Impact of High Pressure Homogenization on the inactivation of spores in Sheep Milk

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Bacterial spores are a challenge to the food industries due to their resistance to chemical interventions of disinfection and physical treatments for inactivation. They can survive any treatment equivalent to pasteurization and germinate into vegetative cells under favourable conditions, thereby limiting the shelf life of milk. Processing techniques using thermal treatments such as Ultra High Temperature (UHT) (135 ?C for 4-8 seconds) have previously been used to inactivate spores in milk. However, the extreme heat applied during the UHT treatment can negatively impact the nutritional quality, taste, appearance, and sensory properties of the milk. Conventional homogenizers with pressures up to 50 MPa have been utilized in the dairy industry to reduce particle size and create stable emulsions prior to UHT treatment of milk. However, treatments up to 50
MPa are insufficient to cause bacterial spore inactivation. Previous literature shows that pressure and temperature have a synergetic impact on bacterial spore inactivation. Ultra-high pressure homogenization (UHPH) is an emerging technology that applies pressures in the range of 200 – 400 MPa and has the capability to inactivate spores due to the combined effect of high pressure and temperature at a very short treatment time (less than 0.5 sec).
Sheep milk is nutrient dense and contains almost double the fat and protein content of bovine milk. However, these properties make conventional thermal processing technologies (i.e. UHT) challenging for sheep milk due to protein denaturation and coagulation, protective effects of sheep milk fat etc. Sheep milk bio-actives have also been shown to be more sensitive to heat treatment. This study aims to investigate the impact of operating pressure and inlet temperature on *Bacillus* spores inoculated in sheep milk. The UHPH treatments are carried out using a pilot scale unit (FPG7575:S6300, Stansted Power Fluid Ltd., UK) with a maximum pressure of 400 MPa. The combined application of heat and pressure lowers the temperature needed for spore inactivation by a few degrees and decreases the treatment time.