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The effectiveness of High-Pressure Processing (HPP) in eliminating or reducing foodborne microorganisms depends on several factors related to the specific organisms and the food type. These include microbiological factors, food characteristics, pH, water activity, temperature and additives.

Microbiological factors

Microorganisms in the exponential phase of growth are more sensitive to pressure than in the stationary phase of growth. Spore-formers are highly resistant to pressure and so a combination of pressure and heat, or high pressure and other antimicrobial treatments is needed to achieve a significant level of inactivation of spores in foods. A combination of HPP and antimicrobial compounds can help eliminate pressure-resistant microorganisms, reduce the temperature needed to inactivate microorganisms and help prevent the repair of sublethally injured cells during storage.

Sublethal inactivation by HPP can lead to injured cells that can recover under favourable conditions. This presents a risk of regrowth of the microorganism during the shelf life of a food. If the pathogens are not permanently inactivated by HPP, further action is required to inhibit the growth of injured cells after processing.

Food characteristics

Food is a complex matrix; some food components, such as proteins, fats, carbohydrates, amino acids, sugars, salts, vitamins and minerals, can provide a protective effect on microbiological cells and increase the microbial resistance to pressure.

pH

As pH is lowered, most microorganisms become susceptible to HPP inactivation and sublethally injured cells fail to repair.

Water activity

Reducing the water activity of food seems to protect microorganisms against inactivation by HPP. However microorganisms may be sublethally injured by pressure and recovery of these cells can also be inhibited by low water activity.

Temperature

Both very low or elevated temperatures enhance the susceptibility of microorganisms to pressure, which increases the rate of inactivation of microorganisms during HPP treatment.

Additives

The inclusion of antimicrobial hurdles can improve the ability of HPP to inactivate microorganisms during processing or inhibit their growth during storage.