transitions, has been presented as a topic of great interest for scientific research due to the abundant magnetic response it generates, translating into a promising effect for technological applications such as solid-state cooling, actuators, or even magnetic sensors.

MM'X ternary compounds with Ni2In-type hexagonal structure such as MnCoGe1-xInx have attracted a lot of attention because with the introduction of chemical pressure, either through interstitial atoms, Mn deficiency, Co holes, or even by the substitution of principal elements by others atoms with different atomic radios and different numbers of valence electrons, allows us to adjust, for example, the structural transition so that it intercepts the magnetic transition and thus induces a magneto structural coupling. This coupling of the transitions, magneto structural transition, generally results in a large magnetocaloric effect. In addition, this type of material has other interesting properties, such as giant negative thermal expansion and/or magnetic shape memory effect.

In this work we present the synthesis of metallic alloys with the composition MnCoGe1-xInx through the arc melting method and their structural, morphological and magnetic characterization. The best synthesis procedure is studied, so that at the same time it is possible to minimize the manufacturing time and the percentage of secondary phases. In this way, improving the homogeneity/quality of the samples and optimizing their thickness. Furthermore, the magnetocaloric effect evolution with sample doping is discussed.

Evaluation of Putative Glioblastoma Biomarkers in Patient Samples

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Abstract

Glioblastoma (GB) is the most aggressive tumor of the central nervous system, and one of the deadliest human cancers. Despite increasing advances in molecular characterization of GB, particularly genetic and epigenetic changes, this disease remains largely undetectable and incurable, with no efficient treatment and no effective circulating biomarkers for clinical monitoring.

GB secretome, which encompasses cell secreted proteins, cytokines, growth factors, shed receptors, proteases and extracellular matrix (ECM) components, holds tremendous potential to be used as source of relevant GB biomarkers. Moreover, the ability of certain GB secretome associated proteins to extravasate from the tumor and the brain into circulating fluids (such as blood), offers a powerful and less invasive method of diagnosis and disease progression monitoring. Some GB secretome molecules have been detected in body fluids of patients, such as MMP9, MMP2, VEGFA, YKL40 and OPN. Still, none have shown (independently or in group) to be specific/sensitive enough for use in clinical routine.

This project aims to evaluate the levels of GB secretome molecules in patients´ tumor tissues and plasma, thus evaluating their potential as GB biomarkers to be assessed in a less invasive manner in patients´ bodily fluids. For this, we propose to evaluate the expression of previously described GB secretome proteins (MMP9, MMP2, VEGFA, YKL40 and OPN) in plasma and tumor tissue samples from a retrospective series of GB patients, using enzyme-linked immunosorbent assay (ELISA) and immunohistochemistry (IHC), respectively. Moreover, a more in-depth comparative proteomic analysis with mass spectrometry will be carried out to identify proteins which are differentially expressed in plasma from GB patients, in comparison with healthy donors.

With this project, we hope to gain knowledge on a set of biomarkers which may be relevant for a minimally invasive GB diagnosis/monitoring, to be used in clinical routine.

Irritation assessment of Universal Adhesives used in Dentistry

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Abstract

The development of adhesive systems, able to make the dental composite resin/dental substrate achievable, defined a turning point in dentistry. Dental adhesives allow a much more conservative design in dental restorative approaches, without the need to prepare self-retentive cavities - providing mechanical retention through such features as grooves or sharp internal angles - conceding the conservation of larger quantities of sound tooth substance. Since 2011, with the introduction of a new family of adhesive systems - Universal Adhesives - clinicians have been able to work with more versatile and more user-friendly systems (one-bottle), facilitating the intraoperative manipulation and reducing treatment time. Biological characterization of Universal Adhesives has been conducted in vitro, with different cell types, broadly focusing on cytotoxicity assessment, suggesting a concentration-dependent toxicity. Notwithstanding, the potential for irritation of dental adhesives has been widely neglected, it is influenced by a variety of factors such as the pulpal health, thickness of the dentin remnant, technique used during the preparation of the tooth and the adhesives´ components.

The HET-CAM (hen´s egg-chorioallantoic membrane test) is an alternative toxicological method that permits to evaluate, in a simple and reproducible way, the irritation potential of different substances. In this test, incubated hen´s eggs are opened carefully and the chorioallantoic membrane (CAM) is exposed. Test substances are following placed directly over the exposed CAM and the membrane is inspected visually for vascular alterations through time, and quantitatively scored.

This study aims to analyze the irritation potential of distinct commercially available Universal Adhesives with dissimilar chemical and physical formulations, through the HET-CAM assay, in order to disclose the ones with the least irritation potential and associated with an enhanced biocompatible profile.

Solid lipid nanoparticles loaded with epirubicin for breast cancer cell therapy

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Abstract

Breast cancer is the main cause of cancer-related death among women around the world. The traditional chemotherapy regimens used to treat this disease frequently result in severe side-effects and poor efficacy. Drug delivery systems have opened up new possibilities for enhancing the therapeutic benefits and limiting the systemic side-effects of chemotherapeutic drugs. Solid Lipid Nanoparticles (SLNs) have emerged as particularly promising nanocarriers in cancer treatment. Low toxicity, high drug bioavailability, adaptability in incorporating hydrophilic and lipophilic medicines, and large-scale production feasibility are all advantages of this type of nanoparticles. Clinical trial data indicate that epirubicin-based adjuvant treatment of breast cancer is associated with marked improvement in relapse-free and overall survival compared with traditional methods. Epirubicin belongs to a group of chemotherapy drugs called anthracyclines, which have low water solubility and can cause severe side-effects, which increase with dosage concentration. Epirubicin toxicity occurs mainly in mammalian haemopoietic cells and cardiac tissue, as this drug is not selective for tumor cells. These limitations can be solved or mitigated through the use of nanotechnology. Therefore, the objective of this work was to design and develop an affordable SLN using an organic solvent-free method as drug delivery system of epirubicin to enhance its solubility, improve its selectivity towards breast cancer cells and minimize its systemic side-effects. The nanoparticles were functionalized with folic acid to target cancer cells. The SLN were characterized in terms of size distribution, zeta potential and encapsulation efficiency (EE). Results showed particles with high EE (above 90%) and size and morphology suitable for intravenous administration.

Nanostructured biomimetic catalysts for solar light assisted oxidation reactions

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Abstract

Metalloporphyrins and their analogues are compounds with a central role in several fundamental biological processes, such as oxygen transport, oxidative metabolism, or light assisted synthesis. The mode of action of these macromolecules has been a source of inspiration for biomimetic processes of great relevance in the current eco-energy context, namely the use of sunlight to remove pollutants, the conversion of CO2 or the development eco-sustainable syntheses [1]. The oxidative processes allow to remove (toxic) pollutants from the environment, possibly to its mineralization or conversion to environmentally degradable intermediates [2].

In this context, the use of nanostructured metalloporphyrins (heterogeneous catalysts) is of great interest since it allows to obtain structural organization and high contact surface which is one of the main factors for the efficiency of catalysis.

In the present study, iron (III) porphyrins with catalytic or photosensitizing properties were used in the preparation of nanostructured materials by ionic self-assembly processes [3]. The materials have been characterized (UV-VIS and SEM-EDS) and tested in light assisted oxidative degradation in the presence of hydrogen peroxide. The catalytic process has been monitored by UV-VIS spectroscopy.

The catalytic activity of the materials has been tested in oxidative degradation of the 4-nitrophenol (toxic water pollutant) irradiated by solar light, UV light and in the dark (comparison purpose).

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References

1. Khalil, M.; et al., Renew. Sust. Energ. Rev., 2019, 113, 109246.
2. Mahy, J. G.; et al., J. Photoch. Photobio., A 2019, 373, 66-76.
3. Frigerio, C.; et al., Tetrahedron, 2016, 72 (44), 6988-6995.

A novel approach based on essential oils emulsions for the management of periodontal diseases

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Abstract

Periodontal diseases (PDs) are a group of pathogen-induced inflammatory oral conditions, that involve damage to the supporting structures of the tooth and, if left untreated, lead to tooth loss. The success of periodontal therapies depends on the capacity to control local infections. Especially in times of growing antibiotics resistance, the search for alternative agents with high efficacy and minor adverse effects is essential. Essential oils (EOs) are aromatic plants-derived products, widely used in pharmaceutical, cosmetic and foods industries. Several studies have been reporting the efficacy of EOs in the management of infections, owing to their lipophilic nature. Additionally, EOs present ability to penetrate supragingival mucous membranes, becoming therapeutic attractive agents to dentistry application. The most commonly used to combat periodontal disease are Tea tree and Eucalyptus oils, because of their antimicrobial, anti-inflammatory, and analgesic properties. Accordingly, the aim of this study is to develop an innovative therapeutic approach based on EOs emulsions for PDs management. In particular, the comparison between EOs emulsions in free- or encapsulated-state, regarding their antimicrobial and cytotoxic activity. Initially, emulsions of the EOs Tea tree and Eucalyptus were prepared in free-state and encapsulated in a hydrogel. The formulations were then characterized regarding their antimicrobial activity against *Enterococcus faecalis* and cytotoxicity using fibroblast cells. It is expected to obtain a similar profile of antibacterial activity and cytotoxicity, namely that the EO emulsions in the free-state present a biological response superior to that of the encapsulated EOs. The findings of this preliminary investigation will guide future studies on these formulations to aid the management of PDs.

Inhibition of enzyme α-glucosidase by styrylchromones and styrylpyrazoles

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Abstract

α-Glucosidase inhibitors are used as first-line drugs in patients diagnosed with type 2 diabetes mellitus. However, their use is associated with several gastrointestinal adverse effects. Thus, there is a need to find new safe molecules able to inhibit this enzyme. Styrylchromones and styrylpyrazoles are compounds with recognized biological activities. However, its antidiabetic potential is still poorly explored. In this sense, the present study focused on the inhibitory activity of α-glucosidase by a panel of five styrylpyrazoles and five styrylchromones. For this purpose, a microanalysis technique was used by measuring the α-glucosidase-mediated transformation of the substrate p-nitrophenyl-α-D-glucopyranoside into p-nitrophenol. Whenever possible, a structure/activity relationship was established. The results showed that styrylchromones where able to inhibit α-glucosidase with high efficiency. The structure-activity relationship study indicated that for styrylpyrazoles, the presence of a chlorinated styryl group at 4-position of the pyrazole, and for styrylchromones, nitro and chlorine substitutions in the styryl group contributed to the inhibitory activity. The present work suggests that some of the styrylchromones have the potential to be used in regulating postprandial hyperglycaemia in type 2 diabetes mellitus.

Acknowledgments

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Unveiling the Plant Specific Insert interaction network

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Abstract

The Plant Specific Insert (PSI) is a 100 amino acid domain that is cleaved out during aspartic proteinases´ (APs) maturation process. It shows biological activity when expressed in vitro, such as lipid membrane interaction, antimicrobial activity, induction of membrane permeabilization and modulation. Besides that, evidence shows that the PSI is responsible for the APs Vacuolar targeting process in vivo. PSI domains found in cardosin A and cardosin B, two APs from cardoon, can redirect secreted proteins to the Vacuole via different pathways, a mechanism that is still being studied.

Cardosin-A PSI (PSI A) and Cardosin-B PSI (PSI B) sorting mediated routes are very distinct: PSI A-mediated sorting follows an unconventional sorting route to the Vacuole bypassing the Golgi, carrying proteins straight from the Endoplasmic Reticulum (ER) to the Vacuole; while PSI B-mediated sorting route follows the conventional sorting pathway (ER - Golgi - Vacuole).

Our goal was to test the interaction network of cardosin´s PSIs, starting by testing self-interaction: PSI A-PSI A, PSI B-PSI B and PSI A-PSI B. Two different constructs were prepared - PSI A/B-GST-6xHis and PSI A/B-6xHis - and expressed and purified from bacterial cultures (BL21). Pull-downs using the GST fusion as bait and glutathione agarose beads were made under different buffer conditions. No obvious interaction between the PSIs was observed in this system, but further studies in different conditions will be done, especially involving alterations of the pH, as it has been described that PSI structure may change in acidic environments. Presently, we are cloning and expressing in BL21 a few proteins that were previously selected as potential interactors by a co-immunoprecipitation performed on *Arabidopsis* using the two PSIs-GST as baits. After that we will perform pull-down assays to verify the interaction of these proteins with the PSIs.

A contribuation for the Geological Heritage of the municipality of Bragança

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Abstract

Geologically, the municipality of Bragança (NE of Portugal) is part of the Galicia-Trás-os-Montes and Central-Iberian zones. The Galicia-Trás-os-Montes Zone comprises a set of allochthonous and parautochthonous units, thrusted over Central Iberian autochthonous sequences.

For the elaboration of this work, several field visits were carried out in specific geological points namelly in the upper allochtlon, with sampling rock collecting of namely quartzphyllites, such as the following visits to "Castelo de Pinela", as the dunites and mafic rocks in the convent of São Francisco and in the parautochthon (the inactive mine of Alto da Caroceira and the "Castelo de Pinela", with the study of quartzphyllites).

In the convent of S. Francisco and in the "Theater outcrop" detailed geological field work were carried out. The rocks present in the "Theater outcrop" are serpentinized dunites. In the area of the convent it was possible to confirm that mafic rocks are thrusted over serpentinized dunites.

In the Alto da Caroceira/Aveleda barite mine samples of barite, sulphides and the gossan were collected. From these samples were made polished thin sections and polished surfaces and it was possible to notice barite in paragenesis with the sulphides;the precipitation of carbonates-azurite and the iron oxides present in the gossan.A proposal is presented for the formation of barite as well as for the formation of the gossan.

An essay of the geologic, mining and geoheritage significance of the municipality of Bragança was obtained. This information is useful to raise awareness about the geological potential of the area and how it can be better used, either in the mining and economic aspects, or the educational, geotourism and the geological heritage. Noteworthy are the graphic materials (flyers) produced during this work.

Infralimbic-Nucleus accumbens microcircuit underlies neuropathic pain-related working memory deficits

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Abstract

Infralimbic cortex and nucleus accumbens shell region (IL-NAcSh) microcircuit is an important pathway involved in various brain functions, such as spatial working memory (WM). These areas share dense neural interconnections, revealing a strong synchrony during the cognitive demand. The instability of the IL-NAcSh circuit connectivity observed during painful conditions is deemed one source of WM impairments; however, these alterations are not fully understood. To assess the potential role of the IL-NAcSh circuit on spatial information retention and pain responses, we made electrical lesions in the NAcSh to evaluate WM performance on an 8-shaped spatial WM alternation task. The arena was divided into 3 navigation zones. Starting from the center corridor of the maze, the rats were trained to alternatively visit 2 "reward zones" to obtain one sucrose pellet. After visiting 1 of the reward locations, the rat must continue forward ("delay zone") and cross again the central corridor ("choice zone") before visiting the opposite reward location. Within-subject behaviour WM performance was assessed after the onset of a rodent model of persistent neuropathic pain - spare nerve injury (SNI). Probe sessions were composed by 2 daily sessions performed 14, 21 and 28 days after surgical procedures. Sensory threshold for noxious stimulation was evaluated using von Frey filaments. Our results showed a decrease of the WM performance 14 days after nerve injury. This was also accompanied by an increase in the time spent in the reward location. SNI/NAcSh-lesioned rats revealed higher response latency 21 days after the surgical procedures compared with Sham/NAcSh-controls and SNI/NAcSh-controls rats, which shared a similar response latency. Finally, we found that NAcSh lesion in SNI rats has an effect on peripheral pain responses. These results suggest that IL-NAcSh microcircuit may play an important role in the deregulation of WM capability under neuropathic pain conditions.

Wood residues as a promising and sustainable source of bioactive phenolic compounds

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Abstract

Biomass represents a natural source of valuable components with potential application in many industries. Recently, it has been demonstrated that wood residues, namely from apple tree and vineyards, can be used as a potential source of bioactive compounds, namely polyphenols.

This study aims to investigate the potential of apple wood and vine pruning residues as a source of antioxidants, by evaluating their phenolic composition as well as their antioxidant activity. For that, an ultrasound-assisted extraction (5% w/v, 30% aqueous ethanol, 10 minutes and 70% amplitude) was employed, and the obtained extracts were characterized through different spectrophotometric assays. In this research, Jonagold wood sampled in three different locations (Bangels, Neven and Wolfcarius) and vine pruning from different varieties (Touriga Nacional, Tinta Roriz and Loureiro) were used. The results obtained revealed that apple wood extracts presented a total phenolic content higher than vine pruning samples, with the ones collected in Wolfcarius exhibiting the highest content (12.4 ± 0.4 mg of gallic acid equivalents per g of dry extract). Regarding the antioxidant properties, vine pruning extracts from Touriga Nacional variety presented 6.53 ± 0.23 and 16.4 ± 0.6 mg ascorbic acid equivalents per g of dry extract for the ferric reducing antioxidant power and the ABTS radical scavenging activity assays, respectively.

Work is in progress in order to identify the individual phenolic compounds that can be contributing to the presented antioxidant properties, using high performance liquid chromatography with diode array detection. Additionally, to ensure the safety of the produced extracts, contaminants will be also screened.

Acknowledgments

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Embryological and clinical outcomes - Comparing HCG and GnRH agonist as oocyte triggers

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Abstract

Ovarian hyperstimulation syndrome (OHSS) is the most common and severe iatrogenic complication of the application of assisted reproduction treatment (ART), occurring in 1-2% of the ART cycles performed. This life-threatening syndrome corresponds to an excessive response to controlled ovarian stimulation during treatment cycles and it leads to development of multiple ovarian follicles and supra-physiological levels of estrogens. Clinically, OHSS resumes in an enlargement of the ovaries, with presence of ascites, pleural effusion and hemoconcentration, due to the increased capillary permeability, and other serious systemic complications.

There are, in the literature, several factors described that predispose women to develop this complication, such as young age, high number of antral follicles, high serum estradiol levels and the number of collected oocytes. In the past years, the advent of new ART techniques and drugs has had the reduction of OHSS as great aim. However, there is a need to understand if the implementation of new oocyte triggers is influencing the outcomes of the cycles on these women. Our research aims to compare the embryological and clinical outcomes of oocyte trigger either with HCG or with a GnRH agonist, in order to unveil if the use of an agonist as oocyte trigger is able to avoid the development of OHSS during ART cycles without lowering clinical successful outcomes.

For this purpose, a population of good responders was selected. From 2012 to 2018, 503 cycles of ICSI and IVF, 202 using HCG as trigger and 301 using a GnRH agonist as trigger, were analyzed. In this work, we present the characterization of the population (Table), which will be followed by statistical analyses to determine if there is a significant difference between the two groups in the rates of fertilization, embryo development, biochemical pregnancy, clinical pregnancy, implantation, abortion, live birth delivery, newborns and ectopic pregnancy.

Assessing the potential role of brassinosteroids, strigolactones and silicon in alleviating the effects of heat and salt stress on *Solanum lycopersicum L.*

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Abstract

The Mediterranean basin, harboring three of the most important producers and exporters of tomato worldwide, is one of the most susceptible regions to CC (Climate Change), with high temperatures and soil salinization being two of the most prevalent factors impacting agricultural productivity. Recent studies from our team clearly showed that the combination of heat and salinity stresses impose a harsher effect on plant growth and physiology when compared to single treatments. As such, developing sustainable strategies to mitigate their combined action is urgently needed. Thus, the focus of this study was to evaluate how the exogenous application of two phytohormones [brassinosteroids (BRs; 1 µM 24-epibrassinolide) and strigolactones (SLs; 5 µM GR24)] and a beneficial element (silicon - Si; 2 mM) can modulate the response of *Solanum lycopersicum L.* var. cerasiforme (tomato plants) to high temperatures and salinity. After 7 d of acclimation to growth chamber conditions, salt stress was applied through NaCl irrigation (100 mM) every alternate day during 28 d, with heat stress being applied in the last 21 d, through exposure to 42 ºC for 4 h every other day. SLs, BRs, and Si treatments were given as a foliar spray, twice per week, throughout the experiment. At the end of the assay, results showed that none of the applied compounds was able to mitigate the combined toxicity, neither in growth, nor in oxidative (hydrogen peroxide and lipid peroxidation) or photosynthetic (chlorophyll and carotenoids) markers. Nonetheless, the potential of these strategies should not be overlooked, as primed plants tended to present slightly increased biomass. Moreover, those sprayed with SLs showed a tendency to accumulate less proline and more glutathione, indicating a differential activation of defense pathways.

Synthesis of diarylpentanoid derivatives as promising antimitotic agents

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Abstract

Despite the effectiveness of Microtubule-targeting agents (MTAs) to prevent cancer cells from dividing, some cancers become resistant to them. In addition, several side effects, including myelo- and neurotoxicity, are reported. Therefore, new MTAs that can overcome the disadvantages associated with the MTAs currently in use are needed [1].

Diarylpentanoids comprise a class of natural products and their synthetic analogues well known for their antitumor activity [2]. Recently, as result of the search for new antitumor agents by our group, the diarylpentanoid BP-M345, possessing a C5 bridge with a dienone moiety between the two aromatic rings, has been identified as an antimitotic agent through microtubule perturbation [3]. To study the effect on antimitotic activity of the molecular modification of the C5 bridge between the two aromatic rings present in BP-M345, a small library of BP-M345 derivatives was prepared. Firstly, Claisen Schmidt condensation of tetrahydro-4H-pyran-4-one with 3,4,5-trimethoxybenzaldehyde afforded BP-M345 with 64% yield. Then, BP-M345 was submitted to catalytic hydrogenation with Pd/C and Pd(OH)2/C in H2 atmosphere affording BP-M345 derivatives with moderate yield. The synthesized compounds were characterized by NMR techniques (1H NMR, 13C NMR, HSQC and HMBC). The antimitotic potential of newly synthesized BP-M345 derivatives will be evaluated in order to perform structure-activity relationship studies.

