

Comprehensive Profiling and Characterization of Untargeted Extracellular Metabolites in Fermentation Processes: Insights and Advances in Analysis and Identification

Authors : Marianna Ciaccia, Gennaro Agrimi, Isabella Pisano, Maurizio Bettiga, Silvia Rapacioli, Giulia Mensa, Monica Marzagalli

Abstract : Objective: Untargeted metabolomic analysis of extracellular metabolites is a powerful approach that focuses on comprehensively profiling in the extracellular space. In this study, we applied extracellular metabolomic analysis to investigate the metabolism of two probiotic microorganisms with health benefits that extend far beyond the digestive tract and the immune system. Methods: Analytical techniques employed in extracellular metabolomic analysis encompass various technologies, including mass spectrometry (MS), which enables the identification of metabolites present in the fermentation media, as well as the comparison of metabolic profiles under different experimental conditions. Multivariate statistical analysis techniques like principal component analysis (PCA) or partial least squares-discriminant analysis (PLS-DA) play a crucial role in uncovering metabolic signatures and understanding the dynamics of metabolic networks. Results: Different types of supernatants from fermentation processes, such as dairy-free, not dairy-free media and media with no cells or pasteurized, were subjected to metabolite profiling, which contained a complex mixture of metabolites, including substrates, intermediates, and end-products. This profiling provided insights into the metabolic activity of the microorganisms. The integration of advanced software tools has facilitated the identification and characterization of metabolites in different fermentation conditions and microorganism strains. Conclusions: In conclusion, untargeted extracellular metabolomic analysis, combined with software tools, allowed the study of the metabolites consumed and produced during the fermentation processes of probiotic microorganisms. Ongoing advancements in data analysis methods will further enhance the application of extracellular metabolomic analysis in fermentation research, leading to improved bioproduction and the advancement of sustainable manufacturing processes.

Keywords : biotechnology, metabolomics, lactic bacteria, probiotics, postbiotics

Conference Title : ICLAB 2024 : International Conference on Lactic Acid Bacteria

Conference Location : Amsterdam, Netherlands

Conference Dates : May 02-03, 2024