

Diana Lopes¹; B. Mata¹; B. Bastos¹; C. Ferreira¹; E. Silva¹; J. Silva¹; Patrícia Antunes^{1,2,3}

Faculty of Nutrition and Food Sciences, Porto University, Porto, Portugal¹; UCIBIO-Applied Molecular Biosciences Unit, Laboratory of Microbiology, Department of Biological Sciences, Faculty of Pharmacy, University of Porto. Porto, Portugal²; Associate Laboratory i4HB - Institute for Health and Bioeconomy. Faculty of Pharmacy. University of Porto. Porto, Portugal³

Background & Aim: Meat analogues have emerged as an alternative protein source to meet the growing consumer demand for sustainable food. They are mostly composed of water, texturized plant proteins and non-texturized proteins (1), and aim to mimic traditional meat in terms of texture, flavour, and nutritional profile (2). However, concerns about their microbiological safety persist, as they are favourable to microbial growth (high in protein and water activity with weakly acidic pH) and not subject to the same regulatory requirements as conventional meat products. Therefore, this study assesses microbiological risks in meat analogues by examining pathogen occurrence and critical production stages based on existing literature. **Methods:** Articles were searched in Google Scholar and PUBMED using the keywords “meat analogues” and “microbiology”, along with news and reports from regulatory agencies (e.g., EFSA, FAO, WHO) on meat analogue outbreaks or microbial detection. Retrieved studies were analyzed for contamination origin, pathogen occurrence, and control measures. **Results:** The presence of *Bacillus cereus*, *Listeria monocytogenes*, and *Clostridium botulinum* was identified in 3 studies. Contamination was found to occur mainly during processing (*B. cereus* and *L. monocytogenes*) and storage (*C. botulinum*) due to cross-contamination or recontamination. These findings suggest that some meat analogues may carry microbial loads comparable to conventional meat. **Conclusions:** Meat analogues are a promising protein alternative, but their microbiological risks remain poorly studied compared to traditional foods, requiring further investigation to better understand their safety implications. Establishing specific regulatory standards and ensuring proper processing and storage conditions are essential to minimize risks. Additionally, consumer awareness and proper handling practices play a key role in ensuring the safe consumption of these products.

Keywords: Meat Analogues, Alternative Proteins, Microbiology.

References:

- [1] Mazumder MAR, Panpipat W, Chaijan M, Shetty K, Rawdkuen S. Role of plant protein on the quality and structure of meat analogs: A new perspective for vegetarian foods. *Future Foods*. 2023; 8:100280.
- [2] Pérez-Santaescolastica C, Munekata PES, Pateiro M, Domínguez R, Misihairabgwi JM, Lorenzo JM. Chapter 1 - Modern Food Production: Fundaments, Sustainability, and the Role of Technological Advances. In: Lorenzo JM, Munekata PES, Barba FJ, editores. *Sustainable Production Technology in Food*. Academic Press; 2021. p. 1-22.
- [3] Food and Agriculture Organization of the United Nations & World Health Organization (2023). *Food Safety Aspects of Cell-based Food*.