Acknowledgments

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References

1. A.C. Henriques et al. Cancer Lett. 2019, 440, 64-81.
2. J. Moreira et al. Eur. J. Med. Chem. 2020, 112177. 10.1016/j.ejmech.2020.112177
3. P. Novais et al. Molecules 2021, 26, 7139. doi.org/10.3390/molecules26237139

Genistein-loaded nanostrategies for skin anti-aging

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Abstract

Genistein is a natural isoflavone which promotes skin elasticity and prevents photoaging and skin cancer. Its bioactive properties comprise a strong inhibition of reactive oxygen species, antioxidant activity and photoprotection against ultraviolet-B radiation. Genistein can therefore increase the thickness of skin collagen, delaying skin aging and protecting from oxidative stress. Topical application of conventional formulations with bioactive compounds are usually characterized by low uptake rates caused by the barrier functions of stratum corneum, so the design of adequate delivery systems must be a priority to achieve an effective cutaneous application. This study aimed to develop and characterize lipid nanoparticles to deliver genistein into the skin. The storage stability at room temperature revealed no statistical differences in terms of size, polydispersity index, and no loss of drug content through 12 weeks, although surface charge became more negative through time. The antioxidant activity is maintained in genistein-loaded nanoparticles, with a protection effect when compared to the same amount of free compound. Cellular biocompatibility towards keratinocytes was confirmed up to 2 mg/mL in lipid, corresponding to 100 µg/mL of entrapped genistein. Upon freeze-drying the nanoformulation formed an oleogel with rheological properties suitable for skin application. There was also an increase in water uptake up to 6 hours, resulting in a swelling behavior of the oleogel. The developed formulation may present an efficient strategy for achieve skin anti-aging effects.

Acknowledgements

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Semen microbiome shows diversity differences correlated with bacterial load

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Abstract

The microbiome is known to play a role in human diseases like inflammatory bowel disease. Yet, studies of the impact of bacteria on the male reproductive system are still in their infancy. Previous results suggested differential bacterial communities according to semen quality variables. To provide a more in-depth characterization of the microbial shifts that could underlie the previously reported differences, we analyzed a well-stratified cohort comprising 15 controls and 53 infertility cases. Total DNA was extracted from seminal plasma using QIAamp DNA mini kit, amplified for 16S ribosomal RNA (16S rRNA) gene using the Ion 16S Metagenomics Kit and sequenced in an Ion Torrent S5 XL platform. The data was processed using the Torrent Suite and Ion Reporter software to perform several quality control steps and generate Operational Taxonomy Units (OTUs). MicrobiomeAnalyst tool was used to perform statistical tests of 16S rRNA data (V3, V4 and V6-7 hypervariable regions) in order to evaluate microbiome profiling alterations. Additionally, samples´ bacterial load was measured by 16S rRNA qPCR. No differences between cases and controls were detected so far. Nonetheless, alpha and beta diversity indexes showed significant differences according to the bacterial load (high, medium and low). Precisely, high diversity levels were observed when the bacterial load was low, which were gradually reduced as the bacterial load increased. Notably, these changes were accompanied by a rise in *Enterococcus* abundance, which was the predominant taxa in the low diversity-high bacterial load samples. Overall, our results seem to fit the concept that in heathy conditions the male urogenital tract presents a microbiome with low biomass and high diversity that shifts towards the prevalence of some taxa in pathological states. Moreover, *Enterococcus* is a recognized pathogen known to cause prostatitis and epididymitis, even though our cohort did not present signs of infection.

Cutaneous drug delivery systems to control skin inflammation

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Abstract

Skin delivery can be designed to achieve topical or transdermal administration. Topical application provides a local action of the drug with reduced ability to penetrate to lower skin layers. On the other hand, transdermal administration allows transporting the drug to the bloodstream or lymphatic system, thus allowing its distribution throughout the body. Cutaneous applications can reduce drug losses through the first-pass effect, improving the dose-efficacy relationship with a decrease in side effects. However, the skin stratum corneum might be a difficult barrier to overcome since its major role is to protect the body from external aggressions. In this study, different drug delivery systems were designed to overcome the problems of drug delivery through skin. First, different betamethasone (BM)-loaded lipid nanoparticles were proposed for cutaneous application. Nanostructured lipid carriers (NLCs) were better platforms than solid lipid nanoparticles, with smaller size (212+/-6 vs 227+/-6 nm) and higher drug content (1.83 vs 1.65 mg). A hybrid hydrogel of sodium alginate and poly(vinyl alcohol) was also prepared to embed the BM-NLCs, address its swelling capacity and ex vivo pig ear skin permeation. After 24 h, free BM reached a skin permeation rate of 60%, while hydrogel embedded BM-NLCs only permeated about 10% of initial amount. The designed hydrogel-BM-NLCs system may retain more BM in skin layers and be a promising strategy for future cutaneous management of inflammatory skin conditions.

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Understanding beta-oxidation in cyanobacteria

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Abstract

Cyanobacteria are an ancient group of oxygenic phototrophic procaryotes from which chloroplasts have evolved. These organisms are gram-negative bacteria with an extensive morphological diversity, existing in forms that range from single-celled to differentiated multicellular forms. They are also famous is various environments, such as marine, freshwater, or terrestrial habitats.

An interesting characteristic of the fatty acid metabolism of cyanobacteria is an apparent lack of a functional β-oxidation pathway, which means that incorporation of fatty acids into lipids is the only destination for moderate amounts of free fatty acids, with excessive amounts being apparently secreted into the surrounding medium. This property was recently taken advantage of for the development of a new strategy to uncover natural products.

This new strategy led to further inquiries into the lack of a beta-oxidation process in cyanobacteria, which uncovered a possible alternative fatty-acid catabolic pathway.

We now intend to explore this observation and try to identify how the lipid metabolism of these ancient organisms works, which will not only bring understanding to this widespread question, but also take us a step further into cyanobacteria evolution.

Potential therapeutic role of fluvoxamine in COVID-19: a systematic review

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Abstract

Fluvoxamine is a selective-serotonin reuptake inhibitor (SSRI), well-tolerated and widely available, usually used in the management of mental-health conditions. Fluvoxamine is also a sigma-1 agonist with high affinity to this receptor and this pharmacodynamics effect has been the main explanation for some evidence emerged about the potential of using fluvoxamine in COVID-19 patients.

This systematic review was conducted according to the PRISMA guidelines and protocol was submitted in PROSPERO. The search was run in MEDLINE, Web of Science, and CENTRAL from the Cochrane databases. The study protocol was registered in PROSPERO (CRD42022302025).

Our aim was to evaluate the present evidence for therapeutic role of fluvoxamine in COVID-19 patients, the review included studies which evaluate the effect of fluvoxamine in COVID-19 patients.

The main outcomes evaluated in the review were: mortality, need for hospitalization (outpatients) and clinical deterioration.

The quality control of the selected articles was made using Cochrane´s Risk of Bias tool for the randomized controlled trials (RCTs) and the ROBINS criteria for non-randomized studies.

A total of 4 studies were included in the final qualitative analysis of the review, 2 of which were RCTs, and the others were open-label prospective cohorts. 3 studies assessed outpatient population and 1 evaluated ICU population. Overall, the 4 studies included a total of 1864 participants.

In conclusion, 3 studies with outpatients showed that fluvoxamine treatment can prevent clinical deterioration, hospitalisation, or proxy-hospitalisation. The only study with patients hospitalized in the ICU, also demonstrated a therapeutic benefit reducing overall mortality.

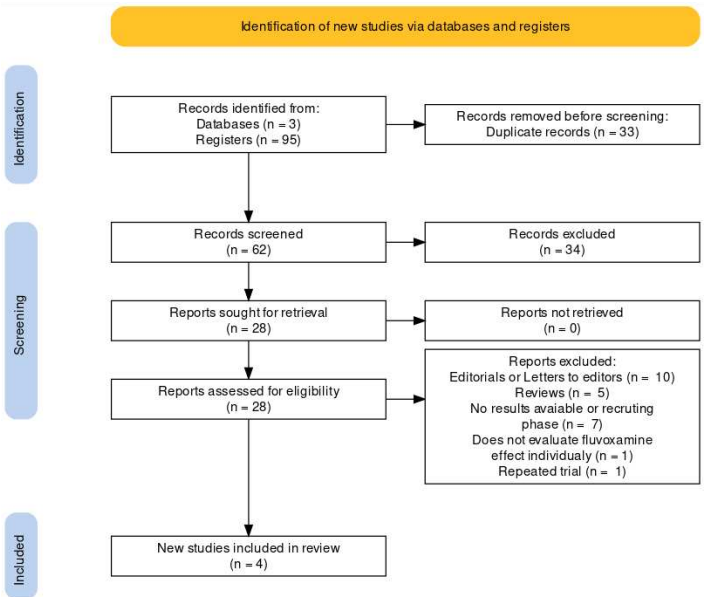

Figure 1. PRIMA 2020 flow diagram

Assessment of cyanobacterial biomass as sustainable agricultural fertilizer: soil-experiment with plants in pot.

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Abstract

To provide food to the growing human population in a sustainable way is one of the greatest challenges of modern society. In this context, cyanobacterial biomass can act as a source of nitrogen, phosphorus and potassium, phytohormones and vitamins increasing soil productivity. These organisms are easy to grow in controlled conditions but can also be collected from the environment in high amounts. However, some of these cyanobacterial strains produce toxins as secondary metabolites therefore, its use in the production of food needs to be carefully monitored to ensure food safety. The main objective of this study is to evaluate the possible use of cyanobacterial biomass, from toxic and non-toxic strains, as fertilizer supplement in the growth of economically relevant vegetables. To do this, we will compare the growth and chlorophyl content of plants with and without added commercial fertilizers and lyophilized cyanobacterial biomass. Also, we will assess the safety of the edible vegetable products obtained regarding their toxin content and the nutritional and mineral content. In our first experiment, we had exposed one-moth old *Raphanus sativus* and *Spinacia oleracea* plants growing in pots in indoor conditions. The experiment included 6 experimental conditions, (1) a control with no extra nutrient addition, (2) a recommended dose of a commercial NK fertilizer, all the other contained lyophilized cyanobacterial biomasses among them, (3) a non-toxic strain of *Cylindrospermopsis raciborskii*, and the toxin producer strains of (4) *C. raciborskii*; (5) *Microcystis aeruginosa* and (6) *Anabaena sp*. In the lyophilized cyanobacterial biomass, we will assess the toxin concentration and the NPK content. Also, in the plant tissues we will measure the chlorophyl content and the growth in terms of high, wet and dry weight. Finally, in the vegetable edible parts, we will estimate the toxin content to compare them with the maximum recommended dose, the total phenols and mineral content.

Initials steps into the synthesis of borylated xanthone derivatives

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Abstract

Xanthones are molecules carrying a dibenzeno-gamma-pyrone moitey affording a model for several potential new drugs [1]. On the other hand, boronic acid derivatives are known to have antibacterial, antiviral, and anticancer activities [2]. It is known that boronic acid has several advantages when incorporated into molecules with therapeutic activity, such as improved pharmacokinetics and potency [2]. The aim of this work is the insertion of a boronic acid moiety in xanthone scaffold to pursuit bioactive compounds with favourable drug-like properties.

One hydroxyxanthone was chosen as a precursor for the development of a procedure to borylate xanthones, mainly due to its easy synthesis and availability. From this xanthone, trifylxanthone was prepared. The synthesis of bis(pinacolatoboron)xanthone is achieved using bis(pinacolatodiboron) B2pin2 as a borylation agent under Pd(dppf)Cl2 catalysis with addition of dppf complex in the presence of KOAc. Bis(pinacolatoboron)xanthone derivatives will be further deprotected into xanthone boronic acids to be investigated in future biological assays.

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References

[1] Pinto, M.; Palmeira, A.; Fernandes, C.; Resende, D.; Sousa, E.; Cidade, H.; Tiritan, M.; Correia-da-Silva, M.; Cravo, S. From Natural Products to New Synthetic Small Molecules: A Journey through the World of Xanthones. Molecules 2021, 26, 431.

[2] Silva, M.P.; Saraiva, L.; Pinto, M.; Sousa, M.E. Boronic acids and their derivatives in medicinal chemistry: Synthesis and biological applications. Molecules 2020, 25(18):4323.

[3] Plescia, J., Moitessier, N. Design and discovery of boronic acid drugs. Eur. J. Med. Chem. 2020, 195, 112270.

Promising synergistic effect of blackcurrant anthocyanins and docetaxel on triple negative breast cancer cells

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Abstract

Introduction: Blackcurrants (BC; *Ribes nigrum*) are dark purple berries with a high content of anthocyanins (ANT; 592 mg/100 g), especially 3-O-glucoside and 3-O-rutinosides of delphinidin and cyanidin [1]. Recent studies have focused on the evaluation of ANT effects on triple negative breast cancer (TNBC), an invasive cancer with poor prognosis but interestingly more sensitive to diet [2]. Docetaxel (DT), an effective mitotic inhibitor used on TNBC treatment, has deleterious effects that can be reduced in combined therapies.

Aims: Evaluate the combined effect of two major BC anthocyanins: delphindin-3-O-glucoside (DG) and delphinidin-3-O-rutinoside (DR) with DT on MDA-MB-231 cells (TNBC model) and assess its selective cytotoxicity by comparison with healthy breast cells (MCF-12A).

Methodology: The cytotoxic effect of ANT (10 - 400 µM) and DT (0.01 - 200 nM) on MDA-MB-231 and MCF-12A cells was assessed by the MTT assay. The individual and combined effect of compounds was evaluated using the Compusyn software based on Chou-Talalay method which evaluates interactions in a wide range of concentration/effects at IC50 ratio.

Results: DG and DR induced a dose-effect response on MDA-MB-231 cells proliferation and the DG-DR-DT combination produced a synergistic effect at inhibition concentrations between 10 and 90%. DG-DR-DT was unable to alter MCF-12A cell growth, demonstrating that this combination has selective cytotoxicity for TNBC.

Conclusions: DG and DR combined with DT resulted in a synergistic effect on TNBC cells proliferation with no cytotoxicity in healthy cells. The high content of these ANT in BC can bring these berries to the forefront of studies concerning their utility as an adjuvant to this diet sensitive cancer. However, the identification of the most promising berry products and guidelines of consumption are required to achieve the biological desired effects.

References

1. Phenol-Explorer (http://phenol-explorer.eu/)
2. Viegas, O. et al. J. Funct. Foods. 2019;54:39

Photocatalytic transformation of biomass derivatives into value added products

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Abstract

The reduction of consumption of non-renewable resources is a strong factor in the use of biomass derivatives to obtained value-added products. The oxidation of 5-hydroxymethyl-2-furfural (HMF) is a sustainable method of producing a versatile chemical platform 1. Photocatalysis using solar energy is a promising method for selective transformations under environmentally friendly conditions. 2

This work was focused on preparation, natural biopolymer-based (chitosan) photocatalysts for transformation of the biomass derivatives to valuable products. The photocatalysts were produced by co-precipitation or hydrothermal methods based on utilization of iron-rich or iron-poor fractions from coal combustion. Chitosan was used as a linker between coal fly ash particles (CFA; core), and $BiMnO_3$ semiconductor nanoparticles (photo active sites). The new hybrid materials were tested in photocatalytic oxidation of HMF, and the substrate consumption and products formation were monitored by HPLC.

Acknowledgements

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References

1.Wu, X. et al., Chem. Soc. Rev. 49 (17), 2020, 6198.
2.Krivtsov, I.; et. al., Appl. Catal. B204, 2017, 430

Marchantia polymorpha L. as a model organism for intracellular trafficking pathways studies

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Abstract

Marchantia polymorpha is a bryophyte with a wide distribution and is considered one of the ancestral of terrestrial vascular plants. *M. polymorpha* has a life cycle with a dominant haploid phase. The haploid dominance of *M. polymorpha* life cycle confers advantages in terms of genetic and biochemical analysis since there is no heterozygosity in the gametophyte generation. Our main goal was to evaluate the potential of *M. polymorpha* as a model for the study of intracellular trafficking pathways, particularly the ones related to the vacuole. The Plant Specific Insert (PSI) is a protein domain with about 100 amino acids present in certain aspartic proteinases that function in protein targeting to the vacuole and interacts with cell membranes in vitro. It is known that some PSI domains can mediate transport towards the vacuole without interacting with the Golgi complex, which makes it more efficient favoring metabolically active organs. *M. polymorpha* gemmae were transformed via co-culture with *Agrobacterium tumefaciens* and four different lines were obtained with the following markers: Endoplasmic reticulum marker (HDEL-GFP), Golgi marker (ST-GFP), cardosin A PSI (PSIA-mCherry) and cardosin B PSI (PSIB-mCherry). So far, we have established and validated these *M. polymorpha* lines and started their characterization by checking the markers expression by western blot. The localization of the reporters used was also assessed by the observation of transformed gemmae under confocal fluorescence microscopy. Preliminary results point to a similar localization as in *Arabidopsis* plants compartments. Further work will involve the confirmation of the proteins´ localization in different types of cells and evaluation of their trafficking routes by using drugs affecting the vesicular transport.

Nature-based solution to treat olive oil mill wastewater

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Abstract

World olive oil production exceeded 3 million tons in 2019/20. Olive oil is produced through extraction methods that lead to the production of effluents (0.5-1.5 m3 per 1000 kg of olives) named olive oil mill wastewater (OOMW). OOMW are characterized by their dark color, strong odor, low pH, high content of organic matter and phenolic compounds, being potentially toxic to plants and microorganisms, and difficult to treat due to the presence of lipid compounds, in addition to the problem associated with their seasonality. Constructed Wetlands (CW) are affordable treatment options that allow the improvement in the quality of various types of effluents by adsorbing or modifying compounds of their composition when passing through the substrate and plant roots. Thus, we developed a pilot-scale project in which we tested the treatment of OOMW in lab-scale CW units with the aim of evaluating its efficiency in improving the physicochemical characteristics and reducing the toxicity of this effluent, evaluating the effects through ecotoxicological assays with aquatic organisms. Furthermore, considering the seasonality of olive oil production, and in a circular economy perspective, the possibility of using the CW substrate as a natural soil fertilizer will be studied evaluating its safety for soil organisms through ecotoxicological assays, as well as its potential as a soil fertilizer.

From Abstract to Concrete: Project for a Chapel in the Countryside

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Abstract

An architect, when designing, seeks to synthesise and develop his ideas so that, one day, they can become reality. The dissertation "From Abstract to Concrete: Project for a Chapel in the Countryside" explores the creative process of architecture and the constant confrontation between abstract and concrete that the projectual conception implies. The architect, when designing, follows a path that starts from the abstract "world of the ideas" towards the concrete reality of the "real world". Since, in the conception of architecture, the synthesis of the ideas is what allows them to exist in the "sensible world", the logic defended by Plato in his parable of the Allegory of the Cave is inverted, placing the "world of ideas" inside the "cave", and the "sensible world" in the "real world".

Thus, through the development of an architectural project for a chapel in the countryside, from its diffuse initial ideas to the aspects of construction and detail, the creative process of architecture and the constant confrontation between the abstract and the concrete are explored. The research is developed in relatively autonomous essays, which result from reflections and a sense of awareness around the project´s themes that were raised during the creative process of the chapel, and that are exposed here in order to describe this path, not always linear, that the architect follows from the "world of ideas" to the "real world".

Influence of different wine spirits on the production of Port Wine

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Abstract

Port Wine is one of the most famous Portuguese wines known worldwide for its unique characteristics and excellence. Adding of 77% wine spirit which represents about 20% of the total volume of the wine, stops fermentation allowing about half of the initial sugars of the grapes to be kept. In addition, the wine spirit gives several characteristics to the Port Wine due to the interactions between the compounds of both. Knowledge of the different compounds of a wine and the influence that wine spirit can have on these compounds is essential to guarantee a final product with the highest possible quality.

In this work, the effects of adding three wine spirits, normally used by the company in fortification, were studied to understand if there are differences in the properties granted to the wines produced in the 2020 harvest.

The three fortified wines were analyzed monthly for color intensity, by two different methods, color tone, percentage of different colors, pH, Baumé degree, total alcoholic strength by volume, total sugars, SO2 content, total anthocyanins and stained anthocyanins, ionization index, total phenols, non-flavonoid phenols and flavonoid phenols. A comparative sensory analysis was also performed.

The results obtained made it possible to observe significant differences between the wines and their evolution over the months of the analysis period, although it was not possible to draw conclusions from all the procedures performed.

In summary, we can conclude that wine to which wine spirit 2 was added showed superior characteristics in terms of colorimetric parameters and phenolic composition, making the wine spirit used in this wine the most suitable in the winemaking process. The opposite was found with the wine with wine spirit 1, which presented the lowest values for the different analyses.

Antimicrobial activity and cytotoxicity of copper oxide-loaded hydrogels

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Abstract

Nowadays, drug-resistant bacteria are a severe clinical concern that poses a threat to people's health and lives, being required alternative antimicrobial compounds to prevent and control bacterial infections, particularly those caused by drug-resistant bacteria. Antimicrobial metals have been studied as promising compounds to control and treat bacterial infections due to their efficacy against both Gram-negative and Gram-positive bacteria and their non-specific antibacterial mechanisms, which avoids the development of bacteria resistance. Copper oxide particles are being exploited in consumer and medical device products in the last decade, due to their excellent antimicrobial properties and their role in numerous physiological and metabolic processes critical for the appropriate functioning of almost all tissues in the human body. Copper (II) ions (Cu2+) are utilized to improve wound healing, since they are involved in the synthesis and stabilization of extracellular matrix skin proteins and angiogenesis. The incorporation of copper oxide particles into hard and soft biomaterial surfaces is an attractive approach to develop biomaterials with antibacterial activity. Hydrogels, 3D networks formed from natural or synthetic polymers, are widely used in several biomedical applications such as tissue engineering, drug delivery, cell culture, wound healings.

Thereby, the present work intends to develop copper oxide-loaded hydrogels for the management of infected wounds. The antimicrobial activity of developed hydrogels will be evaluated against bacterial strains associated to wound infections such as methicillin resistant *Staphylococcus aureus* (MRSA), *Staphylococcus epidermidis* and *Pseudomonas aeruginosa*. Moreover, blood coagulation studies and its cytotoxicity will be also performed using fibrin formation and fibroblast cultures, respectively. In the end, it is expected to have a biomaterial with good antibacterial activity and negligible cytotoxicity.

Piliostigma thonningii (Schum.) Milne-Redh.: An ethnopharmacological approach to validate its traditional use as antidiabetic

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Abstract

According to ethnobotanical surveys, *Piliostigma thonningii (Schum.) Milne-Redh.* is a particularly reputed species in African Traditional Medicine, especially for the treatment of diabetes. Despite the existence of some works describing the biological activities of this species, its antidiabetic potential remains poorly studied. Therefore, the purpose of this work was to further detail mechanisms underlying their antidiabetic properties, by using in vitro models of disease. To achieve these goals, a series of non-enzymatic and enzymatic assays were performed with aqueous extracts from P. *thonningii* leaves and stem bark, which include the capacity to scavenge nitric oxide (●NO) and superoxide anion (O2●-) radicals, and the inhibitory effects against α-amylase and α-glucosidase.

