Applications of the HPP Technology: Challenges Beyond Food Preservation

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Nothing to disclosure

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What is High Pressure Processing (HPP)?
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HPP is a promising cold pasteurization technique (already approved by the FDA), which is based upon the application of very high levels of hydrostatic pressure (300-600MPa), on already sealed food products, with the aim to reduce or eliminate harmful bacteria and extend the shelf life.
What is High Pressure Processing (HPP)?

HPP usually extends the shelf life of raw foods from a few days up to 45-90 days, making the food stable and easier to transport, hold, store, and sell.
HPP Main Advantages?
1. **Food safety and international trade:** destroys pathogenic microorganisms (*Listeria, Salmonella, Vibrio, Norovirus, etc.*).

2. **Food quality and customer satisfaction:** characteristics of the fresh product are retained since valuable low molecular constituents, such as bioactive compounds, vitamins, colors and flavors, remain largely unaffected making sensorial and nutritional properties remain almost intact... lowering returns and complains.

3. **Improves quality along shelf life:** drastically reduces the overall microbial spoilage flora.

4. **Clean label foods:** avoids or reduces the need for food preservatives (Natural/Additive Free).
5. **Environmentally friendly**: its operation requires only electricity and water (which is recycled)

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**However there is even more...**
7. **Food Product Innovation and competitive advantages:**
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**Novel Food Applications:**
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**Novel Food Applications:**

*Development of innovative textures & products with a better sensory performance…*
Effect of HPP on milk proteins
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HPP affects size, shape and conformation of various milk proteins
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Protein functionality
Effect of HPP on milk proteins

✓ Native proteins are stabilized by covalent bonds plus electrostatic interactions, hydrogen bridges (H-H) and hydrophobic interactions.

✓ At relatively low temperatures (0–40 °C), covalent bonds are almost unaffected by HHP so the primary structure of proteins remains intact during HHP treatment [Mozhaev VV, Heremans K, Frank J, et al. (1994)].
Effect of HPP on milk proteins

However, HPP affects:

1. The secondary structure (H- and electrostatic interactions)
2. The tertiary structure (hydrophobic and hydrogen bonding)
3. The quaternary structure (e.g., through hydrophobic interactions)
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100-300 MPa: reversible changes occurs
>300 MPa: irreversible denaturation of milk proteins occurs
Effect of HPP on milk proteins

Thus affecting:

1. Molecular interactions among components.

2. Phase equilibrium phenomena.
Effect of HPP on milk proteins

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* Casein-whey protein interactions occurs leading to the formation of aggregates
Effect of HPP on milk proteins

As a result there is a change on the micro and macrostructure of the system that in turn leads to a change in:

1. Foaming properties of whey proteins.
2. Viscosity of the system.
3. Structural effects that may affect its perception in the mouth.
What is beyond food preservation?

HPP induces beneficial structural effects:

1. Rheological changes for better sensory perception.
2. Lowering costs by increasing water holding capacity.
3. Improving sensory quality of low-fat foods (milks, ice cream, sauces and creams).
4. Improving yield and rheological properties (cheese making processes).
5. Novel textures without using foaming or thickeners agents-
What is beyond food preservation?

HPP opens an impressive opportunity to design better textures to meet the needs of food consumers!
Challenges beyond food preservation

Skim milk that tastes like whole milk?
Challenges beyond food preservation

Low-fat ice cream with a great overrun, tasty and an impressive mouthfeel?
Challenges beyond food preservation

Low-fat sauces and creams with protein content, full-fat product taste and a very delicious and creamy mouthfeel?
Challenges beyond food preservation

How to avoid any fraud without constraining the development of the technology?
Conclusions

✓ Application of the HPP Technology brings new challenges, beyond food preservation, which are related towards an amazing opportunity for the design of novel and healthier foods with innovative textures and mouthfeels to impress and fulfil consumer needs.

✓ The road is broad so it is time now to start facing a new application of this technology that might bring important benefits for both the industry and the global consumer of foods.

✓ Special care must be taken with the regulatory issues in order to avoid possible fraud, but without limiting the development of technology.
Thank You for Your Attention!
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¡GRACIAS!!
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Any question?
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