

21246 | Antimicrobial effect of photoactive phytochemicals on *Staphylococcus aureus* by themselves and combined with antibiotics

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Abstract

Nowadays, a high incidence of infections are related to the *Staphylococcus aureus* bacterial pathogen, which are usually treated with antibiotics. However, in a society where antibiotic resistance is a problem, such treatment becomes particularly difficult. The systems that can be used to overcome resistance to conventional antibiotics are still poorly understood. In this context, the use of plant-derived photoactivatable compounds in antimicrobial photodynamic therapy (aPDT) has emerged as an attractive and cost-effective way to suppress bacterial resistance mechanisms. The project aims to develop an innovative aPDT approach combining less effective antibiotics with natural plant products (such as phytochemicals) with photosensitizing activity to develop a new and natural system to combat chronic wound infections. In this work, five phytochemicals and eight antibiotics were combined and tested to determine if a pair resulted in enhanced antimicrobial activity. Using the disc diffusion method, 9 combinations resulted in possible potentiation. In the checkerboard test performed afterwards, out of these 9 combinations, only two were found to be synergistic: Mupirocin/Gallic Acid and Mupirocin/Quercetin. However, none of the 9 combinations were labelled as non-synergic because the results of the checkerboard test appeared to be influenced. In both assays, the paired compounds revealed a minimum inhibitory concentration (MIC) at least four times smaller than the MIC of the antibiotics and phytochemicals separately. Two selected phytochemicals, Berberine and Curcumin, were used to optimise the photoactivation assay in which irradiation was applied using an LED emitting visible light at 420 nm in an optimized power density of 30mW/cm² with a duration of 10 min. This work can help to further deepen the knowledge in the antibiotic resistance problematic and possibly lead to a potential solution using phytochemicals.

Keywords: antibiotic resistance; aPTD; phytochemicals; infections.

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