Both extracts revealed capacity to scavenge ●NO and O2●- in a concentration-dependent manner, being stem bark the most effective material (IC25 = 8.79 µg/mL and IC50 = 25.94 µg/mL. respectively). While displaying a mild inhibition towards α-amylase (IC50 (Stem bark) = 239.94 µg/mL), *P. thonningii* aqueous extracts were particularly effective against α-glucosidase, with IC50 values of 0.36 and 5.50 µg/mL for stem bark and leaves, respectively. The potential of both extracts to inhibit aldose reductase, a key enzyme in the glucose metabolism, is being assessed. Furthermore, their phenolic profile is being established, by HPLC-DAD, to identify possible structure-activity relationships, and preliminary results revealed that both extracts have a distinct profile, being leaves essentially composed by flavonol derivatives. Overall, the antidiabetic effects herein reported provide a rationale for the use of *P. thonningii* in traditional medicine.

Acknowledgements

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A microfluidics approach for minimally invasive isolation and protein profiling of CTCs in lung cancer

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Abstract

Lung cancer (LC) is one of the most incident cancers, with the highest mortality rate, worldwide. LC is often detected in advanced stages, with tissue biopsy being the go-to diagnostic procedure, which has several drawbacks. Difficulties in accessing lung tissue or analyzing tumor heterogeneity, associated with limitations in performing re-biopsies due to the risks they pose to the patient, prevent the monitoring of the patient's condition in real-time.

Liquid biopsies are relevant in this area since they offer the possibility of a non-invasive diagnosis and prognosis. Examining LC through relevant tumor biomarkers, such as circulating tumor cells (CTCs) would provide a representative analysis for detection and disease progression.

However, isolating and identifying these cells remains a challenge due to their rarity in the blood. In that sense, the objective of this work is to efficiently capture and detect CTCs from LC patient´s blood applying a microfluidic chip. This research also aims to identify new specific biomarkers for LC, by performing protein profiling of CTCs, as well as to develop high-throughput methods to detect PD-L1 expression, a protein already identified in patients eligible for immunotherapy.

Preliminary work has focused in the assembly of a functional closed microchip by soft-lithography and plasma treatment techniques, as well as optimization of a Fluorescence in-situ hybridization (FISH) method for PD-L1 identification.

In future works, blood samples from LC patients will be processed in-chip to detect and isolate CTCs by size. Subsequently, the proteomic profile of these CTCs will be characterized and the validation of a fluorescence probe (FISH) in detecting PD-L1 expression will also be performed. This aims to serve as a high-throughput chip-based method of diagnosis and/or prognosis of LC, as well as potential selection of personalized treatments for the patient via liquid biopsies.

In vitro interaction of human gingival fibroblasts with gelatin-based haemostatic agents

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Abstract

Haemorrhage is a leading cause of preventable mortality and haemostatic sponges are an important therapeutic option for its management when physiological processes are inefficient. However, and given the wide availability of commercial products, there is a need to systematically address the biological functionality of these materials, in order to disclose the most adequate to be used in a clinical setting, with enhanced outcomes.

In accordance, this study aims to address the biological characterization of clinically available gelatin-based haemostatic agents (specifically, Hemospon®, Clinix®, Roeko® and Octocolagen®), through in vitro studies with human fibroblastic cells.

The cells were cultured for 24 hours in growth medium (a-MEM with 10% FBS, 100 UI/mL penicillin, 100 UI/mL streptomycin and 2,5 µg/mL amphotericin B) after which the leachables obtained from the hemostatic agents according to ISO 10993-17, were added at concentrations of 50%, 25% and 12,5%. Cells grown in the absence of leachables were established as a negative control. The cell cultures were then evaluated on cellular viability (live and dead assay and flow cytometry analysis) and metabolic activity, at different timepoints.

Data analysis revealed that cultures grown in the presence of the leachables from all four haemostatic sponges were found to proliferate actively throughout the culture period, with minimal evidence of cell death and reduced impairment of the culture metabolic activity. Comparatively, Hemospon appeared to induce the least cytotoxic behavior. We can conclude, that although tested sponges are all gelatine-based, they present differences in their biological behaviour that might influence their clinical performance.

Overexpressing SVCT2 in Microglia to Target Learning and Memory Deficits in the Thy1-αSyn Mice Model of Parkinson's Disease

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Abstract

Parkinson's disease (PD) is a neurodegenerative disease that presents motor and non-motor symptoms such as deficits in learning and memory. Vitamin C is an essential antioxidant molecule present in the central nervous system (CNS). Ascorbate (its reduced form) uses the SVCT2 (sodium vitamin C co-transporter isoform 2) to enter microglial cells. These cells are the main immune resident cells in the CNS and respond to changes in CNS homeostasis, such as neuronal hyperactivation or disease. In those cases, the SVCT2 expression in microglia is downregulated, leading to decreased amounts of ascorbate inside microglia, inducing microglial proinflammatory activation. Recently, studies suggest that microglial proinflammatory activation correlates with Parkinson's disease (PD) progression, including memory decline. In this work, we used the Thy1-αSyn mice as a mice model of PD, which presents an increased expression of human wild-type α-Syn. We observed in these mice hippocampi hallmarks of microglial activation, such as changes in microglial morphology and increased microglial numbers compared to age-matched controls.
This work aimed to investigate the role of SVCT2 overexpression in the microglia from the hippocampus of the Thy1-αSyn. For that, we asked if the SVCT2 overexpression (induced by AAV particles administration) in microglia ameliorates learning and memory deficits observed in the Thy1-αSyn mice model. Furthermore, regarding the behavioral test battery, we observed minor changes in the olfactory test, translating low improvements in hyposmia in Thy1-αSyn injected with the SVCT2. Still, a significant improvement in these mice group in comparison with Thy1-αSyn mice injected with AAV control particles at 4 months old in learning and memory in the Moris Water Maze test.
This work, therefore, highlights the importance of the SVCT2 transporter expression in microglia and its potential role in ameliorating some features in PD, such as learning and memory deficits.

Antimicrobial susceptibility of *Staphylococcus aureus* and coagulase-negative staphylococci in oral and nasal cavities

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Abstract

Staphylococcus infections are becoming increasingly difficult to treat due to the growing number of resistant strains to old and new antibiotics. *Staphylococcus aureus* is referenced as the most clinically relevant but other species, known as coagulase-negative staphylococci (CoNS), have emerged as major causes of serious infections. Although nostrils are considered *Staphylococcus* preferred host habitat, the oral cavity has also been appointed as a relevant reservoir. Thus, this study aimed to evaluate the antibiotic susceptibility (AS) of nasal and oral staphylococci isolates. Therefore, AS was determined to 102 nasal and 90 oral isolates, previously recovered from dentistry students, by disc diffusion agar for amoxicillin, cefoxitin, ciprofloxacin, chloramphenicol, clindamycin, erythromycin, gentamicin, quinupristin-dalfopristin, tetracycline, and trimethoprim+sulfamethoxazole following the EUCAST/CLSI guidelines. In either nasal (N) or oral (O) cavities, the *Staphylococcus* isolates included 22% of *S. aureus* and 78% of CoNS isolates, namely *S. epidermidis* (41%-N,37%-O), *S. warneri* (15%-N,16%-O), *S. capitis* (10%-N,4%-O), *S. saprophyticus* (9%-N,6%-O), *S. pasteuri* (7%-O), *S. lugdunensis* (3%-O), and other (*S. haemolyticus, S. hominis, S. sciuri, S. cohnii*, and *S. condimenti*/*S. carnosus*). All *S. aureus* isolates presented resistance to at least one antibiotic, and 36% in oral and 25% in nasal cavities presented multi-drug resistance (MDR). Among CoNS 65% in oral and 49% in nasal cavities presented resistance to at least one antibiotic, and ~5% presented MDR, namely isolates of *S. epidermidis*, *S. pasteuri*, *S. haemolyticus*, and *S. hominis*. In conclusion, this study revealed the relevance of the oral cavity as a colonization site for *Staphylococcus*, including *S. aureus*, and as a potential source/reservoir of antibiotic resistance, which has been widely neglected so far, highlighting the need for oral cavity inclusion in the *Staphylococcus* carriage and antibiotic screening.

Vortex-based nano-oscillators based on magnetic tunnel junctions for Neuromorphic applications

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Abstract

Until recently, spintronic research relied solely on external magnetic fields to manipulate the spin of the electron. However, electrical currents were also recently shown to be able to tune the magnetic behavior of nanoscale magnetic tunnel junctions. This opened the prospect for novel applications, such as chip-to-chip, wireless communication or, even more recently, neuromorphic electronics.

In collaboration with the Iberian Institute of Nanotechnology (INL) in Braga, in this work we're developing and studying magnetic tunnel junctions with novel magnetic textures. In particular, by controlling the granularity of the devices we're aiming to obtain strongly pinned magnetic vortexes in the free layer, with pinning site-dependent resonant frequency.

So far in this work, by studying the I/V curves and magnetoresistance of the device, we have verified that the system can converge to different values while in its vortex state and we now plan to study and obtain its temperature dependence to probe the emergence of hysteretic behavior at low temperatures. Such behavior can have potential applications in neuromorphic computation, including reservoir computing.

New mitochondria-targeted antioxidants as potential neuroprotective agents

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Abstract

Parkinson's disease (PD) is a neurological disease characterized by the selective loss of dopaminergic neurons in the brain's substantia nigra pars compacta. Several pathological hallmarks have been identified as biomarkers of PD, like Lewys body formation, iron accumulation, oxidative stress and neuroinflammation. Since there is currently no effective therapy capable of stopping or delaying the disease progression, several approaches are being implemented to discover new disease-modifying drugs with therapeutic potential. Phenolic acids, such as naturally occurring hydroxycinnamic and hydroxybenzoic acids (HCA and HBA, respectively) are recognized as privileged structures in drug discovery due to their vast biological activities, namely antioxidant properties. In this context, the main objective of this work was to evaluate the potential neuroprotective effects of 11 newly synthetized compounds (from a series of HCA and HBA-based libraries) in an in vitro model of Parkinson's disease, as well as the mechanisms underlying the observed neuroprotection. Compounds (0-100 µM) cytotoxicity was initially evaluated in differentiated SH-SY5Y cells, 24h after exposure, by the neutral red (NR) uptake and resazurin reduction assays, aiming to select non-cytotoxic concentrations. To induce a PD phenotype two aggressors were used, ferric nitriloacetate (FeNTA, 500 and 1000 µM) and MPP+ (500 and 1000 µM), and the neuroprotective effects evaluated by the NR uptake assay 24h after exposure to the aggressors in the presence and absence of the compounds. Compounds C1, C3, C4, C5, C6, C7, C8, C9, C10 and C11 significantly reduced FeNTA-induced cell death, while only C9 afforded a significant protection against MPP+. These results, although preliminary, highlight that these compounds, by significantly reversing the harmful effects of an excess iron, could be useful for the synthesis of new derivatives that ultimately may be used in PD treatment/prevention.

Synthesis of bioactive flavonoid-like amino acid derivatives

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Abstract

Flavonoids are characterized chemically by the presence of two aromatic rings joined by a three-carbon chain, and are compounds widely present in nature, namely in terrestrial and in marine environments [1].

Several flavonoids with antitumor and anti-inflammatory activities have been identified in our research group [2,3], namely some chalcone derivatives and analogues demonstrated antimitotic effect [3] and flavones activated caspase-7[2]. Many flavonoids found in nature are chiral and display interesting biological activities [1]. Non-chiral flavonoids are also attractive for preparation of chiral derivatives in association with chiral moieties allowing to enlarge the chemical diversity and to explore the structure activity relationship, including enantioselectivity. Based in our previous results and on the well-known health promoting effects of flavonoids [1] we recently started to investigate chiral derivatives of flavonoids (CDFs) by the association with amino acids/esters. Interestingly, the ester derivatives presented promising results against human tumor cell lines and high enantioselectivity, with GI50 values near to 1.0 µM for D enantiomer derivatives.

Thus, the main objective of this work was to synthesize CDFs by coupling pure enantiomers of amino acid/esters with adequate functionalized flavonoids for further evaluation of the influence of chirality (enantioselectivity) in antiproliferative effects on human tumor cell lines.

Acknowledgements

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References

1. Pinto, C. et al., Pharmaceuticals 14, 1267, 2021.
2. Moreira, J. et al., Molecules, 24, 2019.
3. Pinto, P. et al., Eur. J. Med. Chem., 184, 2019.

Deep-learning approach to classification of optically trapped particles

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Abstract

Optical tweezers find application in a plethora of natural sciences from physics to biology (Jones et al., 2015; Gieseler et al., 2021), by allowing precise manipulation of micro to nanometer sized particles. In a typical setup, the particle is immersed in a viscous fluid where collisions with the fluids constituents subject the particle to Brownian motion (Chandrasekhar, 1943), a stochastic dynamic regime caused by collision of the smaller neighboring particles. Tracked with high precision through the interrogation of a quadrant photodetector, this dynamics are sufficient to perform particle classification using the forward scattered optical beam (Carvalho et al., 2021). In this work we make use of convolution neural networks (CNN) to classify particles of distinct material - polystyrene (PS) and polymethylmethacrylate (PMMA) - and size - 3, 4 and 8 µm - based on patterns for the position displacement. The patterns constructed using histograms follow a normal distribution that depend on the particles characteristics, making them a robust source of information for classification. Using k- fold cross-validation, we obtain satisfactory prediction accuracy (80 −90%) using just a 250ms timeseries. Our results show the improvement of particle classification using deep neural networks and position displacement-based information. Furthermore, by making use of displacement for high position acquisition rates when compared with the characteristic trapping time, our approach allows not only to work at faster rates but also to probe a regime closer to that of a free particle under Brownian motion. This way, the information content is intrinsically tied to particles characteristics that can provide a better approximation to the particles properties and consequently a superior information source.

A contribution to the Environmental Risk Assessment of Estarreja Chemical Complex: the tier 1 chemical line of evidence

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Abstract

Estarreja Chemical Complex (ECC) is one of the biggest and most important industrial complexes in Portugal. Even though there have been many works denoting the presence of contamination caused by inappropriate discharges in the past, there is still work to be done when it comes to relating the contamination and its impact on the environment. Accounting for this, an environmental risk evaluation for the area adjacent to the ECC has been started, by applying a tiered approach and following the TRIAD concept. Thus, for each step of the process, data from different lines of evidence (LoE; chemical, ecotoxicological) is being collected, to accomplish a site-specific assessment. Hence, this work aims at providing data for the chemical LoE for Tier 1. Previous works identified the presence of contamination in this area, particularly nearby Vala de S. Filipe (a waterway used to dispose contaminated effluents into the Ria de Aveiro), that has been the target of the last remediation efforts. For this reason, this work was focused in an area of the Vala de S. Filipe had not yet been remedied at the time of sampling. Therefore, 23 soil samples were collected and submitted to physical-chemical analysis (pH, electrical conductivity, organic matter content, water holding capacity, organic contaminants, and metal(loids) concentrations). The results showed the presence of contaminants in the area, notably As, Hg, and Pb with maximum values reaching around 1000, 60, and 400 mg/kg respectively. These concentrations far exceed the reference values for agricultural soils given by the Portuguese Environmental Agency. This, in addition to the low pH and organic matter content of these soils, which may result in a high availability of contaminants, indicate a potential risk to the ecosystems. However, ecotoxicological analysis are also underway, which will allow to obtain a more reliable risk calculation for Tier 1 using two LoE.

Medicinal plants from Guinea-Bissau to target inflammation

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Abstract

Plants are an extremely valuable source for the discovery and development of new medicines. Indeed, drug discovery based on medicinal plants is the most dynamic and polyvalent approaches in the management of complex disorders, as the ones with inflammatory background. Although some plants are used in Guinea-Bissau to relieve inflammation-related processes, there are few scientific studies validating their traditional uses. Thus, the anti-inflammatory potential of aqueous extracts from *Annona senegalensis Pers.*, *Faidhherbia albida (Del.) A. Chev.* and *Uvaria chamae P. Beauv.* are being investigated for their capacity to scavenge nitric oxide (●NO) and superoxide anion (O2●-) radicals, and to interfere with the eicosanoid-metabolizing enzyme 5-lipoxygenase (5-LOX).

All extracts revealed potential to scavenge ●NO and O2●- in a concentration-dependent manner, *F. albida* being the most active species, with IC 25 = 7.16 µg/mL and IC 50 = 30.35 µg/mL, respectively. Aqueous extract from *U. chamae* was most effective against ●NO (IC 25 = 15.17 µg/mL), while the one obtained from *A. senegalensis* was more active towards O2●- (IC 50 = 44.39 µg/mL). Concerning to the ability to inhibit 5-LOX, *F. albida* also seems to be the most effective species, with an IC 50 value of 24.76 µg/mL. Aiming at establishing possible associations with chemical composition, the phenolic profile of the most active species is being characterized by HPLC-DAD, and preliminary results reveal the abundance of flavonoids. Considering the foregoing, the results deliver relevant in vitro data that appears to substantiate the traditional uses of these species, especially for *F. albida*, in the amelioration of inflammation-induced pathologies and symptoms.

Acknowledgements

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Image Rights of the Professional Football Player. Focus on Brazilian Reality

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Abstract

The present study deals with the use and exploitation of the image of the football player, focusing on the Brazilian legal system, having as references the personality right, the image right, the image use license agreement and the arena right. Its objective is to demonstrate that, although the image right is non-transferable, individual and irrevocable, among other characteristics, it can be monetarily exploited by the player and the club to which he is linked, in the same way that he presents the right to the arena, a right that owns the football club. In the methodology, bibliographic research was used, the reading and legal interpretation of the relevant legislation, the analysis of articles and doctrinal works and jurisprudence. The results of the work demonstrate that the personality rights are unique, exclusive and very personal to each individual, belonging to one of these rights is the image right, which it is up to each being to be able to make use of their image, name, nickname and voice in the way that suits you, and if you wish to obtain a financial return for this, the law allows it to happen in this way, in the specific case of the football player, he can make this exploitation through the image use license agreement. And finally, we have the right to the arena, from the football entity, which profits from the televising of the shows, passing on a percentage stipulated by law, to the athletes participating in the match, whether they actually played or just remained on the bench, as stipulated by the recently passed law. The theme allows us to continue the work, seeking to analyse how the current legislation in Brazil will affect players and clubs, in the same way as the new means of broadcasting matches (online).

The City and the Equipments: A perception of the city of Porto

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Abstract

The object of this study is the interaction that equipment buildings establish with cities. Namely, the relationship established between a multifunctional set of equipment buildings, with the specific urban development of the city of Porto, which is taken here as a case study. Being carried out in the scope of a Master's degree, more than any original discovery, we value the experience of different research methodologies, from bibliographic review to photographic record, from cartographic analysis to analytical design, from qualitative to quantitative research parameters, and from the urban scale to the architectural scale.

In a first and second part, the urban evolution of the city of Porto is exposed, identifying periods that marked it, structured between before and after the twentieth century, and the identification of equipment, accompanied by the comparative analysis of graphic records (plans and cut) according to various parameters, such as the program, the architectural language and urban insertion. Methodologically, we resort to a bibliographical review of the main authors, such as José Oliveira, Bernardo Ferrão, or Vítor Oliveira (1st part) and Fátima Fernandes, Alexandre Costa or João Rapagão (2nd part).

The selection of case studies considers selection criteria (representativeness/value), among others. Design is privileged as an instrument of analysis, both of the urban-territorial scale developments and of the architectural buildings. In the relationship equipment/city, we seek to understand, according to a defined set of parameters, the importance that each type (function and form) of equipment had in various stages of development of the city of Porto.

The study aims to contribute to the discussion about the possibilities of simultaneous perception at various scales (urban/architectural), beyond practical approaches focused on uni-scalar representation and without overlapping spaces/time/life.

Development of Biosensors for functional textile applications

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Abstract

SARS-CoV-2, the cause of the disease COVID-19, has a high level of contagiousness, and has been verified as a major epidemiological threat.

In order to reduce the spread of the virus, the entire population was advised to use personal protective equipment, among which are the face masks. The eficacy of masks depend on the time of use, amount of moisture and contact with infectious agents.

The objective of this study is the development of a colorimetric biosensor, based on biological reactions that detect a given analyte through color change. This biosensor will be incorporated in a textile surface, with the capacity of direct indication of the protection effectiveness of the face masks, giving the user information about the filtration level of the equipment, with a humidity sensor; and of the contamination space, with a sensor to detect the presence of the virus.

Thus, a biosensor for SARS-CoV-2 is intended to indicate the contact with the virus. It was developed based on gold nanoparticles functionalized with sialic acid, to be coupled with a humidity biosensor and previously presented to scientific community.

The humidity biosensor is intended to contribute to reduce the risk spread and contagion of the disease, by monitoring the effectiveness of the protection of the masks, since humidity causes the degradation of the filtering quality of the masks.

For the development of the humidity biosensor, two approaches were adapted: clay and silica mesoporous, which will be impregnated, together with the SARS-CoV-2 biosensor, on a textile surface, and then incorporated into the textile mask.

The developed biosensor appears to be more reliable through silica-based technology with methylene blue dye, is aligned with the Portuguese standard for textile face masks that indicate up to 4 hours of use and [85±5]% of maximum relative humidity, as maximum levels expected for the inutilization of the masks. After reaching this humidity the biosensor changes color, indicating to us the need for mask replacement.

A sentencing study on corruption

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Abstract

The collective and individual harm caused by corruption is worldwide acknowledged, and the criminal justice agencies devote efforts to deal with this crime. A research strategy to better knowing corruption and to understand criminal justice responses consists in analysing court decisions. The present study follows that strategy aiming to explore court decisions, specifically to identify predictive factors for the three-level court decisions (conviction, sanction type, and length of prison). Furthermore, it is possible to explore the main attributes of this type of crime, in terms of the modus operandi, the offenders, and the contexts. For this study, 54 court files related to corruption were collected in Portugal, involving 221 accused individuals. Making use of qualitative and quantitative methods, data was analysed. Results show that predictive factors for court decisions are not always the same in active and passive corruption. In both types of corruption, the decision to convict is determined by legal factors. However, for the active corruption, extra-legal factors related to accused sociodemographic characteristics emerged as significant predictors of the court decisions. The decision on the type of sanction is mainly determined by extra-legal factors such as nationality and professional situation. Finally, the severity of the penalty is significantly determined by legal and extra-legal factors, but only for those cases of passive corruption.

m6A modification in gastric cancer: The function of the YTH family of proteins

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Abstract

Gastric cancer (GC) is the fourth leading cause of global cancer mortality, with a clinical outcome and treatment choice still strongly dependent on clinicopathological tumour characteristics. While DNA epigenetic modifications are well-known to play a pivotal role in gene expression regulation, over the last few years, RNA modifications, referred to as the "epitranscriptome", were also shown to portray an additional layer of gene expression regulation.

