Frontier of food microbiology: Microbial spoilage indicators (MSI) for safer longer-lasting foods.

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Introduction

Food microbiology is a critical field of science that examines the interactions between food and the diverse array of microorganisms that inhabit it, from the beneficial to the harmful. Microorganisms are essential players in food production, preservation, and safety, impacting everything from fermentation processes to spoilage prevention. With the constant risk posed by microbial contamination and spoilage, the role of food microbiologists is increasingly essential to ensure food safety, enhance shelf life, and reduce waste [1, 2].

Microbial spoilage is one of the primary challenges in food microbiology, leading to substantial food waste globally and posing health risks to consumers. Spoilage occurs when microorganisms such as bacteria, molds, and yeasts grow in food, resulting in changes in color, odor, taste, and texture. While certain microbial populations are beneficial in creating foods like yogurt, cheese, and sauerkraut, uncontrolled microbial growth is often a leading cause of foodborne illnesses. Identifying, quantifying, and controlling microbial populations in food have become a priority for food scientists [3, 4].

One promising area in food microbiology is the study of microbial spoilage indicators (MSI). MSIs refer to certain biological markers or characteristics that signal microbial spoilage in foods before it becomes visible to the naked eye or detectable by changes in taste and odor. The primary goal of MSIs is to give food producers and consumers an early warning of potential spoilage, allowing them to take preventive actions. With the growing demand for minimally processed foods, MSIs hold the potential to transform food safety by allowing spoilage detection without the use of chemical preservatives, which are increasingly avoided by health-conscious consumers [5, 6].

The importance of MSI lies not only in identifying spoilage before it causes harm but also in reducing food waste. In recent years, food waste has become a pressing global issue, with around one-third of all food produced going uneaten. Food spoilage plays a major role in this wastage, highlighting the need for more effective ways to monitor and preserve food products. MSI technology offers an innovative approach that could prevent spoilage at the microbial level, significantly extending shelf life without compromising food quality [7, 8].

The implementation of MSI technology in food microbiology is multifaceted, as it involves a combination of biosensor technology, molecular biology, and chemical analysis. Through the integration of these fields, scientists are developing tools that can detect spoilage-related microbes or compounds in real-time. These tools include biosensors capable of identifying volatile organic compounds (VOCs) produced by spoilage microorganisms, molecular methods to detect microbial DNA, and enzymatic assays that identify specific spoilage enzymes. The result is a proactive system that could revolutionize food safety and preservation in ways previously unattainable.

However, challenges remain in developing and implementing MSI technology across the food industry. Issues such as cost-effectiveness, scalability, and the need for further research into microbial behavior in various food matrices still need to be addressed. Additionally, MSI technology must be adapted to work seamlessly within the diverse and complex food supply chain, from production facilities to distribution channels and retail. Despite these challenges, the potential of MSIs to transform food microbiology and impact food safety is significant, representing a critical advancement in addressing both food security and sustainability [9, 10].

Conclusion

In summary, microbial spoilage indicators (MSI) present an exciting and essential development within food microbiology. By focusing on early detection of spoilage, MSI technology can help to extend food shelf life, reduce waste, and enhance food safety. As food producers, scientists, and consumers continue to prioritize health and sustainability, MSIs are poised to play a major role in advancing food microbiology's goals. Continued investment in research and development for MSI technology, as well as collaboration between food industries and regulatory bodies, will be crucial to making this technology accessible and effective at a global scale. Through MSI advancements, the field of food microbiology is set to make substantial contributions to healthier, more sustainable food systems worldwide.

Reference

1. Babu US, Harrison LM, Mammel MK, et al. A loop-mediated isothermal amplification (LAMP) assay for the consensus detection of human pathogenic Campylobacter species. J Microbiolo Method. 2020;176:106009.

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2. Auguste M, Rahman FU, Balbi T, et al. Responses of mytilus galloprovincialis to challenge with environmental isolates of the potential emerging pathogen malaciobacter marinus. Fish Shellf Immunolo. 2022;131:1-9.

3. Gourama H. Foodborne pathogens. Food safety engineering. 2020:25-49.

4. Shange N, Gouws PA, Hoffman LC. Prevalence of campylobacter and arcobacter species in ostriches from oudtshoorn south africa. J Food Protec. 2020;83(4):722-8.

5. Ortiz-Suárez LE, Redondo-Solano M, Arias-Echandi ML, et al. Optimization of the in *vitro* bactericidal effect of a mixture of chlorine and sodium gallate against campylobacter spp and arcobacter butzleri. J Food Protec. 2021;84(7):1127-35.

6. Dias-Alves A, Espunyes J, Ayats T, et al. Foodborne pathogens at the livestock–wildlife–human interface in rural western uganda. Eco Health. 2023:1-6.

7. Park SM, Choi C, Rhee MS. One Health approach for prioritization of potential foodborne pathogens: Risk ranking, Delphi survey, and criteria evaluation pre-and post-COVID-19 pandemic. Comprehe Rev Food Sci Food Saf. 2024;23(1):1-21.

8. Baztarrika I, Salazar-Sánchez A, Hernaez Crespo S, et al. Virulence genotype and phenotype of two clinical isolates of arcobacter butzleri obtained from patients with different pathologies. Archi Microbiol. 2023;205(12):369.

9. Zautner AE, Riedel T, Bunk B, et al. Molecular characterization of arcobacter butzleri isolates from poultry in rural ghana. Fronti Cellu Infect Micro. 2023;13:24.

10. Boimah M, Weible D. We prefer local but consume imported: Results from a qualitative study of dairy consumers in Senegal. J Internat Food Agribus Market. 2023;35(2):244-60.