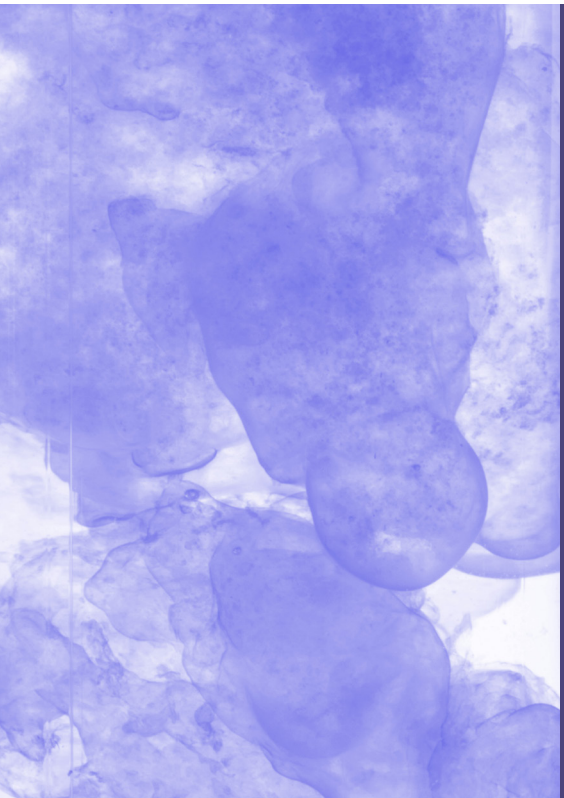
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Selected Papers



The Applications of MALDI-TOF MS in the Diagnosis of Microbiological Food Contamination

Authors: Maciej Ireneusz Kluz, Bożena Waszkiewicz-Robak and Miroslava Kačániová

Abstract: Microbiological contamination of food remains a critical global public health concern, contributing to millions of foodborne illness cases each year. Traditional diagnostic methods, particularly culture-based techniques, have been widely employed but are often limited by low sensitivity, insufficient specificity, and lengthy turnaround times. Recent advances in molecular biology, biosensor technology, and analytical chemistry have enabled the development of more rapid and precise diagnostic tools. Among these, Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry (MALDI-TOF MS) has emerged as a transformative method for microbial identification. This review provides a comprehensive overview of the current applications of MALDI-TOF MS in the diagnosis of microbiological contamination in food. The method offers rapid, accurate, and cost-effective identification of microorganisms and is increasingly used in food safety laboratories for the detection of foodborne pathogens, ensuring the safety and quality of food products. We highlight the fundamental principles of MALDI-TOF MS, discuss its methodologies, and examine its advantages, limitations, and future prospects in food microbiology and quality assurance.

https://doi.org/10.3390/app15147863



Plant-Derived Phytobiotics as Emerging Alternatives to Antibiotics Against Foodborne Pathogens

Authors: Kamila Rachwał and Klaudia Gustaw

Abstract: Growing consumer awareness of clean labels is driving demand for preservative-free products yet concerns about foodborne pathogens and microbiological safety remain significant. Plant-derived compounds with bioactive properties—phytobiotics—have emerged as promising alternatives or complements to conventional antimicrobial agents. This review discusses phytobiotics, including essential oils, polyphenols, alkaloids, and organosulfur compounds, highlighting their structural diversity and antimicrobial potential. Phytobiotics combat foodborne pathogens by disrupting cell structures, inhibiting biofilms and quorum sensing, and interfering with genetic and protein synthesis. Importantly, some phytobiotics exhibit synergistic effects when combined with antibiotics or other natural agents, enhancing overall antimicrobial efficacy. The impact of phytobiotics on the microbiota of food products and the gastrointestinal tract is also addressed, with attention to both beneficial modulation and possible unintended effects. Practical applications in food preservation and supplementation are analyzed, as well as challenges related to composition variability, stability, and interactions with food matrices. Nevertheless, modern technologies such as nanoencapsulation, complexation with polysaccharides, and advanced extraction methods are being developed to address these challenges and enhance the stability and bioavailability of phytobiotics.

https://doi.org/10.3390/app15126774

Optimizing Bioremediation of β-Blockers: Cometabolic Transformation of Propranolol and Metoprolol by *Raoultella terrigena* BB2 and *Stenotrophomonas terrae* BB3

Authors: Anna Dzionek, Cansel Taskin and Piotr Siupka

Abstract: β-blockers are among the most widely prescribed cardiovascular drugs and are increasingly recognised as emerging pollutants due to their persistence, continuous release into aquatic environments, and potential toxicological effects on aquatic organisms. Their removal in conventional wastewater treatment plants is often inefficient, highlighting the need for biological remediation strategies. This study aimed to identify bacterial strains with the highest potential for the biotransformation of β-blockers. Therefore, we isolated and characterised bacterial strains capable of transforming two commonly used β-blockers—propranolol and metoprolol. The strains BB2 and BB3, which were able to transform propranolol and metoprolol, respectively, were identified as *Raoultella terrigena* and *Stenotrophomonas terrae*, respectively. BB2 showed broad metabolic versatility, utilising a wide range of carbon sources, whereas BB3 exhibited limited substrate utilisation. Antibiotic resistance profiling further distinguished the strains, with BB2 resistant across multiple antibiotic classes and BB3 largely sensitive. Co-metabolic assays demonstrated that supplementation with specific carbon and nitrogen sources markedly enhanced β-blocker removal, increasing propranolol biotransformation from 5% to 50% and metoprolol from 4% to 36%...

https://doi.org/10.3390/app152212052

Silver Nanoparticle-Infused Pullulan Films for the Inhibition of Foodborne Bacteria

Authors: Karolina Kraśniewska and Małgorzata Gniewosz

Abstract: The aim of this research was to examine the antibacterial activity of commercially available silver nanoparticles against foodborne bacteria and to evaluate the properties of pullulan films incorporating these nanoparticles, including their antibacterial activity and selected physical properties. First, the antibacterial activity of silver nanoparticles against foodborne bacteria was investigated. The following parameters were assessed to evaluate the antibacterial activity of silver nanoparticles: minimum inhibitory concentration (MIC), minimum bactericidal concentration (MBC), percentage antibacterial activity, bacterial survival based on time–kill curves, leakage of DNA and intracellular proteins using spectrophotometric measurements, and changes in bacterial cell morphology using scanning and transmission electron microscopy (SEM and TEM). Pullulan films with silver nanoparticle content ranging from 2 to 32 μg/cm² were obtained. The films were evaluated for antibacterial activity and physical properties, including macroscopic and microstructural (SEM) observations, thickness, light barrier, and color...

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