N6-methyladenosine (m6A) RNA modification is the most prevalent chemical modification present in mRNA molecules in eukaryotes. This modification is reversible, and is dependent on three key enzyme types, which deposit, remove and recognise RNA modifications. The latter belong to the YTH family of proteins and share nearly identical YTH domains which recognise m6A in a methylation-dependent manner. We have previously shown that the YTHDF3 was the most prevalent in GC and had a significant impact in cell motility and survival.

Yet, given the lack of evidence on the specific effects of the YTHDF proteins on the m6A-modified mRNA in GC, our aim was to understand the level of function overlap between the three proteins using two gastric cancer cell lines and ΔYTHDF3 mutants as models.

To do so, we evaluated the expression of YTHDF1-2 in AGS and SNU638 and respective ΔYTHDF3 mutants. We studied the expression in YTHDF1 and 2 in GC tissues and we will now assess the impact of YTHDF1 and 2 in GC cells by downregulating their expression using siRNAs.

Up to now we have shown that YTHDF1-2 expression is present in GC and remains identical in both wild-type and ΔYTHDF3 mutants, suggesting that there is no compensatory mechanism and that each RBP has non-redundant functions.

Bioherbicide effects of a microalga from Portuguese soils

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Abstract

The exponential growth of the human population increased the need for environmentally friendly substitutes for the chemicals used in agriculture, such as herbicides used to fight weeds that reduce crop productivity.

Microalgae are photosynthetic microscopic organisms that can grow in a variety of environments, including terrestrials. These organisms can produce many bioactive compounds, some with bioherbicidal potential and although very important for an agricultural sustainable growth, there are only a few studies regarding their use as bioherbicides.

This study aims to investigate the mode of action of a microalga from the genus *Klebsormidium* that in the scope of the GreenRehab project (Green rehabilitation system for burned soils based on the inoculation of native cyanobacteria and microalgae) showed a selective bioherbicidal potential. Seeds of monocotyledonous and dicotyledonous plant species were germinated in petri dishes with solid nutrient medium, inoculated with microalga exudates and the plantlets biometric parameters evaluated. The results showed a selective herbicide effect of *Klebsormidium sp*, inhibiting the growth of dicotyledonous plants: *Arabidopsis* and *Nicotiana*, and having no effect in monocotyledonous species: Lollium, barley and maize. Then species with different sensibilities were chosen to grow in pots and some biochemical parameters were assessed, allowing a better understanding of the mode of action of the *Klebsormidium* sp on plants.

Although the potential of the microalgae for plant growth has been widely recognized, the knowledge about these interactions is limited. This study will contribute to understanding the molecular mechanisms beneath these interactions and to disclose the potential of microalgae to be used in sustainable ecological and agricultural strategies.

This research was supported by national funds through FCT - Foundation for Science and Technology within the scope of UIDB/05748/2020, UIDP/05748/2020 and PCIF/RPG/0077/2017.

The role of glycogen metabolism in human spermatozoa

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Abstract

Male infertility has been increasing over the years and affects an increasing number of men in the world. Metabolic diseases are associated with male infertility, although the underlying mechanisms remain unclear. Testicular bioenergetics display several unique features and play a role in the crosstalk between metabolic diseases and male infertility. Testicular somatic cells are important to supply the conditions needed for spermatogenesis, including hormonal and nutritional support. Besides glucose and lactate, the main two energetic sources used by the germ cell line, glycogen is also present. In fact, glycogen metabolism is a potential source of energy to germ cells, although glycogen is an overlooked and understudied energetic source. The purpose of this study was to characterize the glycogen metabolism in human spermatozoa. For that we aimed to evaluate the expression of the enzymes involved in the synthesis and degradation of glycogen and its role for human spermatozoa motility and viability. Total glycogen content in human spermatozoa lysates was quantified using the phenol-sulfuric acid method. Then, we evaluated the impact of a specific inhibitor of glycogen phosphorylase (CP-91149), in the presence or absence of glucose (5.5 mM) or any energetic substrate, in spermatozoa motility and viability. Our first results highlight that glycogen is present in human spermatozoa, and that it might be used as an energetic source to sustain spermatozoa´ motility, sheding some light on the role of glycogen dynamics in human spermatozoa metabolism and function.

Dynamic Quality Estimation of Wireless Links with Autonomous Agents

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Abstract

Nowadays, UAV - Unmanned Aerial Vehicle - is a widespread class of aircraft. Its usage ranges from recreational scenarios to health-critical monitoring purposes. UAVs communicate with a ground station and with each other, e.g., using Wi-Fi, from a transmitter to a receiver. Communications problems may arise when the Received Signal Strength decreases: packets can be lost. Packet Delivery Ratio (PDR) is the probability that a packet, sent by a transmitter, is delivered to the receiver on a single-link channel. Given a pair of UAVs - a transmitter and a receiver - the single-link PDR is modeled in [1] as a non-negative, strictly non-increasing curve, that is a function of link length, and depending on two parameters that we want to estimate.

Moreover, considering a line network topology (Figure 1) the end-to-end network PDR is the product of all the single-link PDRs. It is a function of relay placement. Given a set of link models, we aim at finding the optimal relay placement that maximizes the network PDR.

Since wireless links are non-symmetric, symmetric placement is not the optimal placement. The work in [2] comprehensively answers this necessity. However, a problem still open is how to effectively estimate online and in a distributed context the parameters describing the models of the different links, which is the main aim of this thesis. The methodology was based on studying the wireless transmissions process and the literature related to packet delivery ratio models, then defining a PDR measurement process and a link PDR modeling strategy. The current results were obtained with simulation of the wireless channel and show the effectiveness of the link PDR modeling and the capacity to detect model changes online as desired.

References

[1] L.R. Pinto. Aerial Multi-hop Sensor Networks. PhD thesis, Universidade do Porto - Carnegie Mellon University, 2018.

[2] L.R. Pinto and L. Almeida. Optimal relay network for aerial remote inspections. Sensors, 22(4):1391, 2022.

The Portuguese gene pool revealed through a high-throughput array

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Abstract

Genome-wide arrays containing thousands or millions of single nucleotide polymorphisms (SNPs) are becoming a useful tool in evaluating global human diversity, in elucidating admixture events and in mapping selection along the genome. In this work, we performed a systematic genome-wide characterization of the Portuguese population by screening nearly one million SNPs in around 200 individuals.

We tested the relationships of Portuguese individuals with other worldwide populations using ADMIXTURE. This algorithm revealed the following median admixture profile for the Portuguese population: 49% South European; 24% North European; 8% North Africa, 7% Near East; 4% Arabian Peninsula; 2% South Asian; 2% East Asian; 1% Native American; 2% West African; and 1% East African. When projecting the Portuguese diversity in the European diversity clustered in Principal Components 1 and 2, it was possible to verify that all the Portuguese samples clustered around other Iberian samples, and near some Italian samples. The GPS algorithm agreed with that geographic distribution, and highlights the higher Mediterranean than Atlantic influence in the Portuguese profiles. The profiling of the maternal lineages (inferred from the mitochondrial DNA diversity) in the Portuguese cohort was: 98 Eurasian lineages (predominance of 46% of H haplogroup) and 2% of sub-Saharan African. For the paternal lineages: all of Eurasian background, and dominated by 63% of R1b haplogroup.

This high-resolution genetic characterization of a Portuguese cohort testified the high influence that the Mediterranean Sea had in facilitating the migration of people and exchange of genes and culture.

Adherence, permanence, benefits and barriers of the web-based exercise program for older adults “Mais Ativos Mais Vividos” during the COVID-19 pandemic: a qualitative study

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Abstract

Physical activity, and particularly exercise, have been considered as key-factors to reduce the cognitive and physical decline resulting from the aging process (Melzer et al., 2020). With the emergence of the COVID-19 pandemic, the participation in in-person physical exercise programs were restricted. Web-based physical exercise programs have emerged as a substitute for in-person activities. The aims of the present study were to understand the perceived: (1) motivations to participate in a web-based exercise program, (2) factors that contribute to the permanence in the program, (3) health benefits and (4) main barriers in participating in the program. This qualitative study conducted semi-structured interviews with 16 participants (7 females, mean age=75.9 ± 5.2 and 9 males, mean age=74 ± 3.1) after the implementation of 8-month real-time online exercise program (3sessions/week, multicomponent regime). The data obtained were subjected to a thematic analysis. The results of the present study revealed that the main reasons that conducted the older adults to adhere to the online exercise program were the maintenance of physical fitness and exercise routine, as well as health, socialization, and family support. The factors of permanence in the program were the instructors' support, social interaction and maintenance of physical fitness and exercise routine. The older adults perceived multi-level benefits (physical, social and mental) and the main barriers were related to the use of technology and to their physical health and physical environment conditions. Concluding, web-based real-time exercise program as a substitute for in-person activities during the COVID-19 pandemic had a great importance in maintaining physical fitness, exercise routines and social interactions. The multilevel perceived barriers and factors related to adherence and permanence call to the design of future interventions based on socioecological models.

RNA signatures in cancer triggered by smoking habits

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Abstract

Alternative polyadenylation (APA) is an RNA-processing mechanism that creates a variety of transcripts with distinct 3'ends. It is tissue-specific and is widely used as a gene regulatory mechanism. 3'UTR-APA is a common APA type where two or more polyA signals in the 3'UTR are alternatively chosen, resulting in multiple mRNA isoforms without affecting the protein-coding sequence. Yet, it has been widely reported that alternative 3´UTRs have physiological consequences, namely, cancer is correlated with short 3´UTRs. Our study focus on the analysis of 3'UTR-APA events. Our hypothesis is that lung and bladder cancer, induced by smoking, have common 3'UTR-APA profiles that may be used as biomarkers. Therefore, we have performed a bioinformatic analysis to identify new mRNA signatures in these cancer types. We collected data from tumor and normal bladder tissues (GSE174330, TC3A and APAatlas), tumor and normal lung tissues (TC3A, APAatlas and PRJNA356345). The samples from TC3A and APAatlas were paired. All the datasets have pre-processed data that uses DaPars to allow the characterization of APA profiles by comparing the percentage of distal usage index of normal and tumor samples. From the 47 genes obtained from the TC3A and APAatlas analysis, 25 genes undergo 3´UTR shortening and 22 genes undergo 3´UTR lengthening. However, when we compared these results with those obtained with the other two datasets, there are no common genes. We will now perform a bioinformatic analysis on the raw data from GSE174330 and PRJNA356345 to find genes that behave similarly. A pipeline is being implemented using tools such as fastqc, cutdapt, STAR and Dapars to analyze the data to obtain a more robust candidates gene list to be evaluated in vitro. With this study we will identify 3'UTR-APA mRNA isoforms in cancers triggered by tobacco smoking, which may be used in diagnosis or as therapeutic tools.

Amino acids profile of meat from wild boar (*Sus scrofa L.*): extraction optimization and protein quality

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Abstract

Meat is one of the most important food products for human beings, due to its nutritional value, high energy content, high value proteins, several minerals, and some vitamins. Proteins vary from one tissue to another within the same animal and in corresponding tissues of different species. The nutritional value of meat can vary greatly by the presence or absence of some amino acids, which are the basic units for protein construction [1]. Wild boar (*Sus scrofa L.*) is a species of wild pig, with 4 to 25 subspecies widely distributed. It is a medium-size animal with a relatively large head with two tusks and a small hindquarter, having a thick double layer of fur.

The main aim of this research was to optimize amino acids extraction and, subsequently, characterize the total amino acid profile of *Sus scrofa L.* meat [2]. Also, to evaluate the protein quality through the calculation of the Amino Acid Score (AAS) and the Essential Amino Acid Index (EAAI).

The extraction optimization was carried out varying sample mass and reagents volume. The best conditions found were 75 mg of sample and 3 mL of the hydrolysis reagent, for both acid and basic hydrolyses. For basic hydrolysis, 22 h were necessary to obtain higher yields of tryptophan. The sample presented a high protein quality due to a high EAAI (158%), in which only tryptophan has an amino acid score lower than the reference amino acid (98.32%).

Acknowledgements

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References

[1] M. Á. Jiménez Martínez, et al., in Pathology of Wildlife and Zoo Animals, Elsevier Inc., 2018, pp. 207-228.

[2] S. Machado, et al., Food Chem., vol. 326, pp. 126940-126949, 2020.

Culture-Independent Discovery of New Cyanobacterial Natural Products

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Abstract

Cyanobacteria are prolific producers of natural products with potential pharmacological applications. Traditionally, the discovery of new natural products has been hampered by the ability to culture microbes in laboratory thus restricting the diversity explored. The development of more sophisticated bioinformatic strategies and the decreasing cost of genome sequencing have been paving the way to the development of genome-derived discovery of new natural products. Metagenomics allows the direct genome sequencing of the microorganisms that compose an environmental sample and its subsequent bioinformatic characterization. Therefore, this methodology enables the study of biosynthetic gene clusters (BGCs) from non-cultured microorganisms, including the production of the encoded metabolites in a heterologous host. In this project we have been collecting cyanobacterial environmental biofilms to uncover the biosynthetic potential of this phylum. We recovered several metagenome-assembled genomes (MAGs) from a sample collected in Parque da Cidade, Porto, Portugal. We were able to recover three cyanobacterial MAGs from the Oscillatoriales order, two belong to the already characterized genera *Planktothricoides* and *Planktothrix* and the last one is unclassified at the genus level. Thirty-nine complete and near-complete BGCs were identified through bioinformatic analysis. We selected six BGCs of different biosynthetic classes for heterologous expression, namely one cyanobactin, two microviridins, a type I polyketide synthase (PKS)/non-ribosomal peptide synthase (NRPS) and an NRPS. Currently, we started the heterologous expression of the BGCs into *E. coli* using Direct Pathway Cloning coupled with Sequence- and Ligation-Independent Cloning (DiPaC-SLIC). The heterologously-produced compounds will be isolated using a LC-MS-guided strategy, their chemical structures will be elucidated through MS/MS and NMR and their biological activity will be accessed through different bioassays.

Evolution of endocrine systems in Lophotrochozoans

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Abstract

Nuclear Receptors (NRs) are a group of Metazoan-specific transcription factors triggered by specific ligands, including hormones, morphogens and dietary compounds, thus modulating the transcription of downstream target genes. The coordinated action of NRs and their ligands controls many aspects of the endocrine system. Over the years, a significant inroad into the evolutionary origin of NRs and their diversification in Metazoans has been made. From the basal metazoan phylum, the Porifera, an original set of two ancestral NRs expanded through large events of duplication, at the base of the Bilateria and later in the Vertebrate branch. However, a variable NR gene repertoire has been appointed to different animal lineages, denoting a profoundly dynamic evolutionary path. A string of recent findings, including works by the research team in which I am integrated (AGE, Animal Genetics and Evolution), lends support to the hypothesis that NR evolution has been punctuated by episodes of functional plasticity associated with subtle or more dramatic amino acid changes in the ligand pocket of NRs with likely impacts in endocrine system evolution. In my internship, I explore novel genomes to isolate and characterize new NRs. I expect my work to put into an evolutionary context the structural and functional aspect of NR biology and their role in endocrine systems, validated by millions of years of evolution. Species of the Lophotrochozoa clade (e.g. phyla Mollusca, Annelida, Platyhelminthes, Phoronida) were forgotten and still poorly studied, remaining doubts about the evolutionary relationships between them. Studying NRs allows us to infer and decode the genetic basis of differences and similarities between species. My work plan has a strong component of Bioinformatics (e.g. gene mining and phylogenetics) in combination with molecular and cell biology techniques (e.g. cell-based functional assays).

Exploring the allelopathic properties of plants to control harmful algal blooms

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Abstract

Freshwater eutrophication is an increasing ecological and public health concern. The natural nutrient enrichment of these bodies of water occurs gradually, over centuries of sediment deposits. However, anthropogenic inputs, such as aquaculture and agriculture runoffs, have been shown to greatly accelerate these changes in water composition. One of the major consequences of eutrophication, is the overgrowth of toxic microalgae, also known as harmful algal blooms (HABs).

In this project, we aim to find a Nature-based solution to this environmental problem. Our strategy is to evaluate the direct and indirect effects of aquatic plants on the growth and viability of two cyanobacteria species associated with HABs: *Microcystis aeruginosa* and *Chrysosporum ovalisporum*. Both cyanobacteria produce toxic metabolites, representing a risk to the ecosystem, to public health and to agricultural and livestock activities. The project started by screening the allelopathic activity of different plant species on these microorganisms. Plant extracts were prepared and are now being tested against the growth of cyanobacteria.

The cyanobacteria inhibitory assays should enable us to select the plants displaying increased allelopathic activity against toxic cyanobacteria. These plants will be next used to build a floating bed system, and test the feasibility of this technology for the control of toxic-cyanobacteria in situ. We will be assessing cell count, water and plant tissue toxin quantification, and plant photosynthesis rate. The results of this work will provide the basis for an ecofriendly and practical treatment for eutrophic bodies of freshwater.

Keywords: Plant allelopathy; *Microcystis aeruginosa*; *Chrysosporum ovalisporum*; Bioremediation; Floating beds; Harmful algal blooms;

Empathy in Portuguese medical students: a cross-sectional study using the Jefferson Scale of Physician Empathy

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Abstract

Background: Empathy is a multi-factorial concept that plays a vital role in a patient centered health care.

Objectives: To analyze the empathy of first- and second-year medical undergraduates, and study its association with personal and academic characteristics.

Methods: First- and second-year students from FMUP completed Jefferson Scale of Physician Empathy Student (JSPE). Students´ performance on JSPE-spv was compared across multiple variables.

Results: From a total of 685 students on the first and secon year, 539 (78,69%) agreed to participate. Female students exhibited higher scores in total JSPE when compared to males (94,15 ± 10,45 vs 88,32 ±13,31 p<0,001). Students that were repeating a physiology course had higher total empathy scores when compared to students enrolling for the first time (94,27 ± 9,94 vs 91,93 ±12,05 p=0,035). A positive correlation was found between the average classification of courses on the first year of medical school and empathy scores (r=0,142, p=0,015). No statistically significant differences in empathy scores were observed between first- and second-year students (91,68 ± 12,25 vs 92,86 ±11,31 p=0,257), public versus private high school students (92,48 ± 11,48 vs 92,28 ±12,05 p=0,846), or full-time students versus working students (94,34 ± 12,52 vs 92,28 ±11,62 p=0,312). No correlation was observed between total JSPE scores and high school final grade (admission grade) (r=0,034,p=0,438), and classification on the Musculoskeletal Morphophysiology (r= 0,037, p=0,582) or, Cardiovascular Morphophysiology (r= 0,112, p=0,061).

Conclusions: A reflection should be made on the focus of developing empathy values among medical students from the beginning of their medical education.

Influence of fire on pH and electrical conductivity of forest soils – case study

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Abstract

Soils are natural resources of great importance, performing multiple environmental and productive functions, and being an important support for life.

Forest fires are frequent in our country and their intensity and extent have increased in recent years. These events can cause changes in the physical and chemical properties of the soils. The pH and electrical conductivity are two chemical characteristics that can change and alter the biogeochemical behavior of soils.

In this research work, the evolution of these characteristics is monitored over the course of time, the effect of a prescribed forest fire is evaluated, and the natural recovery of these properties is analyzed. Samples taken before the fire and at various times after the fire are analyzed.

The soils under analysis have predominantly loam and silt-loam textures and were sampled in a study area located in the Montesinho Natural Park, Bragança, Portugal.

The test methodologies used are in accordance with the specifications of international standards, such as ISO 10390:2005 and ISO 11265:1994.

The results of the electrical conductivity showed a general tendency to decrease in depth, with average values between of 58 µS/cm in the most superficial layer and 32 µS/cm in the deepest layer, before the fire. Analysis over time revealed, on average, a very slight decrease, with variations of less than 10% in most cases. However, in the most superficial layer, after 2 months, there has been, in most situations, a slight increase compared to the initial values.

Regarding the results of pH in water, it showed a very strongly acidic soil (according to the USDA - U.S. Department of Agriculture classification) with an average value of 4.96, with small variations in depth, with no clear pattern. Immediately after the fire, the pH increases on average by 14% in the surface layer and approximately 12% in the remaining layers, which means that the soils become strongly acidic. Two and seven months after the fire, the values remain higher than before the fire, but have already decreased when compared to their value immediately after the fire.

Acknowledgements

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A cholinergic model for screening potential compounds for the treatment of Alzheimer's disease

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Abstract

Alzheimer's disease, characterized by a progressive decline in cognitive function, is one of the most prevalent neurodegenerative diseases affecting millions of people worldwide, with both prevalence and incidence increasing with age. The complexity inherent to the BBB, and the lack of reliable in vitro cell-based models capable of mimicking its true phenotype are the two key difficulties associated with the discovery of new potential compounds for the treatment of this disease.

In this work the screening of the neuroprotective effects of a library of new potential dual BACE-1/GSK-3β inhibitors was made resorting to the neuroblastoma cell line SH-SY5Y, differentiated into a cholinergic phenotype using DMEM medium supplemented with 3% FBS and retinoic acid (10 µM), for a period of 7 days. The compounds (0-50 µM) cytotoxicity was initially evaluated by two different cytotoxicity assays: MTT reduction and the Neutral red lysosomal retention assays, and two of the initial compounds were abandoned for further studies given their high cytotoxicity. Once amyloid-beta is a well-established substrate for the P-glycoprotein (P-gp) efflux protein, the effects of the compounds on P-gp activity were evaluated by the rhodamine 123 accumulation assay. In addition, the neuroprotective effects of the remaining compounds were also evaluated against t-BHP-induced oxidative damage and iron(II)-induced cytotoxicity, since reactive oxygen species and iron overload are linked to the disease. With the performed assays we aimed to select the most promising neuroprotective compounds with the future perspective of testing them against the two hallmarks of the disease: hyperphosphorylation of tau protein and amyloid-beta aggregation.

