

The use of high pressure processing (HPP) as a tool for microbial control and quality preservation in modern food systems

Tone Mari RODE (Nofima, Norway),

Abstract

High pressure Processing (HPP) has become one of the most important non-thermal preservation technologies in the food industry, enabling microbial control while maintaining many of the sensory and nutritional attributes associated with fresh foods. Today, HPP is applied commercially across a broad range of refrigerated products, including juices, ready-to-eat meals, meat products, seafood, and fruit- and vegetable-based foods. However, its suitability and effectiveness is product-specific, depending on the characteristics of the target microorganisms, food matrix, processing conditions, and subsequent storage environment.

This presentation will explore the role of HPP as a tool for microbial safety, shelf-life extension, and quality preservation in modern food systems. The influence of key processing variables – including pressure level, holding time, temperature, and product composition – will be discussed in relation to microbial responses such as inactivation, sublethal injury, and recovery during chilled storage. Particular attention will be given to vegetative pathogens, spoilage microorganisms, and *Listeria monocytogenes*, a major concern in refrigerated ready-to-eat foods.

The limitations of conventional HPP for controlling bacterial spores will also be addressed, together with emerging approaches such as pressure-assisted thermal processing and germination–inactivation strategies. In parallel, the presentation will examine how HPP can help preserve desirable quality attributes, including flavour, aroma, colour, texture, and nutritional value, while also highlighting product-specific challenges related to enzyme activity and pressure-induced quality changes.

Finally, HPP will be considered within a broader framework of integrated food preservation. The future of HPP lies not only in achieving microbial inactivation, but in enabling the design of food systems that simultaneously deliver safety, quality, sustainability, and consumer value.