Use of Technosoil in the recovery of burned forest soils - case study

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Abstract

The occurrence of fires annually affects large forest areas around the world. In Portugal, this problem is serious and recurrent, which causes deregulation in the biogeochemical processes that occur in soils due to the change in their physicochemical and biological characteristics. In most situations, specific preventive recovery measures are not taken, leading to the slow re-establishment of the environmental, ecological and productive functions of the burned areas.
The use of a "tailor-made" Technosoil, an innovative remediation method made "to measure" according to specific problems, as a corrective measure allows to improve and speed up the re-establishment of soil functions, reduce soil losses by erosion and increase its resilience to future episodes.
In the present research, the effect of the application of a Technosoil in a forest area previously subjected to a prescribed fire was evaluated, with particular focus on the organic matter content and on the pH. Soil samples were collected in a study area located in the North of Portugal, in the Montesinho Natural Park, before and after the prescribed fire. Samples were collected at different depths, in areas with application of Technosoils and, for control, in areas where corrective measures were not applied.
The organic matter content was determined by calcination (Loss-on-ignition method) and the pH was obtained according to the procedure specified in the International standard ISO 10390:2005.
It was possible to conclude that the application of a Technosol as a post-fire corrective measure accelerated the re-establishment of the soil's previous characteristics regarding these two parameters.

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The authors would like to thank to the project 0701_TERRAMATER_1_E - Medidas Inovadoras de Recuperação Preventiva em Áreas de Queimadas, co-financed by the European Regional Development Fund (FEDER) through the Interreg V-A Spain-Portugal program (POCTEC) 2014-2020.

World distribution of mites associated with the Red Palm Weevil (*Rhynchophorus ferrugineus Olivier, 1790*)

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Abstract

The Red Palm Weevil (RPW), *Rhynchophorus ferrugineus Olivier, 1790*, is a major pest of palm trees. It is native to South-East Asia and has been introduced in Europe, showing a preference for the Canary Island date palm (*Phoenix canariensis*). There are several organisms associated with the RPW. Mites are one of the major groups associated with the RPW and are often considered phoretic organisms, but several studies have shown that some mites might cause harm to this weevil´s life cycle. We aim to review and document the world distribution of mite species in RPW. We reviewed 36 scientific papers from 1981 to 2020 about mites associated with RPW. Information about the mites, such as family, genera, species, locality and year of the collection, was compiled in a summary table.

According to our analysis, associated mites were found in 18 countries, Egypt with the highest species diversity (31 species). A total of 49 species, from 20 different families were identified. The most diverse families were Uropodidae with 6 species, and Urodinychidae and Laelapidae with 5 species of mites each. *Centrouropoda almerodai* and *Uroobovella marginata* were reported in 8 and 7 different localities, respectively.

We found that the same mite species has been detected found associated with RPW in different localities. Our findings suggest that mites, while attached to this weevil´s body, are reallocated from their original locality following the RPW dispersion route.

Increasing intensity in Physical education classes using dynamic breaks

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Abstract

The promotion of Physical Activity (PA) in young people has been identified as a global health priority (World Health Organization (WHO, 2010). The school is the place where it is possible to literate young people for an active and healthy life, and physical education (PE) classes are a cornerstone to promote PA. Even so, what is observed is that most of the time the PA levels of the PE classes do not comply with the recommendations of 50% in moderate-to-vigorous physical activity (MVPA) (DHHS, 2010). The content taught has repercussions on the PA levels of the class. Sports such as volleyball, gymnastics and others are of reduced intensity compared to basketball, football, and handball. The purpose of this study is to analyse if classes with dynamic breaks have a significant effect on time spent in MVPA compared with traditional PE classes. The study design is quasi-experimental. The participants were 20 students from a 12th-grade class with ages ranging between 16 and 18 years old. 8 lessons have been studied. In the first 4 classes, the teaching content was volleyball and gymnastics, which are contents that the literature portrays as less intense. In the following 4 classes, the content was the same, but two dynamic breaks were introduced of five minutes each. Data related to time spent in MVPA were recorded using polar heart rate monitors in students. T-test independent-measures will be used for data analysis. It is expected that the dynamic breaks have a relevant effect on MVPA and delivering this information to PE teachers is a good tool to increase the PA levels of their classes.

Keywords: MVPA, Physical Activity, Physical Education, Quality.

References: World Health Organization (WHO) (2010) Global Recommendations on Physical Activity for Health. Geneva: WHO.

DHHS (2010) Strategies to Improve the Quality of Physical Education. Atlanta, GA: U.S. Department of Health and Human Services.

Promoting blueberry fruit quality: Identification of growth promoting rhizobacteria in *Vaccinium spp*.

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Abstract

Blueberry (*Vaccinium spp.)* is widely produced worldwide, with Portugal being one of the major world producers in the last 20 years. Nevertheless, producers still face many challenges such as production costs from fertilization, weed management, and pest control.

Plant growth promoting rhizobacteria (PGPR) have been thoroughly investigated as a new sustainable strategy to reduce the use of agrochemicals, including fertilizers. It is estimated that 1 to 2% of the bacteria in the rhizosphere promote plant growth. *Bacillus* and *Pseudomonas* spp. have been reported as two of the most common PGPR bacteria. These and other PGPR have been extensively studied for their potential to improve the nutritional plant´s input, by e.g., increasing nitrogen fixation or mineral mobilisation, and modulating phytohormone production. Also, some can also control pathogens and increase the tolerance to abiotic stress of their host plants, having a positive impact on plant growth, health, and yield. Several commercial versions of PGPR are already available, although using non-native strains.

Therefore, this work aims to understand which microorganisms, in particular PGPR, are present in the rhizosphere of the *Vaccinium* species. To achieve that, we axenically inoculated (in duplicate), on culture medium, root segments of ten different *Vaccinium* plants, half of them previously disinfected and the other half not disinfected. From these, a collection of 55 different bacteria regarding their phenotype was obtained, and genomic DNA was extracted for each isolate. Currently it is being performed the Sanger sequencing of the partial ribosomal gene 16S, to assess the identity of the species and future confirmation resorting to specific molecular markers. This work will allow further identification and exploitation of native PGPR to increase blueberry production and resilience.

Improving resilience of blueberry production: Metagenomic identification and isolation of plant growth promoting microorganisms in the rhizosphere of blueberry plants (*Vaccinium* spp.) with mycorrhizal potential

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Abstract

World population is rapidly increasing, with estimations reaching 8.5 billion by 2030, posing critical challenges on agro-food production. On other hand, anthropic activities are accelerating climate change events with ongoing episodes of more frequent and severe extreme episodes of drought or heat waves, particularly in the Mediterranean Basin. Climate change will thus profoundly modify the ecosystems, impairing the growth and reproduction/yield of crops. One of the crops affected by these climate changes, with special incidence in the Douro Region of Portugal, is the Blueberry (*Vaccinium* spp.), a commodity with increasing relevance in Portugal in the last ten years.

This project aims to investigate the presence of plant growth promoting microorganisms (PGPM) in the rhizosphere of blueberry plants, and the identification of mycorrhizal fungi of native origin, which can improve the resilience of the plants and promote plant growth and development, improving the efficiency of water use and nutrients uptake. To achieve this, metagenomic analysis of the rhizosphere will be performed to identify the microbial community associated with the blueberry plants, and further isolation and identification of fungi of the same rhizosphere will be performed. Samples of 10 blueberry plants in the Douro Region were collected, their DNA extracted, and are currently undergoing metagenomic analysis. Regarding epiphytic and endophytic fungi isolation and identification, two root samples were collected from the 10 blueberry plants. A collection of 80 morphological different fungi was obtained, with some presenting characteristics of PGPM. DNA extraction from the fungi is ongoing for sequencing through Sanger of the ITS region to confirm the identity of the isolates obtained for future analysis. The results will then allow disclosing native microorganisms capable to improve the blueberry production, increasing plants resilience and improving fruit quality.

A novel hydrogel-based dressing for radiodermatitis treatment

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Abstract

Every year, millions of people are diagnosed with cancer worldwide and radiotherapy (RT) plays an important role in cancer treatment. However, it can also cause uncomfortable or even painful side effects on the skin. The most common side effect of RT is radiodermatitis (RD) [1]. These skin lesions could affect the success of the treatment and the quality of patient life. One therapeutic approach of relevance to skin wound healing is tissue engineering (TE), in which the combination of biomaterial, cells, and biological signals plays a decisive role in the regeneration of the damaged tissue. Hydrogels are considered suitable and ideal biomaterials for skin tissue engineering, due to their structural similarity to the extracellular matrix [2]. Hydrogel-based dressings can absorb the exuding liquids and debris from the wound area, maintaining a physiologically moist microenvironment and promoting wound healing [3]. Alginate (Alg) is one of the most common biopolymers used in wound healing and type I collagen (ColI) is the most abundant protein in the human body. The combination of these two components in wound dressings can provide a proper environment for the healing process [4].

The aim of this study is to develop an innovative hydrogel-based dressing for RD treatment. Different ColI concentrations (0.25 and 0.125%), temperature (room temperature and 37 ºC) and incubation time (0, 12h and 24h) were used to produce Alg-ColI hydrogels formulations. The hydrogel formulations were characterized in terms of chemical composition (FTIR) and morphology (TEM). The results showed that ColI was incorporated in Alg hydrogel without chemical modification. Further, the incubation time induced the Col fibrils formation into the Alg network, which may be useful for TE.

References

[1] - Robijns, J. and H.-J. Laubach. J. Egypt. Women's Dermatologic Soc. 2018; 15(1).
[2] - Geckil, H., et al. Nanomedicine, 2010. 5(3).
[3] - Negut, I., et al. Polymers, 2020; 12(9).
[4] - Venkatesan, J., et al. J. Biomater Tissue Eng. 2015; 5.

Metalloporphyrin binary structures as catalysts in the reduction of 4- nitrophenol

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Abstract

Environmental decontamination based on catalytic processes have been intensively studied in the last decades. Especially, the use of photocatalysts or photosensitizers for reactions assisted by sunlight are particularly relevant, due to the use of accessible and renewable energy source [1].

The 4-nitrophenol (4-NPh) is a pollutant often found in industrial wastewaters. The reduction of 4-NPh to 4-aminophenol (4-APh) is important in the context of circular economy, once the 4-APh has high commercial value with applications in the synthesis of pharmaceuticals [2].

Metalloporphyrin materials were obtained by ionic self-assembly of Fe (III) and Cu (II) porphyrins with opposite charges, in water, at room temperature. This eco-sustainable preparation makes them very attractive materials. Characterization of the materials by UV-vis and SEM/EDS showed the formation of nanostructures for which high specific surface areas are expected [3].

The new materials were applied as heterogeneous catalysts in the transformation of 4-NPh, in the presence of $NaBH_4$ as reductant, and in the presence and absence of simulated solar light irradiation. Under these conditions, the 4-APh is expected to be the unique product. Best performances were observed for catalysts carrying both Fe(III) and Cu(II) centers.

Acknowledgements

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References

[1] Gao, W., et al., Chemosphere 2019 125334;
[2] Sun, S. P.; et al., J Mol Catal Chem 2011, 349 (1-2), 71;
[3] Rebelo S. L. H., et al., Appl. Mater. Today 21 2020 100830

Sentinel-6 SAR altimetry and Jason-3 synergy cases: Internal Solitary Wave observations and effects on radar backscatter and SWH

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Abstract

Satellite altimetry can be used to detect sea surface signatures of high-frequency ocean phenomena, e.g. Internal Solitary Waves (ISWs), which are especially evident in radar backscatter (sigma0) and the Significant Wave Height (SWH). ISWs in particular change the sea surface by alternating rough and slick sections which affect the parameters, e.g. when changing the sigma0. These shorter-scale ocean phenomena could benefit from tandem missions such as Jason-3 and Sentinel-6. Sentinel-6 was launched in November 2020, and during the Tandem mission, it is positioned on the same orbit as Jason-3, lagging 30 seconds behind it. The Tandem flight configuration is extended until the end of March 2022, so we would be able to exploit more than one year of S6-MF/J3 datasets, to compare Sentinel-6 data with the same parameters of the Jason-3 radar altimeter in order to find synergy cases between both satellites and discover patterns concerning ISWs and sea surface signatures in SWH. Hence, the synergy cases can be used to detect roughness patterns with different signatures in the data sets and to find systematic differences between calibrations of the two altimeters in question. In this study, we select regions of the oceans, namely the Banda Sea, the South China Sea, the Andaman Sea and the Atlantic Ocean off the Amazon shelf. In each region, we check for possible cases of ISWs in tracks. Comparisons with images from optical sensors such as Ocean Land Colour Imager (OLCI) from Sentinel-3A, MSI onboard Sentinel-2, MODIS-AQUA and MODIS-TERRA, as well as SAR images from Sentinel-1, were made to provide additional evidence of the ISWs signatures, namely their rough and slick patterns. On the contrary to Sentinel-6, Jason-3 does not provide equal precision in 20Hz measurements for SWH, and here we can find differences in how each phenomenon appears on the along-track record. Also, we demonstrate that the passage of an ISW can change patterns of SWH.

Antimicrobial resistance in urban river water of Porto

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Abstract

Antimicrobial resistance is one of the most relevant problems in terms of Public Health and environmental protection. Intestinal colonization of the populations with antimicrobial resistant threats is a reality that can be detected in natural waters impacted by anthropogenic influences as for example unexpected contamination by waste waters. The aim of this work was the detection of antimicrobial resistant bacteria in river water from urban area of Porto. River water was analyzed by membrane filtration method in Gram negative selective culture media supplemented with adequate antibiotics. Isolated colony forming units were selected in chromogenic medium and antibiotic susceptibility tests were performed by the disc-diffusion method, according to EUCAST guidelines Results of this work showed contamination with antimicrobial multi-resistant Enterobacteriaceae, namely carbapenem resistant isolates confirmed by carbapenem inactivation method (CIM), extended-spectrum β-lactamases (ESBLs) producers confirmed by the synergism between clavulanic acid and β-lactams and AmpC β-lactamases producers confirmed with double-disk test using cefoxitin and cefoxitin + cloxacillin disks. This kind of resistance is typical of health care associated settings showing a putative wastewater contamination of health care origin. These typical markers reflect the intestinal colonization of particular niches of the population colonized with these resistant threats. These findings reflect the robustness of this marker as indicator of unexpected accidental contamination of river water with particular type of health-care associated bacteria. This is an exploratory work, intending to help in the detection of the origin of the focal contamination. These findings represent a risk to environmental spread of antimicrobial resistant bacteria and genes, relevant in terms of public health and environmental protection.

Extraction optimization of bioactive compounds from *Undaria pinnatifida (Harvey) Suringar*

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Abstract

Seaweeds, such as the brown macroalgae *Undaria pinnatifida (Harvey) Suringar*, have been the target of several research studies due to natural compounds with neuroprotective capacity against neurodegenerative diseases due to their antioxidant, anti-inflammatory, and immunomodulatory capabilities. Therefore, this work aims to study the bioactivity of *U. pinnatifida* seaweed extracts, and, for this purpose, extraction optimization was performed using different extraction conditions: type of solvent (ethanol, methanol, acetone and dichloromethane, and mixture of solvents such as water: acetone (10:90), water: ethanol (50:50) and water: methanol (50:50)), solid/solvent ratios (1:10 and 1:20), extraction times (1h and 2h), and extraction temperatures (25 ˚C and 40 ˚C). The extraction yield showed values ranging from 4.97 to 17.68 %, in which the highest yield was obtained in the extraction carried out with the solvent mixture water: methanol (50:50) at 40 ˚C for 2h, with a solid/solvent ratio of 1:20. After extract preparation, the antioxidant and neuroprotective capacity of the obtained extracts will be evaluated as well as the determination of the total flavonoid, total phlorotannin, total phenolic and total carotenoid contents.

Acknowledgments

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Characterization and cartography of lope instability on the banks of the Douro River in Vila Nova de Gaia and Porto

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Abstract

Historic areas, such as the Porto and Vila Nova de Gaia areas, have been recognized for the phenomena that cause rocky massifs to become unstable. Of these, the slope hazard instability was based on the study of various modes of parameters that classify as characteristics of the rocks, having the physical process of analysis of kinematic analysis, which allowed us to infer the probability of occurrence of movements due to falling blocks.

The main objective of this dissertation is to study, assess and map the danger of instability on slopes along the banks of the Douro River, in the cities of Porto and Vila Nova de Gaia.

The study area is located Vila nova de Gaia and Porto, next to the Douro River, and Porto, exempt in the Central Iberian zone, next to the border with the Ossa Morena zone. This study area was later divided into three distinct areas corresponding to Serra do Pilar, zona da Arrábida and Porto. The geological framework of the study area essentially comprises two-mica granites of the Variscan age, classified as a medium-grained and to coarse-grained, two-mica leucocratic granite.

This study was carried out based on the methods defined by the International Society of Rock Mechanics (ISRM) for the characterization of discontinuities in rock on the slopes studied, considering the parameters: rock alteration state, roughness, fracturing, discontinuity, opening and humidity, followed by cartography for each parameter studied and for the instability of the slopes studied, based on the kinematic analysis.

The kinematic analysis indicates that, the type of rupture most likely to occur is the wedge rupture, however, other types of failure are also possible.

The work carried out within the scope of this study indicates that the slopes studied present an average hazard, considering the parameters and criteria used. Some of the studied sites stand out, presenting a higher instability hazard, recommending their monitoring and eventually intervention

Macrocyclization of Melanostatin Neuropeptide by Ring-Closing Metathesis

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Abstract

Melanostatin (MIF-1, Fig. 1), formally known as L-prolyl-L-leucylglycinamide, is a neuropeptide that acts as a positive allosteric modulator (PAM) of D2 dopamine receptors (D2R) (1), thereby decreasing the concentration of dopamine required for the activation of these receptors. In this sense, this neuropeptide is considered a good candidate for the treatment of neurodegenerative pathologies in which activation of D2R is compromised, such as Parkinson's disease (2). However, due to its peptide nature, MIF-1 displays low intestinal permeability (3) and a reduced stability in plasma (4).

In this context, this study fosters to develop the macrocyclic derivatives of MIF-1 to circumvent the limitations of this neuropeptide. Macrocyclic peptides are known to increase the resistance to proteolysis and increase the hydrophobicity by exposing the hydrophobic groups outwards, thus increasing the permeability in biological membranes in comparison with the corresponding acyclic peptides (5).

In this work, the preparation and characterization of 14- and 15-membered head-to-tail macrocycle analogues of MIF-1 are described (Fig. 1), which were synthesized from a ring closing metathesis (RCM) reaction catalyzed by Grubs II with 65-70% yield. Catalytic hydrogenation of olefin-containing macrocycles with Pd/C delivered saturated macrocycles in quantitative yields.

These MIF-1 analogues are currently under functional pharmacological assays to determine and characterize their PAM activity at D2R through mobilization of cAMP, and cytotoxicity assays in differentiated human neuroblastoma cells (SH-SY5Y).

References

(1) Mann, A. et al. Eur J Pharmacol 2010, 641, 96.
(2) Sampaio-Dias, I. E. et al. J Med Chem 2021, 64, 6209.
(3) Barbeau, A. et al. Can Med Assoc J 1976, 114, 120.
(4) Redding, T. W. et al. Neuroendocrinology 1973, 11, 92.
(5) Shinbara, K. et al. Front. Chem. 2020, 8, 447.

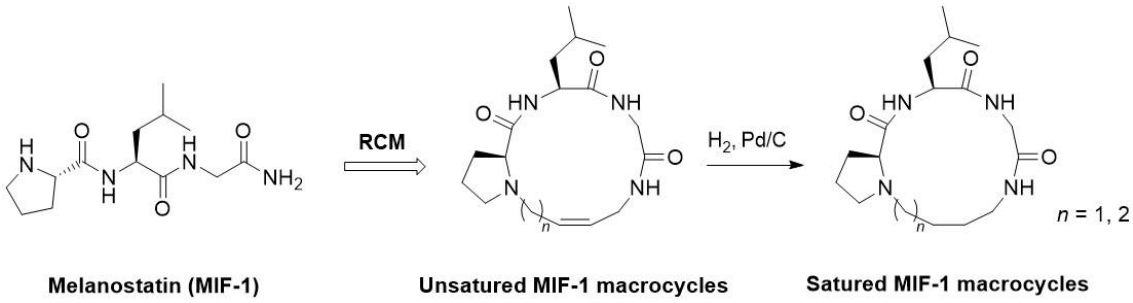

Figure 1. Structures of Melanostatin (MIF-1) and the corresponding macrocyclic derivatives described in this work.

Potential application of acorns as functional food: chemical characterization

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Abstract

The circular economy and the sustainable food production are among the main market trends that have led to the search for new solutions, such as the use of raw materials, little explored as human food. In this sense, the exploitation of undervalued natural resources deserves special attention, particularly regarding low-cost and highly available vegetable matrices in Portugal, such as acorns. Acorns are one of the most promising natural resources to be considered nationally and internationally due to their nutritional benefits although still undervalued. Hence, their valorization is an essential factor of sustainability nowadays. Therefore, the objective of this project is to characterize acorns by analyzing their chemical and nutritional composition.

Acorns were collected in a forest, washed and dehydrated at 41°C for 72 h. After this process, the seed and pericarp of the fruit were separated. Finally, a proximate analysis was performed where moisture, ash, lipids and proteins were determined, and the values obtained in mass percentage, on a dry basis, are shown in Table 1.

As future work, it is intended to perform further analyses of the chemical composition of the acorn and study its biological characterization in order to assess its potential value as a functional food.

Acknowledgments

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Parameters	Content
Humidity (%)	9.95 ± 0.243
Ash (%)	1.92 ± 0.0295
Lipids (%)	3.83 ± 0.344
Proteins (%)	3.72 ± 0.0655

Table 1. Acorn chemical composition.

Pressure-Induced Phase Transformations of Sr3Hf2O7

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Abstract

We present an ab-initio study performed by means of Density Functional Theory and lattice dynamics to probe the octahedral distortions, which occur during the structural phase transitions of the quasi-2D layered perovskite Sr3Hf2O7 (SHO) compound. Such a system is characterized by a high-temperature I4/mmm (S. G. 139) centro-symmetric structure and a ground-state Cmc21(S. G. 36) ferroelectric phase. We have probed potential candidate polymorphs that may form the I4/mmm towards the Cmc21 transition pathways from which the lower symmetry structural phases may be generated by inducing tiltings and/or rotations of the O octahedral cages. We mainly focus our attention to the Ccce (S. G. 68) structural phase, since it has been experimentally evidenced in systems with similar stoichiometry, i.e. Ca3Mn2O7. This phase may occur through a first-order phase transition when temperature decreases towards room temperature, breaking the center-of-symmetry of the tetragonal phase. By observing the phonon dispersion curves of the Ccce phase we find that the system is dynamically unstable at room conditions, evidencing negative phonon modes localized at two of the high symmetry points of the Brillouin-zone: Γ and Y points. Thus being, by considering the enthalpies of four different phases as a function of pressure (up to 20 GPa), we observe that the Ccce structural phase becomes thermodynamically and dynamically stable at 13 GPa and 20 GPa, respectively. As a continuation of the work done so far in SHO under compression, we will show the evolution of the electronic properties of the Ccce phase with increasing pressure and further explore the behaviour of the optical vibrational modes, which are responsible for the instability of the Ccce phase at low pressures. Furthermore, the Quasi-Harmonic Approximation will be applied to include the variation in the lattice volume due to thermal expansion/contraction which may lead to changes in both the lattice energy and the phonon frequencies.

Potential neuroprotective effects of astaxanthin-loaded solid lipid nanoparticles (SLN) against oxidative stress

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Abstract

Nowadays, neurodegenerative diseases (NDs), such as Alzheimer´s disease and Parkinson's disease, represent one of the biggest health problems as they affect millions of people worldwide. Extensive evidence highlights a common pathophysiological mechanism in these diseases, the oxidative stress. Therefore, the use of antioxidants arises as a promising approach in NDs therapy, potentially limiting the neuronal loss and slowing the disease progression. An example of a naturally occurring antioxidant is astaxanthin (ASTX), a carotenoid with no vitamin A activity, hence less toxic to humans. It is found in most aquatic organisms with red pigment. ASTX has shown to mediate both antioxidant and anti-inflammatory actions.

The main objective of this work was the development and characterization of an ASTX-loaded SLN formulation. Afterwards, the biocompatibility and the potential neuroprotective effects against oxidative stress were assessed in vitro. The prepared formulation was characterized for particle size, polydispersity index (PDI) and zeta potential (ZP), in both the preparation day and 90 days after storage at 20,0 ± 0,5 ºC. For the in vitro studies, SH-SY5Y cells differentiated into a dopaminergic phenotype were used and the cytotoxicity of both empty and ASTX-loaded SLN formulations (0 - 100 µg/ml) was evaluated by the neutral red uptake and MTT reduction assays, 24 h after exposure. The neuroprotection against tert-butyl hydroperoxide (t-BHP)-induced oxidative damage was assessed 24 h after exposure to the aggressor in the presence or absence of both empty and ASTX-loaded SLN formulations. ASTX-loaded SLN showed a particle size of 98,460 ± 1,269; PDI of 0,218 ± 0,010; and ZP of -18,300 ± 0,458. These values remained stable after storage. Although further studies are needed, the obtained results concerning their biocompatibility and antioxidant activity were promising, open a new window of opportunity for the treatment of NDs associated with oxidative stress.

Impact of single and combined copper and drought stresses in barley plants

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Abstract

Plants are constantly confronted with several abiotic stresses that seriously reduce their productivity. The indiscriminate use of copper (Cu) in agriculture results in its accumulation in soils and consequent phytotoxicity and this problem can be aggravated by the increasing frequency and intensity of soil drought episodes. As the impact of interactive effects of these stressors on plants´ physiology remains unexplored, the goal of this study was to assess the combined action of Cu and drought on barley (*Hordeum vulgare L.*) plants. By employing a bifactorial design, seedlings were grown in natural soil for 14 d under the following treatments: a) control (CTL) - plants continuously irrigated (14 d) and exposed to uncontaminated soil; b) Cu - plants continuously irrigated (14 d) and exposed to Cu-contaminated soil (115 mg Cu kg-1); c) drought - plants only irrigated during the first 7 d of growth and exposed to uncontaminated soil; d) combined - co-exposure to Cu and drought treatments. The results showed that while root length was negatively affected by Cu (individually and combined), drought stress (individually and combined), led to a decreased plant biomass, and affected plants´ water status, compared to CTL. Also, lipid peroxidation was higher in plants exposed to combined stress compared to CTL, while no changes were detected in individual treatments. Photosynthetic pigment content did not change upon Cu and/or drought exposure, despite the observed trend of decreased levels under Cu-induced stress. Overall, individual exposure to Cu or drought triggered distinct plant responses, yet the combined action of these stressors resulted in higher oxidative damage.

New insights in drug discovery for the treatment of Amyotrophic lateral sclerosis

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Abstract

Amyotrophic lateral sclerosis (ALS) is characterised by the progressive loss of both upper and lower motor neurons, leading to paralysis and death due to respiratory failure within 2-5 years after diagnosis. Although the pathophysiology of the disease remains largely unknown, reactive oxygen species, iron metabolic dysregulation and glutamate-induced excitotoxicity are known to contribute to the pathogenesis of this disease. However, the drugs currently available for ALS treatment only lead to symptomatic relief, extending patients survival for a short period of time. Therefore, huge efforts are being made for the development of new drugs for an effective therapy of ALS. In this work, we aimed to evaluate the potential protective effects of a series of novel compounds, here labelled as PS derivatives, which may represent promising new drugs for ALS treatment.

The cytotoxicity of PS derivatives was firstly evaluated in differentiated SH-SY5Y cells, 24h after exposure, by the MTT reduction and neutral red uptake assays, to select non-cytotoxic concentrations. The effects of PS compounds on P-glycoprotein (P-gp) were also assessed through the rhodamine 123 accumulation assay. Finally, the potential neuroprotective effects against ferric nitriloacetate (FeNTA)- and tert-Butyl hydroperoxide (tBHP)-induced cytotoxicity were evaluated, 24h after exposure to the aggressors, in the presence or absence of the tested compounds. Accordingly, with the obtained data, 3 of the tested PS derivatives significantly protected SH-SY5Y cells against FeNTA-induced cytotoxicity. Also, several PS compounds were capable of reducing the cellular damage induced by exposure to tBHP. Moreover, several PS compounds were not able to modulate P-gp activity, thus decreasing the potential for pharmacokinetic interactions. In conclusion, newly synthetised PS derivatives showed promising

results highlighting the identification of new disease-modifying drugs with therapeutic potential for ALS treatment.

Positive body image in people with spinal cord injury: relation with anxiety, depression and quality of life

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Abstract

Body Image (BI) can be defined as the beliefs about one´s appearance, and the thoughts, feelings and actions directed toward the body (Cash, 2011). Most of the BI research focus on the prevention and treatment of negative BI outcomes, such as body dissatisfaction. More recently, a different view of BI brought a new construct - positive BI - defined as appreciating the body's appearance and functionality, being constantly aware and attentive to the body's experiences and needs and having positive and adaptive cognitions to process messages related to the body in a self-protective way (Menzel & Levine, 2011; Tylka & Wood-Barcalow, 2015).

Spinal cord injury (SCI) is a clinical condition, marked by significant body changes and a degree of body functionality loss. Despite the impact on BI, studies regarding positive BI in this population still scarce. However, they reveal interesting data, namely, there is evidence that BI becomes more positive with time after injury (Bailey et al., 2015, 2016; Bassett et al., 2009) and that people with physical disabilities gradually adjust and increasingly accept their bodies (Taleporos & McCabe, 2002).

The present investigation aims to study some dimensions of positive BI in a sample of individuals with SCI, and its relationship with quality of life (QoL), anxiety and depression. Outcome measures and interviews were applied.

Preliminary results reveal no differences between individuals with or without SCI on positive BI. However, the sample without SCI has higher levels of QoL, and, interestingly, higher levels of anxiety and depression, compared with the participants with SCI. Through interviews, we expect to better understand these results and to access the personal representations of the participants about their BI.

Ionic liquid electronic synapses

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Abstract

As computer technology moves closer to the end of Moore´s law, a solution capable of improving hardware is needed. Keeping in mind the computational entities known, the human brain stands out as the most efficient, leading scientists to study ways in which it can be mimicked [1]. The brain presents impressive characteristics such as memory retention and learning capabilities with very low power consumption. It is composed of a complex network of neurons and synapses being that information is transmitted from the pre- to the post-synaptic neuron and memory is stored in the synapses in the form of synaptic strength. In order to mimic these characteristics, a new generation of devices was built that shows resistive switching, a process that resembles the synaptic behavior, being that this can be achieved in both liquids and solids. The present work studies the behavior of a two-terminal device based on a silver nitrate solution (AgNO3) and silver electrodes that, due to the liquid nature, can be fabricated in various shapes [2]. During experimentation, electrode spacing was varied and several concentrations of the solution were tested. Dynamical properties were also studied, such as endurance and data retention, important properties of the human synapses as well. The power achieved by the device ranges between -300 mV to 500 mV with a current compliance of 0.1 mA. The resistive switching behavior achieved is explained by the diffusion of silver atoms inside the solution as an electric field is being applied.

References

[1] Wan, Q., Sharbati, M. T., Erickson, J. R., Du, Y., & Xiong, F. (2019). Emerging Artificial Synaptic Devices for Neuromorphic Computing. Advanced Materials Technologies, 4(4), 1-34.
[2] Kim, D., & Lee, J. S. (2019). Liquid-based memory and artificial synapse. Nanoscale, 11(19), 9726-9732.

Anatomical study of the human skeletal pelvis and obturator nerve: importance for acetabular fractures treatment

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Abstract

Introduction: Acetabular fractures are a challenge for orthopaedic surgeons, and the knowledge of the pelvic anatomy is critical for its diagnosis and treatment. Obturator nerve injury is one of the complications associated with these fractures.

Materials, methods and results: Ten embalmed adult human cadavers (derived from body donation, Portuguese Decreto-Lei nº 274/99) were carefully dissected in order to preserve the normal anatomy of the abdominopelvic region. After dissection, the following measurements were made bilaterally and the following results were obtained (median in mm):

1. Length of the anterior border of the sacral ala (36)
2. Distance between the lateral end of the anterior border of the sacral ala and the obturator nerve (measured in the sagital plane) (3)
3. Length of the obturator nerve measured from the lateral end of the anterior border of the sacral ala to the point where the nerve enters in the obturator canal (71)
4. Length of the lineae terminals (136.5)
5. Distance between the pubic symphysis (at the median plane) and the point where the obturator nerve enters the obturator canal (62)
6. Distance between the pectineal line and the obturator nerve (at the point where the nerve enters the obturator canal) (20)
7. Distance between the pubic tubercles (51.5)

Discussion/Conclusion: This study increases the knowledge of skeletal pelvis and obturator nerve anatomy, topics that are among the most relevant aspects in the management of acetabular fractures.

Anatomical study of the human upper part of the sacrum and ventral rami of the first and second sacral nerves: relevance for sacral fractures management

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Abstract

Introduction: Sacral fractures are uncommon injuries and are a heterogeneous group of fractures. Depending on the location of the fracture, neurological injury may be present in more than half of the cases.

Materials, methods and results: Ten embalmed adult human cadavers (derived from body donation, Portuguese Decreto-Lei nº 274/99) were carefully dissected in order to preserve the normal anatomy of the abdominopelvic region. After dissection, the following measurements were made bilaterally and the following results were obtained (median in mm):

1. Length and width of the ventral ramus of the first sacral nerve (36 and 9)
2. Length and width of the ventral ramus of the second sacral nerve (42 and 7)
3. Vertical distance between the anterior border of the sacral ala and the upper border of the first pelvic sacral foramen (16)
4. Height and width of the first pelvic sacral foramen (13 and 12)
5. Vertical distance between lower border of the first pelvic sacral foramen and upper border of the second pelvic sacral foramen (13)
6. Height and width of the second pelvic sacral foramen (10 and 10)
7. Anterior height of the first sacral body (measured in the median plane) (29)
8. Anterior height of the second sacral body (measured in the median plane) (22)

Discussion/Conclusions: This study contributed to increase the detailed knowledge of the pelvic anatomy, a topic that is very demanding in management of sacral fractures.

Study of SerpinA3 levels in a mouse model of ATTR V30M amyloidosis

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Abstract

ATTR V30M amyloidosis is the most frequent form of ATTR amyloidosis in the Portuguese population. This disease previously known as Familial Amyloid Polyneuropathy (FAP) is characterized by systemic deposition of amyloid in tissues with predominant involvement of the peripheric nervous system originating polyneuropathy (PN) but also with variable severity at the cardiac tissue originating cardiomyopathy (CM). TTR (transthyretin) fibrils in the amyloid deposits are composed by full length and fragmented TTR due to proteolysis by a serine protease.

Different proteomic studies of serum from ATTRm patients revealed differences on serine protease inhibitors (Serpins) levels as compared to controls. While one of the studies refers that SerpinA 1 is overrepresented in serum from FAP patients [1] another study reports that SerpinA3 is differently expressed in ATTRm associated with polyneuropathy [2].

Besides its effects as inhibitors of serine proteases these proteins also act as extracellular chaperones in several aggregation diseases indicating that it may also present a significative role in TTR amyloidosis.

Studies developed in our lab to study the role of serpins in a mouse model of ATTR V30M, designated as HM30 mouse, it was found that downregulation of SerpinA1 resulted in overexpression of SerpinA3n in liver. Thus, we decided to investigate the expression of SerpinA3n in the HM30 mice (knockout for mouse ttr gene and transgenic for the human TTR V30M gene).

We will present the results obtained in this preliminary study where we investigated the levels of SerpinA3n in liver and heart of HM30 mice as compared to wild type mice (IW) in groups of mice with different ages.

References

[1] da Costa G, et al. Transthyretin Amyloidosis: Chaperone Concentration Changes and Increased Proteolysis in the Pathway to Disease. PLoS One. 2015.

[2] Chan GG, et al. Serum Proteomic Variability Associated with Clinical Phenotype in Familial Transthyretin Amyloidosis (ATTRm). J Proteome Res. 2017.

Characterization of the disease outcome and immune response by evolving variants of SARS-CoV-2

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Abstract

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, which causes the coronavirus disease 2019 (COVID-19), rapidly evolved to a world pandemic. Currently, this devasting disease led so far to almost 6 million deaths. Animal models, such as the K18-hACE2 mice, have been used to test novel vaccines and drugs against this disease. However, a fair amount of variability has been reported in what concerns the outcome of infection in K18-hACE2 mice, and only a few studies systematically compare outcomes across different variants of concern (VOCs). Additionally, how the immune response develops and correlates or might predict disease severity has not been addressed in detail. Therefore, we compared the disease outcome and immune responses in K18-hACE2 mice intra-nasally infected with the B1.1.7 (alpha) and B.1.617.2 (delta) VOCs. B.1.1.7-infected animals showed a wide range of symptoms, including respiratory and neurologic symptoms, while B.1.617.2-infected animals mainly exhibited dyspnea along with a sharp decrease on their weight, which suggests distinct severities of disease caused by these VOCs. In line with other studies, we found that the most affected organs were the lungs, brain and intestine, with severe macroscopic and histologic alterations. Regarding the elicited immune response, we observed an accumulation of neutrophils in the lungs, which was also seen in the blood. The increase in neutrophils in the circulation corelated with the disease severity and time of disease. We are currently measuring the expression of cytokines and chemokines in the lungs of the infected animals, and including in our analysis the VOC B.1.1.529 (omicron). Our study contributes to the general understanding of host-pathogen interactions during COVID-19 and enhances the K18-hACE2 model as a platform for testing novel approaches to control this disease.

Selected environmental biomarkers in wild mussels (*Mytillus galloprovincialis*) from different sampling sites of the NW Atlantic coast of Portugal

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Abstract

Marine pollution is a serious global problem that has been receiving a lot of attention from all the political, social, and scientific communities. The goal of the present study was to investigate the effects of environmental variation on selected biomarkers of wild mussels from the NW Atlantic coast of Portugal. Mussels were collected (Summer 2021) in four sampling sites along the coast with different predominant types of environmental contamination: Vila Praia de Âncora, Cabedelo, São Bartolomeu do Mar, and Boa Nova. Several biomarkers were determined in selected tissue samples, namely the levels of lipid peroxidation (LPO) indicative of lipid oxidative damage, and the activity of the enzymes acetylcholinesterase (AChE) indicative of neurotoxicity, isocitrate dehydrogenase (IDH), and octopine dehydrogenase enzyme (ODH) indicative of alterations in the mechanisms of cellular energy production, and glutathione S-transferases (GST) involved in biotransformation and oxidative stress prevention. The results showed variations in several biomarkers among sites in good relation with the known environmental contamination in the sampling sites and other environmental variations.

Acknowledgments

This study was done in the scope of the projects Ocean 3R (NORTE-01-0145-FEDER-000064) and RESPONSE (FCT: MICROPLAST/0006/2018) and funded by the respective funding institutions. M. I. Samara had a fellowship from the OCEAN 3R project.

D,L-threo-Methylphenidate protects SH-SY5Y cells against the dopaminergic neurotoxin - paraquat

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Abstract

Introduction: Parkinson´s disease (PD) is the second most prevalent neurodegenerative disorder, affecting 1-2% of the total global population. The herbicide paraquat (PQ), is a well-known dopaminergic toxin. Meanwhile, psychostimulants such as amphetamine (AMPH) and methylphenidate (MPH) have shown to increase dendritic complexity and synaptic plasticity, what may represent a mechanism by which they can provide neuroprotection.

Objective: Evaluate whether AMPH and MPH can promote neuroprotection against PQ-evoked neurotoxicity in human differentiated SH-SY5Y cells.

Material and Methods: SH-SY5Y cells were differentiated with retinoic acid and 2-O-tetra-decanoyl-phorbol 13-acetate for 7 days to acquire the dopaminergic phenotype. After differentiation, SH-SY5Y cells were exposed to the drugs or toxin for 24 hours. Initially, the toxicity of AMPH and MPH was tested at clinical concentrations (0.001, 0.01, 0.1; 1; 10 µM). The reduction of 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-2H-tetrazolium bromide (MTT) and neutral red (NR) uptake, were used as viability cytotoxicity assays. Then, the same assays were carried out for PQ to estimate the lethal concentration of 50% (LC 50), being the concentrations used: 5000, 2500, 1000, 500, 100 µM. Finally, to evaluate the effect of AMPH and MPH on PQ neurotoxicity, the concentration of 1 µM of AMPH and MPH was used. Statistical analysis was conducted by One-way ANOVA followed by a multiple comparisons test, with $p<0.05$ considered meaningful.

Results: AMPH and MPH were not toxic at any concentration tested. For PQ, all concentrations revealed toxicity in a concentration dependent manner, with LC50 being 500 µM. The evaluation of the protection afforded by AMPH and MPH, in cells previously exposed to PQ, showed that only MPH significantly reduce the neurotoxicity induced by PQ by mechanisms that we are currently evaluating.

Conclusion: MPH showed neuroprotection against PQ-induced toxicity in SH-SY5Y cells.

Development and optimization of an experimental protocol to determine the impact of early-life microbiota on the immune system

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Abstract

Background: Early life gut microbiota is highly plastic and susceptible to external factors such as delivery mode and maternal microbiota. During this period, the gut microbiota impacts the development and maturation of the child´s immunity and any disruption to the infant´s gut microbiota during this period can impair the proper maturation of the immune system, leading to future health complications.

Aims: This study aims to develop and optimize an experimental protocol to (1) separate and inactivate microbiota from infant´s stool samples, and (2) evaluate its ability to stimulate primary human monocyte-derived dendritic cells (DCs) and T cells.

Methods: The microbiome of infant stool samples was isolated through a series of centrifugations and inactivated by UV radiation. The gut microbiota was then used to stimulate DCs and T cells and their activation levels were evaluated through flow cytometry.

Results: Several problems were tackled along the protocol development. Sample homogeneity was overcome through the use of the GentleMACS system. To surpass the yield of sample recovered post-UV inactivation. Two co-culture protocols were compared which differed at the time of LPS addition: in the first protocol, LPS was added after 5 days, while in the second protocol LPS was added after buffy coat isolation. The first protocol had better performance, as it obtained higher activation levels in the immune stimulation essay. To test the ability of gut microbiota to stimulate the immune response, two distinct microbiota: DCs ratios were used, Multiplicity of Infection (MOI) of 5 and 10. Our results indicate that a higher MOI enhanced T cell and DCs activation, as evidenced by the expression of CD25/CD69 and CD86/CD40, respectively.

Conclusions: A protocol was successfully developed and optimized for the separation and inactivation of infant´s gut microbiota and subsequent immune cell stimulation.

Past, Passing, Future: Chronography of Apúlia

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Abstract

Apúlia is located in the north coast of Portugal, about 5 km south of the mouth of Cávado river. Like many others in this region, this urban settlement is connected to agriculture and fishing activities and also seasonal summer activities. These characteristics have a big impact on the way the landscape was and still is being constructed. But they are not the only ones.

The history of this village is related to the first population settlements in the northwest of the Iberian Peninsula; We can find here some examples of Celtic architecture. During the Roman invasions some Villas appeared: Menezis and Pariatis; connected to them, the roman Via Veteriis. In the X c., Villa Pariatis became the catholic São Miguel de Paredes, endowed with a romanic church that disappeared before the XVI c. due to one of the many sand storms that reached this region before the pine forest was planted in the XVII c.. After that, the main urban core moves south with a new church near the leader's house (Casa de Couto). In addition, in the XIX c., a new urban core appeared connected with the beach. Meanwhile, a unic agricultural technique was developed: masseiras allow sandy soils to become fertile with a mixed technique of building sand barriers and using compounds from dried sargaço (a seaweed). Nowadays, the village presents itself as the set of all the aforementioned focus and the spaces between them that were, naturally and gradually, inhabited.

The main claim of this work is to understand how the history of this place generated this urban formation, by presenting a cartography that's meant to be read in chronological layers. Eventually, this information can help solving today´s problems: many of the natural disasters aren´t new and were somehow softened in the past; the expansion of the urban territory can be a clue to find a better way to do it today; the ancient routes should be reused; the technologies used at masseiras can provide an ecological solution to agricultural problems.

Algae-based food supplements: Quality, safety, and efficacy in the context of body mass control

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Abstract

Cardiovascular diseases and type 2 diabetes are two of the leading causes of death around the world. While weight management is a successful approach for reducing the risk of chronic diseases, long-term maintenance of weight loss is a challenge. There are several commercially available algae-based supplements indicating weight loss properties, though scientific evidence on their effectiveness is still scarce. The aim of this work is to assess the efficacy of several algae-based supplements indicated for weight loss. Thus, the effect of ethanol extracts obtained from *Arthrospira platensis* and *Fucus vesiculosus*-based supplements and from *A. platensis* (Spirulina) and *F. vesiculosus* (wild specimens) on a panel of in vitro targets underlying metabolic changes in diabetes, namely its capacity to modulate the activity of enzymes involved in the metabolism of carbohydrates (α-amylase and α-glucosidase) and of glucose (aldose reductase) ise being explored. While displaying a mild inhibition towards α-amylase (IC25 > 2500 µg mL-1), preliminary results reveal that ethanol extracts obtained from Spirulina and F. vesiculosus-based supplements are particularly effective against α-glucosidase (IC50 ranging from 8.0 to 14 µg mL-1), acting as a mixed-type inhibitor. The inhibitory potential of the extracts towards aldose reductase is being explored. Additionally, to ensure the genuineness of the marketed product, the pigments profile is being used as "fingerprint" for authenticity control. Results obtained so far showed the presence of several compounds (xanthophylls, carotenes and chlorophylls) in Spirulina and F. vesiculosus-based supplements.

Acknowledgements

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Where does the difference lie? Multiculturalism, Narratives and Mediation

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Abstract

Where does the difference lie? This is our question to reflect the inevitability of migration flows and the interculturality of the times in which we live. This poster is the result of an exploratory study on Multiculturalism, Narratives and Mediation developed as part of the evaluation of the curricular unit of Communication and Human Relations, part of the 2nd Cycle of Studies in Health Education (FMUP/FPCEUP), in which we tried, as a group, to develop the topic and to foment a reflexive analysis mobilizing the content of the curricular unit.

In this sense, and despite the longstanding existence of the concept and nature with which multicultural contexts have emerged, there has been increasing resistance to the often-uncorroborated difference that persists and spreads, gaining strength through biased communication channels. Sensitive to this issue, we started the narrative study based on our perception and the collection of testimonies of different people on the concept of multiculturalism and its relations. The theoretical framework was conducted using different authors and perspectives in the areas of Social Perception and Interpersonal Relationship, as well as their impact in multicultural contexts, with special emphasis on Education and Health.

This assignment has enabled us to deconstruct the concept of difference and the processes that lead us to question it and, at times, to repulse it without opening up to a mutual and inclusive knowledge. The study also provided a critical reflection as a group, about our relationships, behaviors, and stereotypes, and thus realize that we are all agents of change and mediation with the responsibility to communicate and act according to the convention of human rights, and for the greater good, which will always be peace and the good of all, built by all.

Keywords: human rights, multiculturalism, social perception, health and education.

Development of electrochemical genosensors for the CYPC*2 gene polymorphism detection

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Abstract

Pharmacogenetic studies search for heritable genetic polymorphisms that influence responses to drug therapy. Pharmacogenetics has many possible applications in cardiovascular pharmacotherapy including screening for polymorphisms to choose agents with the greatest potential for efficacy and least risk of toxicity. Pharmacogenetics also informs dose adaptations for specific drugs in patients with aberrant metabolism [1].

Cardiovascular diseases (CVD) are considered one of the leading causes of death worldwide. To prevent cardiovascular complications and further loss of life oral anticoagulants (e.g., warfarin) are frequently prescribed to patients. Nevertheless, warfarin therapeutic agent presents narrow therapeutic windows with well-documented health risks. Some of these dose-responses are a result of specific single-nucleotide polymorphism (SNP) genetic variations present in a patient´s DNA. Among them, determined SNP in the cytochrome P4502C9 (CYP2C9), namely the CYP2C9*2, gene has been identified as dose-response altering SNP. Therefore, the need for a rapid, selective, low-cost and in real time detection device is crucial before prescribing any anticoagulant.

In this work an analytical approach based on electrochemical genosensor technique is under development to create a low-cost genotyping platform able to genotype SNPs related with the therapeutic response of warfarin. Analyzing public databases, two specific 71 bp DNA probes, one with adenine (TA) and other with guanine (TG) SNP genetic variation were selected and designed. The design of this electrochemical genosensor consists of ssDNA immobilization onto gold surfaces that act as the SNPs complementary probes. The hybridization reaction is performed in

a sandwich format of the complementary ssDNA, using an enzymatic scheme to amplify the electrochemical signal. The electrochemical signal was performed by using chronoamperometric technique.

EXIT procedure from a maternal perspective: is it safe? – a systematic review

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Abstract

Background: Maternal outcomes regarding Ex-Utero Intrapartum (EXIT) procedure are inconsistently reported in the literature, which focuses mainly on the fetal effects. Therefore, to provide an informed decision making by the families, this review aims to verify if this procedure is safe in a maternal perspective.

Methods: Upon research using PubMed, Web of Science, Lilacs, and Scopus databases, all the studies that reported an EXIT procedure and maternal outcomes were included. Out of the 568 initially selected studies, 61 took part in the final analysis. A descriptive analysis was performed.

Results: Most of the articles that make up this systematic review have an intermediate-high quality. Overall, 449 cases of EXIT procedure were reviewed. The most reported outcome was uterine hemorrhage. The mean estimated blood loss (EBL) was 860 ± 480 mL, with a 10% transfusion requirement. Other postoperative complications were reported, with a global rate of 15%. Only one EXIT procedure required maternal admission to the intensive care unit (ICU). No maternal death was reported and there was no need of hysterectomy. A mean value of 5,02 ± 4,28 days of length of stay (LOS) was obtained.

Conclusion: When compared to a standard cesarean section, EXIT procedure is associated with higher values of EBL and LOS. To reliably analyze the maternal morbidity, maternal complications should be reported more consistently, since they are probably underestimated in this analysis due to lack of data. Moreover, a broader follow-up of these mothers is essential to understand the long-term repercussions of this technique.

VKORC1 gene polymorphism as cardiovascular biomarker: Detection by electrochemical genosensors

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Abstract

Warfarin is an anticoagulant generally used to prevent cardiovascular diseases. Since of the low therapeutic index of warfarin and frequent complications of prevention or treatment, significant differences in individual doses of warfarin are needed to achieve prophylactic and therapeutic ranges.

Recent studies have been reporting that genetic variants of vitamin K epoxide reductase complex (VKORC1) influence the response to warfarin and doses [9]. So, the genetic and pharmacogenetic information of the major cardiovascular diseases plays an important role in the identification of the cardiovascular risk factors and in the diagnosis and treatment of these conditions.

This work addresses the development of a disposable electrochemical genosensor able of detecting single nucleotide polymorphism (SNP) in the VKORC1 gene. Analysing public databases, two specific 52 bp DNA probes, one with adenine (TA) and another with guanine (TG) SNP genetic variation were selected and selected and designed.

The genosensor methodology implied the immobilization of a mixed self-assembled monolayer (SAM) linear VKORC1 DNA-capture probe and mercaptohexanol (MCH) onto screen-printed gold electrodes (SPGE). To improve the genosensor´s selectivity and avoid strong secondary structures, that could hinder the hybridization efficiency, a sandwich format of the VKORC1 allele was designed using a complementary fluorescein isothiocyanate-labelled signaling DNA probe and enzymatic amplification of the electrochemical signal.

Preliminary studies indicate that differences in the electrochemical answers were obtained depending of the hybridization reaction format. In fact, higher electrochemical intensities were measured when the hybridization reaction was performed with a complementary DNA (without SNPs). These results suggested that the sensor is able to discriminate between the complementary DNA and single base mismatch targets having a great potential for the DNA polymorphism analysis

Insights into Acute Ischemic Stroke Prognostic Factors in Patients with Mechanical Heart Valves

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Abstract

Background and purpose: Patients with Mechanical Heart Valves (MHV) are in greater risk of having an acute ischemic stroke (IS). However, prognostic factors of these patients are not well-defined. We aimed to identify factors associated with mortality, thromboembolic and hemorrhagic events at 2 years after IS in these patients.

Material and Methods: In this single-center retrospective observational study, we assessed clinical, laboratory and imaging data at admission, during internment, and follow-up of patients with MHV that presented with an IS in a comprehensive stroke unit, between January 2008 and December 2019. Patients were followed-up for 2 years after IS and mortality, thromboembolic and hemorrhagic events were recorded. Univariate analysis was performed between factors and outcomes by logistic regression.

Results: Sixty-three patients were included. Mortality was associated with higher uric acid at admission (Odds Ratio (OR)=1.524, 95% Confidence Interval (CI) 1.038 to 2.239, p=0.032), C-reactive protein at admission (OR=1.016, 95% CI 1.000 to 1.032, p=0.049), National Institutes of Health Stroke Scale (NIHSS) at 24 hours (OR=1.235, 95% CI 1.081 to 1.411, p=0.002), at discharge (OR=1.232, 95% CI 1.051 to 1.443, p=0.010) and at 3 months (OR=1.810, 95% CI 1.044 to 3.137, p=0.034) and modified Rankin Scale at 3 months (OR=2.854, 95% CI 1.367 to 5.958, p=0.005). Major hemorrhagic events were associated with lower ASPECTS at admission (OR=0.570, 95% CI 0.358 to 0.908, p=0.018), higher NIHSS at admission (OR=1.097, 95% CI 1.001 to 1.203, p=0.047) and at 24 hours (OR=1.142, 95% CI 1.015 to 1.284, p=0.028) and restarting anticoagulation more than one day after IS (OR=19.350, 95% CI 4.325 to 86.571, p<0.001). Thromboembolic events were not associated with any factor evaluated.

Conclusion: A range of parameters are available to identify patients in greater risk of death and other complications in 2 years after IS, providing essential information regarding prognosis.

The appropriation of assessment criteria to improve students' ability to express their thinking while solving problems

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Abstract

Since the beginning of my student teaching practicum, I noticed that students have difficulty in expressing their thinking, in writing, when they solve mathematical problems. They can solve the problems, but they express their thinking process poorly or incompletely, focusing their answers on the results only and failing to explain the processes taken. This is particularly troublesome in external assessment situations, in which the ability to express one´s thinking may make a significant difference in a question grade.

Having this in mind, I designed a pedagogical intervention aimed at stimulating a class of 12th grade students to use problem solving assessment criteria as a means to solve problems more efficiently and better explain their thinking. I will start by negotiating the assessment criteria with the students, so that those criteria may become adequately appropriated. Then, they will solve a problem individually and the solutions will be discussed collectively, having the assessment criteria as the background so that, with the help of the teacher, they can "see" the criteria being used to improve their productions. Students will be prompted to self-assess their productions in a subsequent set of a few more problems. The self-assessment process is intended to be based upon the assessment criteria. Each time, they will receive feedback from the teacher regarding the self-assessment logs.

The study herein presented aims at understanding how students appropriate the assessment criteria for problem solving and how they use them to improve not only their problem solving skills but mainly the ability to express their thinking. Data will be collected through students written productions (problem solutions and self-assessment logs) along the intervention and semi-structured interviews with a selected number of students. The teacher´s feedback will also be under scrutiny.

Nonsense Mediated mRNA Decay in the impact of CTNNA1 germline variants in Hereditary Diffuse Gastric Cancer

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Abstract

Hereditary diffuse gastric cancer (HDGC) is an autosomal cancer syndrome that predisposes for the development of early-onset diffuse gastric cancer and invasive lobular breast cancer, accounting for up to 3% of all gastric cancer cases. CTNNA-1 encodes for α-E-catenin, a key component and CDH1/E-Cadherin partner in the adherens junction complex, and whose germline pathogenic variants cause HDGC. Of the currently reported cases of CTNNA-1 variants, there is a notable number of mutations in the last exon, where the person did not develop HGDC symptoms/criteria. This leads to the idea that Nonsense Mediated mRNA Decay (NMD), which causes degradation of mRNA in the presence of nonsense mutations unless they are found downstream of the last exon junction complex, can have a role in determining the pathogenicity of CTNNA-1 variants. To test this hypothesis, a CRISPR-Cas 9 system was designed to create two mutations in Induced Pluripotent Stem Cells: a deletion of an exon, mimicking a large deletion found in a carrier with breast cancer; and a deletion of the last exon, which should be an NMD incompetent mutation. For the CRISPR-Cas 9 system, two plasmids containing highly specific guide RNA sequences designed to flank the desired CTNNA-1 regions were cloned for each mutation. These plasmids were confirmed by Sanger Sequencing. What will follow is the transduction of these plasmids in IPS cells through lentiviral infection, upon which the Cas9 system will generate a double-strand break on each region, leading to a site-specific DNA excision. The successfully transduced cells will be sorted through flow cytometry. The successfully edited cells will be thoroughly characterized regarding CTNNA1 DNA, RNA, protein expression, and NMD activation. The most important read-outs will be the observation of differences in tumorigenic phenotype and differentiation capability between the two mutations, because of the effects of NMD.

Public Perceptions of the Seriousness of Crimes and its Relation with Exposure to Media Coverage of Crime

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Abstract

Investigators have long been focused on public perceptions of crime seriousness and its potential for the development of a rigorous measure of crime seriousness, given its relevance to contemporary criminal policy. Most studies have pointed out a considerable degree of intracultural and crosscultural consensus in the relative ranking of crimes. At the same time there´s a considerable variance in the absolute level or rating of seriousness attributed to them. Most empirical studies try to explain this by analyzing sociodemographic correlates of seriousness perceptions. However, the general conclusion is that these correlates explain only a small amount of the variation in public perceptions of crime seriousness. The purpose of this study is to investigate how individuals rate the seriousness of crimes, including which of its dimensions, i.e., perceived wrongfulness or perceived harmfulness of crime, weights more on these perceptions. Another relevant aspect is the attention given to the perceived severity of punishment as it connects to the perceived crime seriousness. With this, the author wants to examine the extent to which these perceptions of severity of punishment agree with Portuguese law. This study also tries to overcome past studies´ limitations by comparing the perceived seriousness of street crimes and white-collar crimes, perusing possible correlates that might distinguish seriousness perceptions across the crime types. First, the author seeks to determine the effects of conservation values, legal cynicism and religiosity on perceptions of crime seriousness. The main focus, though, is the investigation of the relationship between exposure to media coverage of crime in its different formats, such as television news, television crime shows or social media news, and public perceptions of crime seriousness. This is going to be studied through the application of a cross-sectional survey to a potential sample of 1.316 Portuguese college students.

The role of different resources in learning the areas and volumes of solids

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Abstract

We often come across students' outbursts for not understanding mathematical concepts and this might be due to excessive rote learning processes. Students must be agents in the construction of their own knowledge. Thus, I designed a pedagogical intervention aimed at developing students´ meaningful learning of the topic "Areas and volumes of solids", while also promoting the development of transversal skills, such as problem solving, reasoning, and communication. The intervention was conducted with a 9th grade class, along ten sessions, and involved the use of several resources to support students´ learning: concrete, paper-based, and digital materials. I used wooden pyramids and cones to address the surface area of these solids, and videos to help students relate the volumes of pyramids and cones to the volumes of prisms and cylinders, respectively. I carried out a live experiment using daily objects to address the sphere, using Google Meet, due to sanitary restrictions. I balanced the textbook, worksheets, and the digital application Milage Learn + to pose students diversified problems and exercises. At the end of the intervention, I used a quiz to assess students´ learning, and a questionnaire in Google Forms to gather their opinion about the importance of each resource in their learning of this topic.

The study herein presented stems from this intervention. I looked to understand how the use of different resources may contribute to students´ meaningful learning of the topic "Areas and Volumes of Solids". Data collection included field notes of the classes, students´ productions in all tasks, and questionnaire responses. Preliminary results suggest that the students valued the vast array of resources used in the intervention, especially the life experiments and the videos. The use of several resources may have sparkled students´ interest in learning, and this influenced their achievement in a positive way, despite the difficulties that remain in several students.

Disordered Chern insulators – from electrons to magnons

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Abstract

Topological quantum matter has been intensively studied in recent years due to the robustness (topological protection) of its exotic properties to perturbations like small disorder. Interestingly, this property not only applies to electron systems, but also applies to magnon systems opening new application possibilities in spin-based electronic devices.

Despite robustness to small disorder, a topological transition may occur as disorder is increased. Here we investigate the fate of disordered Chern insulator under increasing disorder by computing the topological invariant (Chern number).

Starting with electronic systems subjected to increasing Anderson or binary disorder, we have found that the usual phase diagram is deformed, extending the topological phases in a certain direction. For a critical value of disorder, a transition from a topological phase to a trivial phase occurs.

We will also discuss the effect of dilution disorder, where atoms are randomly removed from the lattice sites, and explore different approaches to model this kind of disorder. Finally, the extension of these effects of disorder to magnon systems will be discussed.

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Arnelas, archive of time and memories: architectural [inter]actions for the valorization of a riverside place

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Abstract

The aim of this survey, research and design is to create a public space that generates a reinterpretation of the uses linked to the river, without interfering with the landscape, promoting the participatory role of the population of Arnelas. Once, this typical village located on the left bank of the Douro River, held a strategic position in the trade of products between the Alto Douro region and the coastal territories. This position allowed it to establish itself as an important territory, in the 16th century. Although, the connection to the river is increasingly compromised by the disregard and consequent estrangement of people, as a result of the social, urban and economic disengagement. With its values threatened, the place requires immediate adaptation to meet the needs of contemporary society.

Considering the context, the Douro Litoral´ territory, the proposal intends to design a platform to ensure sustainable dynamism, while preserving the identity of the place. The intention is to re-approach the population to the river, not copying the past, but adapting the place to the present´s needs. The priority is to take advantage of the possibilities that the river offers. For this, it is imperative to design a space that promotes a new approach to the river, for development and conviviality, that ensures the preservation of history and built heritage.

The urban and architectural design, first ephemeral but permanent if effective, emerges from the context of the Festival, which takes place once a year. Almost as a manifesto, that like the barcas de passagem, the valboeiros or even, the Rabelo moves on the river and in the territory, regardless of its formal conception, representing the movements in the landscape, but above all people's contact with this landscape. It intends to give people a participative role in the place in order to build a common space, in harmony with the landscape, without forgetting tradition: (in)formally, building a space of freedom.

Fully biodegradable polyamine-terminated PEG-GATGE dendrimers as siRNA vectors to cancer cells

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Abstract

Gene therapy has emerged as a promising therapeutic for the treatment and prevention of an array of disorders, such as cancer and monogenic diseases. Among the diverse exploited gene therapy strategies, the downregulation of protein expression by RNA interference (RNAi) via the small interfering RNA (siRNA) effector, is of considerable relevance for clinical applications.

However, some remaining challenges, such as the development of clinically relevant and efficient nucleic acid (NA) vehicles, keep on hindering the success of these therapies. In this sense, dendrimers arose as promising vectors. Besides their globular, well-defined, and very branched structures, tunable nanosize, and low polydispersity, dendrimers present the unique possibility of controllable multifunctionalization. Moreover, cationic dendrimers have the ability of complexing and protecting NAs, originating dendriplexes (dendrimers-NAs complexes). Despite their unquestionable convenience, most of the currently used dendrimers in the biomedical field present a serious limitation - non-degradability in the organism, which can lead to cytotoxicity due to the buildup of synthetic materials in the organism.

To address this drawback, our group has recently proposed a novel family of fully biodegradable and biocompatible PEG-GATGE (Gallic Acid Triethylene Glycol Ester) dendritic block copolymers, which have previously shown great transfection efficiencies. Here, we synthesize these dendrimers until generation 3 in very good yields, reporting the successful scale-up of some steps of their synthetic process. Also, the subsequent functionalization of PEG-GATGE with diamine moieties was quantitatively achieved by "click" chemistry. The developed diamine-terminated dendrimers have shown an efficient ability for complexing siRNA. Currently, we are starting to carry out their in vitro evaluation as siRNA vehicles in different cancer cell lines.

CCR7 Chemokine Receptor in the Dissemination of T-cell Leukemia

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Abstract

T-cell acute lymphoblastic leukaemia (T-ALL) is a haematological disease caused by genetic alteration in the T-cell precursors, mostly found in children but also present in adults. Poor prognosis is mainly due to its high biological and genetic heterogeneity.
CCR7 is a membrane receptor which responds to chemokine signals, CCL19 and CCL21.
It is one of the key receptors to regulate T-cell development and maintain homeostasis within the thymus, by creating permissive microenvironments.
Cancer cell dissemination (metastasis) is often a chemotaxis-mediated process, meaning CCR7-expressing cancer cells can be guided to peripheral organs via CCL19 and/or CCL21 gradient.
Hence, and to infer the role of CCR7 in dissemination of leukemic cells throughout the body, ETV6-JAK2 transgenic mice were bred with different CCR7 genotype ones. ETV6-JAK2 is a well-documented chromosomal translocation present in acute lymphoblastic leukaemia (ALL) patients that contributes to the oncogenesis process. This experiment showed no difference on the survival curves between CCR7+/+, CCR7+/- and CCR7-/- groups. However, it revealed an increase in thymus' weight, while spleen and lymph nodes decreased in weight.
Thereupon, histology analysis by hematoxylin and eosin staining and immunohistochemistry using the CD3 antibody to detect T-cells is being performed to assess the degree of infiltration of relevant organs by leukemic T cells (thymus, spleen, lymph nodes, liver, lungs, kidney, sternum, brain). This work is ongoing, and the final results will be presented.
The results obtained thus far indicate that CCR7 is involved in leukemic cell dissemination from the thymus to the spleen and lymph nodes.

Contamination of wild fish (*Trisopterus luscus*) from Portuguese waters of the North East Atlantic Ocean by debris suspected of being plastics and microplastics

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Abstract

Plastic and microplastic pollution is a problem of global concern, threatening the health of wildlife populations and marine ecosystems. The main goal of this study was to assess the contamination of wild fish (*Trisopterus luscus*) from Portuguese waters of the North East (NE) Atlantic Ocean by debris suspected of being plastics (S-PL) or microplastics (S-MP). In this study, 50 fish specimens were obtained from the commercial fleet shortly after their landing in the Matosinhos Port. Fish (N = 50) were transported to the laboratory as soon as possible, where they were measured and weighted. The whole gastrointestinal tract (GT) and samples from the gills, liver and dorsal muscle of each fish were isolated, and prepared for further analyses. All the debris suspected of being S-PL or S-MP were isolated, primary characterized (size, shape and colour) and quantified. The preliminary results indicated that a considerable part of the fish had S-PL or S-MP. Most of the debris were S-MP (size lower than 5 mm), and were found in the muscle and liver. Fibre-like shape was the most common shape but debris looking like fragments, films and pellets were also found. Diverse colours were found, including blue, black, transparent, white, grey, red and green. These findings raise concern regarding the potential adverse effects of S-PL and M-PL contamination in the health of the fish, as well as in relation to human exposure to these particles through the consumption of muscle from the analysed fish. These findings are of concerning regarding fish and ecosystem health, as well as regarding human food safety because humans are wide consumers of fish.

Acknowledgments

This study was done in the scope of the projects RESPONSE (JPI Ocean, FCT: MICROPLAST/0006/2018) and ATLANTIDA (NORTE-01-0145-FEDER-000040) was partially funded by the respective funding institutions.

Human iNKT cells trigger macrophage death and activation

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Abstract

Invariant natural killer T (iNKT) cells are unconventional T cells with key immunomodulatory roles. iNKT cells express a semi-invariant TCR which recognizes lipid antigens bound to CD1d at the surface of antigen-presenting cells, including macrophages. In response to different cues, macrophages polarize into the functionally different M1- or M2-like subsets. Although the murine iNKT-macrophage axis has been widely studied over the past years, less is known about this crosstalk in humans. Thus, this work aimed to explore the effect of human iNKT cells on the survival and activation of different macrophage subsets and whether features of this axis translate into colorectal cancer (CRC).

Human macrophages were polarized into the M1- and M2-like profiles by LPS+IFNγ and IL-10 treatment, respectively, and cocultured with iNKT cells and the lipid antigen α-Galactosylceramide (αGC). Upon coculture, macrophage survival and expression of CD40, CD86 (M1/activation markers) and CD163 (M2 marker) were assessed by flow cytometry. To explore the relevance of this axis in CRC invasion, Matrigel invasion assays were performed with macrophages, iNKT cells and the RKO human colon carcinoma cell line.

Our data shows that αGC-activated iNKT cells kill all macrophage subsets. Macrophage survival was partially recovered upon CD1d blocking, suggesting that the killing occurred via CD1d. Macrophages also became activated upon coculture, as seen by CD86 and CD40 upregulation. This effect was attenuated by CD40L blockade, pinpointing CD40-CD40L co-stimulation as a mediator of iNKT-induced macrophage activation. Lastly, our invasion assays revealed that while macrophages induced RKO invasion, iNKT cells were suggested to inhibit this macrophage-driven effect.

Overall, this work helped to characterize the human iNKT-macrophage axis, unveiling that iNKT cells induce macrophage death and activation. It also advanced that exploitation of these features may pose as a promising target in CRC.

Contamination by particles suspected of being plastics and microplastics in wild European hakes (*Merluccius merluccius*) from Portuguese waters of the NE Atlantic Ocean

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Abstract

The contamination of fish from wild populations by plastic and microplastic particles is a global problem in the marine environment with implications to human food safety. The main goal of this study was to assess the contamination of wild European hakes (*Merluccius merluccius*) from Portuguese waters of the North East (NE) Atlantic Ocean by particles suspected of being plastic (S-PL) or microplastics (S-MP). For ethical reasons, the fish (N = 50) were obtained from the commercial fishery fleet immediately after landing in the Matosinhos Port and aimed at human consumption. In the laboratory, the fish were measured and weighted. From each fish, the whole gastrointestinal tract (GT) and samples of the liver, gills and dorsal muscle were isolated. After sampling processing, S-PL and S-MP particles were extracted, isolated and primary characterized (shape, size and colour), and quantified. The preliminary results indicated that most of the S-PL had sizes lower than 5 mm, thus being S-MP. Most of the S-MP were fibres followed by fragments but films and pellets were also found. Several colours were found, such as blue, black, transparent, white, grey, red and green. S-PL and S-MP particles were found in the muscle samples and its expected that the remaining tissues show similar results. These findings raise concern regarding the potential adverse effects of S-PL and M-PL contamination in the health of the fish, as well as in relation to human exposure to these particles through the consumption of muscle from the analysed fish.

Acknowledgments

This study was done in the scope of the projects RESPONSE (JPI Ocean, FCT: MICROPLAST/0006/2018) and ATLANTIDA (NORTE-01-0145-FEDER-000040) was partially funded by the respective funding institutions.

Catalytic reduction of nitrate in water using Pd-Cu based metal oxides

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Abstract

The pollution in water sources has made it necessary to resort to water purification. Catalytic reduction allows to decrease the nitrate concentration (NO3-), without production of waste streams, by conversion into nitrogen (N2), with nitrite (NO2-) and ammonium (NH4+) as by products1. Pd-Cu has been reported as the most promising metal pair with its properties being sensitive to the ratio of the two metals, the synthesis approach, with a maximum for NO3- removal and N2 selectivity that can differ according to the support used 2,3.

This work aims to study the NO3- reduction in water over Pd-Cu catalysts supported on several metal oxides, such as alumina, zinc oxide and zirconia, prepared by different methods. The metals were deposited on the metal oxide supports by sequential or co-impregnation methodologies maintaining constant the content of metals (1 %wt. of each metal). The experiments were carried out in a semi batch reactor using a NO3- concentration of 100 ppm, under H2 and CO2 flows at room temperature and atmospheric pressure.

The experiments revealed that the metal oxide used as support has an important role in the catalytic reduction of NO3-. While the catalysts based on zirconia and alumina present the best results in terms of conversion and N2 selectivity, the catalysts based on zinc oxide showed no activity for NO3- reduction.

Acknowledgments

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References

[1] Soares, OSGP, et al. Desalination 279 (2011) 367
[2] Hamid, S; et al. Chem. Eng., 8 (2020) 103754
[3] Soares, OSGP; et al. Appl. Catal. B Environ. 91 (2009) 441

Between gender and coloniality: exploring feminist approaches in the pathway to emancipation

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Abstract

In societies penetrated by power relations based on gender and social class, 'race' also operates as a category of discrimination-exploitation, constraining the free construction and pursuit of a life project by girls and women who distance themselves from the socially imposed "white" norm. Anchored in coloniality and in the human-non-human dichotomy, the relations of domination built on the basis of this category cross their roots with the assumptions of the capitalist economic system, (re)producing social inequality and perpetrating various forms of violence.

We built our approach proposal based on the review of scientific literature in the field of Violence(s), and Gender Studies, and in its critical analysis, intending to constitute a space for reflection on social inequality and violence(s) in the experiences of non-white girls and women. Therefore, we focus on feminist theoretical contributions concerned with the study of the interactions between coloniality and gender-based relations of domination, since Black Feminism, especially through the works of Kimberlé Crenshaw (1989), Patricia Hill Collins (1990), Djamila Ribeiro (2017) and Joice Berth (2019), to the Decolonial analysis of Maria Lugones (2008; 2014). We finalize drawing some considerations on the pertinence of Feminism contributions to the educational field, especially in the emancipation of girls and women.

Considering the nature of the research done, we intend to present our approach in the poster format.

Masks in Communication: What do children communicate to us through drawings? And how do young people communicate and relate to each other on social media?

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Abstract

This paper is the result of our experience as first-year students of the Master's Degree in Health Education at FMUP/FPCEUP, within the scope of the assessment of the Curricular Unit (CU) of Communication and Human Relationships.

This poster aims to present the study developed in group in this CU, for which we started from our pandemic reality and our perceptions to question the communication between children and young people, through drawings and social media, respectively.

The pandemic by COVID-19 has become an obstacle to communication and human relationship and can influence and harm the development of children who are in a phase of enrichment of their means of communication. Thus, it becomes essential to use children's drawings as a form of communication with them.

Another target of this pandemic has been young people, regular users of social media, who have increased their use for school and social purposes, due to the measures adopted to contain the transmission of the virus. The internet and social media, despite bringing some benefits, also bring some problems, namely mental disorders and feelings of loneliness, aggravated by the absence of face-to-face contact.

For this exploratory work we used the narratives of the group members and children's drawings to analyse and understand them in the light of Piaget's theory, which allowed us to better identify the various stages of children's development. Furthermore, a bibliographic review was carried out on the impact of social media on relationships and the mental health of young people during the pandemic, allowing us to suggest measures to be adopted in the context of health education.

We believe that this was an innovative method of assessment, which took us out of our comfort zone, and led us to reflect on current issues, empirically and through research, allowing us to approach the themes and mobilise the content of the CU in a more enriching way.

Keywords: pandemic; diversity of communication modes

Educate students for aesthetic sensibility: a study with students from secondary level

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Abstract

According to Boal (2009 p.91) "The human body is the source, and the aesthetic languages are the means of a simultaneous thought to the Symbolic Thought of the conventional words and gestures". The recognition of the value of corporality by the educational system is expressed by physical education that follows the student throughout their mandatory schooling. This study aims to analyse the effect of an exploratory intervention that intends to contribute to warning students about sports aesthetic issues, which go beyond the issues of beauty and ugliness. Additionally, it is intended to introduce students to a wider view of the sport. The intervention will be conducted by a pre-service Physical Education teacher and comprise five phases involving teaching artistic gymnastics and acrobatics, and basketball and frisbee, in a 10th-grade class at a college in the Porto metropolitan area. In the first phase (already carried out), we try to understand what were the students' aesthetic conceptions, and taking as starting point their knowledge (second phase) we introduce the aesthetic concepts of rhythm, coordination, and fluidity, using the observation of movements performed by classmates. In the third phase, depending on what students are able to see in aesthetic terms, the focus will be the intellectual dimension, and at the four dimensions, the dimension will be the aesthetic experience. In the final phase, using focus groups and questionnaires we will analyse students´ knowledge acquisition about sports aesthetic and explore changes in the students' point of view about sports. In addition, the works done by students will be exhibited at an event to be held in the college.

Keywords: Sports; Aesthetics; Physical Education; School Placement.

References

Boal, A. (2009). Metamorphosis and the abusive use of words.In The Oppressed aesthetics.Erratic Reflections about the thought from an aesthetic and non-scientific point of view. Rio de Janeiro-Brazil: Garamond Ltda.Publisher.

Importance of climate change manifestations and green urban areas in the expansion of diseases transmitted by ixodid tick vectors

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Abstract

Urban development allied to climate change results in important modifications in the ecosystems, which can endanger public health. Indeed, climatic conditions and anthropic influence on ecosystems seem to have a direct effect on the life cycle of ixodid tick vectors. Studies indicate that milder winters are expected, allowing ixodid tick vectors to survive and increase the probability of occurrence in the parasitic life stage throughout the year. At the same time, the implementation of urban green areas can potentiate an increase in the number of habitats favorable to the propagation of ixodid tick vectors, as well as an increase in contact between human hosts, animal hosts and parasites. The aim of this work is to analyze, in a dynamic space-time, the potential impact of the manifestations of climate change as well as the expansion of urban green areas in the occurrence of ixodid tick vectors and consequently the incidence of associated human diseases.

This descriptive and cross-sectional study was divided into two stages, the first consisted of data collection regarding urban green spaces, climatic conditions, ixodid tick vectors occurrence and incidence of Lyme Borreliosis, Mediterranean spotted fever, and Leishmaniosis, from 2011 to 2022 in the municipalities of Matosinhos, Vila Nova de Gaia and Porto (North of Portugal), followed by treatment, processing, and projection of those data through ArcMap, mapping all the variables in study. Furthermore, to study possible correlations between the different variables, statistical tests will be performed by using SPSS.

It is expected that climate change combined with green urban areas, may cause an increased risk for the occurrence, and spread of ixodid tick vectors and, consequently, an increased incidence of the diseases transmitted by them. This study provides useful information for the further management and territorial planning considering the potential impacts on human health.

Exploring the functionality of cell-free mitochondria: association with hepatocytes inflammation

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Abstract

Mitochondria are known as the powerhouse of cells. Nevertheless, new non-energetic functions have been attributed to mitochondria, regarding cell communication and signaling, changing our knowledge about their role in metabolism. The discovery of circulating mitochondria in human plasma raised new questions and controversy regarding the stimulus for their release and the maintenance of their functionality.

The aim of our study is to evaluate the release of mitochondria from a hepatocyte cell line (HepG2) submitted to an inflammatory stimulus with lipopolysaccharide (LPS) and compare the functionality of intracellular and released extracellular mitochondria.

Mitochondria functionality was measured by the OROBOROS® Oxygraph-2k, high-precision and highly sensitive mitochondrial respiration evaluator. Intracellular mitochondria were evaluated in living cells, and extracellular upon mitochondria isolation by centrifugation. Upon treatment with substrates, inhibitors and uncouplers of respiratory complexes, oxygen consumption rates were calculated and expressed as picomoles per second.

Preliminary results, demonstrated that HepG2 exposed to LPS (2.5 μg/mL) for 24 hours, resulted in reduced mitochondrial membrane potential and cellular ATP content, being complex II the most affected. Both untreated and LPS-treated HepG2 cells released extracellular mitochondria into cell culture medium. In terms of functionality, the extracellular mitochondria complex I responded to the external substrate pyruvate and malate, but these mitochondria did not respond significantly to ADP, uncoupler, or mitochondrial inhibitors rotenone and antimycin. On contrary, complex IV activity was detectable in higher levels, suggesting that although some complexes of cell-free mitochondria are functional, part of the mitochondrial electron transport system may not be functional. Nevertheless, circulating cell-free mitochondria could have significant physiological roles that remain to be elucidated

Effects of temperature increase and different concentrations of polystyrene microplastics on *Artemia franciscana*

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Abstract

Marine organisms are now, more than ever, under the threat of both microplastics and environmental climate change. As such, researchers have been applying ecotoxicological results in their models to better understand and predict these stressors effects on the marine environment. Therefore, this study aimed to evaluate the combined effects of increasing temperature and polystyrene microplastics in the hypersaline crustacean *Artemia franciscana*. This model organism is a filter-feeding branchiopod widely used for environmental toxicology studies due to their fast life cycle and easy and inexpensive laboratory maintenance and sustainability. For this experiment, *A. franciscana* individuals were exposed to five microplastic concentrations (0, 0.4, 0.8, 1.6 and 2.0 mg/L) and two temperatures (25 and 30 °C) for 14 days in the order to study the effects on mortality, growth, reproductive success, histology and swimming speed. Overall, results demonstrate that microplastics and temperature have combined adverse effects on *A. franciscana*, particularly at high temperature and microplastic values. At 14 days, the highest mortality and body length were at the highest microplastic concentration at 30 °C. Overall, this study suggests that a long-term exposure to both high temperatures and environmentally relevant microplastic concentrations can suppose an ecological threat for aquatic zooplanktonic species.

The effects of different types of music practice on wellbeing and humour

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Abstract

Empirical research concerning the impact of music practice on the affective domain is scarce, despite the relevance of this type of evidence to music-based interventions such as music therapy. Our goal was twofold: first, we wanted to determine whether musical practice enhances wellbeing and/or humour compared to non-musical activities; second, we wanted to see whether these effects varied according to the type of music practice in which participants are engaged (exploration vs. execution vs. composition). To that end, we compared the effects of three activities - sonic exploration using an unfamiliar instrument, playing of a musical piece on a keyboard after demonstration (execution) and computer-based composition of a short piece - against three non-musical analogues - manipulating lego blocks (exploration), reproducing sequences of keys in a computer keyboard (execution), and decorating a house within a computer game (composition) - on different facets of wellbeing and humour. The facets of worry, perceived competence and confidence showed no significant effects from music, type of activity, or interactions between the two. However, the will to try new things, joy, and excitement were higher after musical composition than after its non-musical analogue. In contrast, the facet of calm showed a detrimental effect of music, specifically at the level of exploration activities. There was also a marginal effect of activity type on focus, with execution showing an advantage over exploration. Our exploratory findings suggest that musical practice may indeed have a positive impact on some affective dimensions, and musical composition may be a particularly powerful to achieve this. The apparent negative effects of sonic exploration on calm may reflect participants´ fears regarding the artistic outcomes of this unconstrained task.

The Relationship Between Preference and Proficiency in The Execution of a Curved Section of Maximum Running

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Abstract

The relationship between the Proficiency in a curved section (r = 5m) of maximum running and the Preference expressed by the participants in the execution way of it, clockwise (CW) and counterclockwise (CCW), was investigated in two groups (n=18) of young children (9.1 ± 1.9 years). Group A was composed by the participants who demonstrated, during the protocol experimentation prior to official data collection, preference to run in CW (n=9), and group B consisted of participants who showed a preference for the CCW course (n= 9). The protocol of the test involved the use of photoelectric cells, to determine the time (in milliseconds) that each element took to complete the proposed trajectory. Each subject had the opportunity to try in each direction, with 12 minutes of rest between each one. It was used descriptive statistics, Man-Whitney and Wilcoxon non-parametric tests. P value was set at $p < 0.05$. The results revealed statistically significant differences in group B, in which the youngsters stated to prefer CCW running and where they were effectively faster in the preferred direction (3568.6 ± 191.1ms; p=0.021). The results obtained are partially in line with the literature consensus that establishes the existence of a trend towards greater efficiency in CCW rotational or translation displacement. However, and confirming an empirical statement, there is no obvious and indissociable association between Preference and Proficiency, reviewed in the fact that individuals who preferred to run in CW (3571.2 ± 272.6ms; p=0.441) were not statistically significant faster in that sense. This finding put in question the rule that dictates the mandatory CCW displacement in Athletics events, since a sample not exposed to specific training does not seem to have a particular capability to to run in one direction or another. Therefore, we can consider training as a biasing and enhancing mechanism of CCW maximum running competence. It is the Proficiency provided by practice.

Distribution and frequency of a coat colour genetic variant in Iberian wolves

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Abstract

Among the Iberian wolves population (*Canis lupus signatus*) it is known an atypical coat colour that results in individuals exhibiting a reddish colour. These wolves live within their packs along with wolves displaying the wild type coat colour, but their distribution and abundance is unknown. The reddish coat colour in Iberian wolves results from a mutation in the Agouti signalling protein, encoded by the ASIP gene, previously identified in dogs exhibiting this colour. In this work, we set as main goal to assess the distribution and frequency of this mutation across the Iberian wolf population. To do that, we designed an allele-specific PCR approach to genotype the allele in exon 4 of ASIP gene associated with the coat colour variation, across 180 fresh tissue samples and 123 non-invasive scat samples covering the current range of the Iberian wolf. We found 16 individuals (5.3% of the sampling) exhibiting the mutation that confers the reddish coat colour, all localised within the same region in Northwestern Iberia. We conclude from our findings that this phenotype likely originated recently in Northwestern Iberia because it is still in low frequency and confined to a localised region.

A shift from P2X7 receptors to A2A receptors activation aggravates bacterial dissemination on a mouse model of Perinatal Group B Streptococcal invasive disease

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Abstract

Invasive disease due to group B *Streptococcus* (GBS) infection subsists as a main source of morbidity and mortality in neonates. The lack of effective therapies demands the search for alternative approaches. New findings have highlighted a pivotal role of purinergic system, namely ATP P2X7 receptors (P2X7R) and adenosine A2A receptors (A2AR), as a potential therapeutic molecular target in diseases associated to infection/inflammatory processes. Till date no studies have been taken to address the role of these receptors in neonatal bacterial diseases. Here, we addressed the role of P2X7R and A2AR signaling on GBS systemic dissemination in a mouse model reproducing the pathophysiology of human neonatal GBS infection. Pups born from Balb/c dams colonized by intravaginally inoculation with GBS were subcutaneously injected with selective P2X7R agonist, Bz-ATP (2.5 mg/kg/day) and antagonist Oxi-ATP (10 mg/kg/day), and selective A2AR agonist, CGS21680C (0.1 mg/kg/day) from postnatal day (PND) 1 to PND4 and monitored for survival curve, neonatal clinical scores (NCS) and lung, liver, heart, brain, spleen and kidney bacterial colonization. Systemic P2X7R activation prevented GBS induced death ($p<0,002$), clinical disease severity and decreased organ colonization on infected pups. In contrast, Oxi-ATP treatment exacerbated the mortality rate and decreased l

Is PageRank a good addition to a text-mining pipeline? Combining PageRank and SicknessMiner applied to find cancer disease-disease associations

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Abstract

Cancer is one of the leading causes of death worldwide killing over 10 M people yearly. Comorbid conditions may affect cancer diagnosis, prognosis, and treatment. Therefore, studying Disease-Disease Associations (DDAs) is of paramount importance. One of the sources to retrieve DDAs is biomedical literature. Hence, with the exponential increase in biomedical literature, it becomes crucial to implement new text-mining strategies to easily retrieve information and produce new knowledge. Pubmed articles are indexed using Medical Subject Heading (MeSH) terms, a set of vocabulary thesaurus managed by National Library of Medicine´s (NLM´s). In our work, we mined the scientific papers that were mapped to the MeSH term of "malignant neoplasms". Through an adaptation of the SicknessMiner (https://doi.org/10.1186/s12859-021-04397-w) and the PageRank algorithm our aim was to improve the co-mention score provided by SicknessMiner and to make the results more robust with the PageRank score addition. We queried Pubmed for "Neoplasms, Malignant[MeSH Terms]" and retrieved over 3.6 M titles and abstracts. Then, following the SicknessMiner pipeline, we used Bidirectional Encoder Representations from Transformers (BioBERT) for the Named Entity Recognition (NER) task and NormCo for the Named Entity Normalization (NEN) task. The normalized entities were extracted and the resulting DDAs were ranked based on co-mention and served as input for a graph. PageRank was used to calculate a score for each node and rebuild the graph accordingly. Following, we also retrieved DDAs experimentally curated from DisGeNET to compare against our results to evaluate our approach. Lastly, heavy correlation was used to assess PageRank´s performance compared to the original SicknessMiner and both against DisGeNET.

Dynamic Quality Estimation of Wireless Links with Autonomous Agents

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Abstract

Nowadays, UAV - Unmanned Aerial Vehicle - is a widespread class of aircraft. Its usage ranges from recreational scenarios to health-critical monitoring purposes. UAVs communicate with a ground station and with each other, e.g., using Wi-Fi, from a transmitter to a receiver. Communications problems may arise when the Received Signal Strength decreases: packets can be lost. Packet Delivery Ratio (PDR) is the probability that a packet, sent by a transmitter, is delivered to the receiver on a single-link channel. Given a pair of UAVs - a transmitter and a receiver - the single-link PDR is modeled in [1] as a non-negative, strictly non-increasing curve, that is a function of link length, and depending on two parameters that we want to estimate.

Moreover, considering a line network topology (Figure 1) the end-to-end network PDR is the product of all the single-link PDRs. It is a function of relay placement. Given a set of link models, we aim at finding the optimal relay placement that maximizes the network PDR.

Since wireless links are non-symmetric, symmetric placement is not the optimal placement. The work in [2] comprehensively answers this necessity. However, a problem still open is how to effectively estimate online and in a distributed context the parameters describing the models of the different links, which is the main aim of this thesis. The methodology was based on studying the wireless transmissions process and the literature related to packet delivery ratio models, then defining a PDR measurement process and a link PDR modeling strategy. The current results were obtained with simulation of the wireless channel and show the effectiveness of the link PDR modeling and the capacity to detect model changes online as desired.

References

[1] L.R. Pinto. Aerial Multi-hop Sensor Networks. PhD thesis, Universidade do Porto - Carnegie Mellon University, 2018.

[2] L.R. Pinto and L. Almeida. Optimal relay network for aerial remote inspections. Sensors, 22(4):1391, 2022.

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