Survival of microorganisms in High Pressure Processing (HPP) systems and the potential for leaker spoilage

Edyta Margas and Dr John Holah

Campden BRI
food and drink innovation

Aim

The study sought to assess the potential risk of leaker spoilage by determining the number of microorganisms in the HP transmission fluid, their survival through the HPP process and the potential for leakage into the product packs.

Background

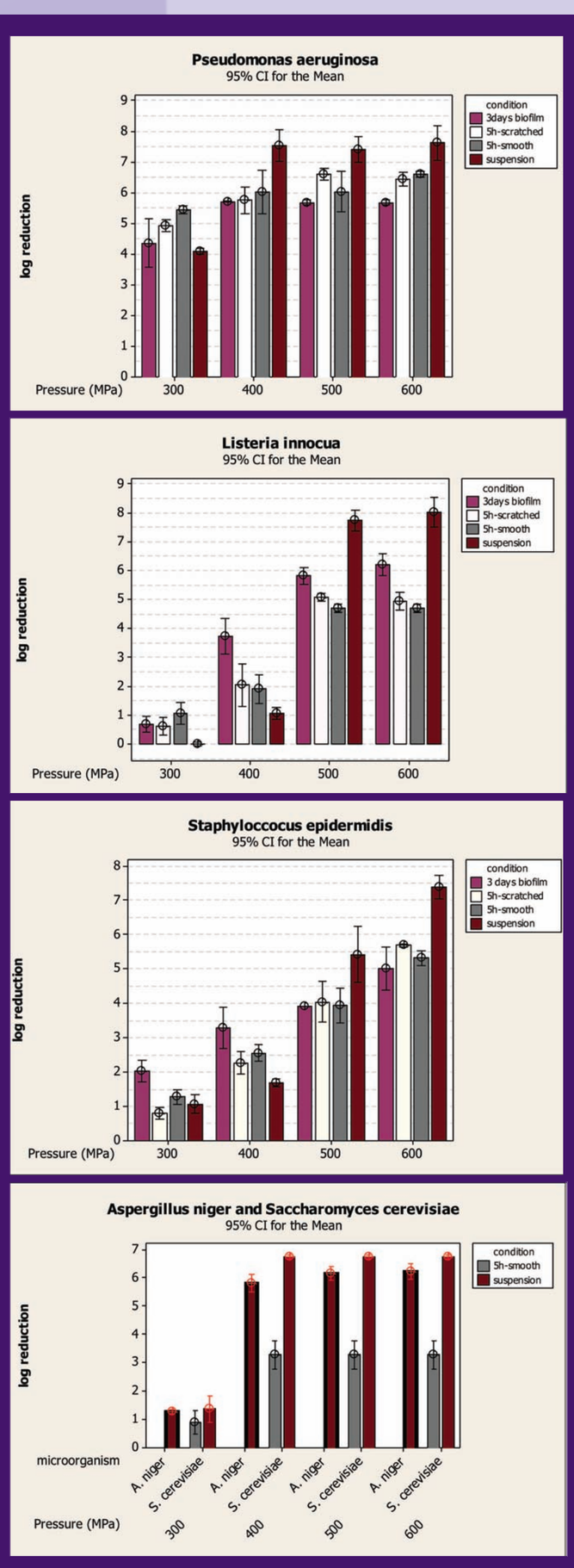

Figure 1. Effect of high hydrostatic pressure on *P. aeruginosa, S. aureus, L. innocua, S. cerevisiae* and *A. niger* in suspension and in surface adhered niches

HPP products preserve the organoleptic properties of fresh products by providing a microbiological reduction treatment without the negatively associated thermal quality changes. All packaged products undergoing the microbial reduction process are, however, subject to potential, post process leaker spoilage

Method

Samples of the transmission fluids and surfaces in the packed product contact zone were taken from 6 commercial and 5 research HPP units to assess microbial loading. Survival of *Staphylococcus epidermidis*, *Pseudomonas aeruginosa*, *Listeria innocua*, *Saccharomyces cerevisiae* and *Aspergillus niger* was assessed in suspension (planktonic) and when grown as biofilms on stainless steel coupons (smooth and with crevices), under a range of pressures (300MPa-600MPa) for 3 min. The migration of microorganisms from the HP unit transmission fluid into simulated food packs was determined by processing pouches containing sterile Nutrient Broth, placed inside pouches containing *Staphylococcus epidermidis* of a predetermined genetic fingerprint. The same number of samples was prepared as controls, without HP treatment. After treatment with 300MPa pressure, the pouches were incubated and, from each sample which showed microorganism growth (turbidity), microorganisms were isolated, purified and identified.

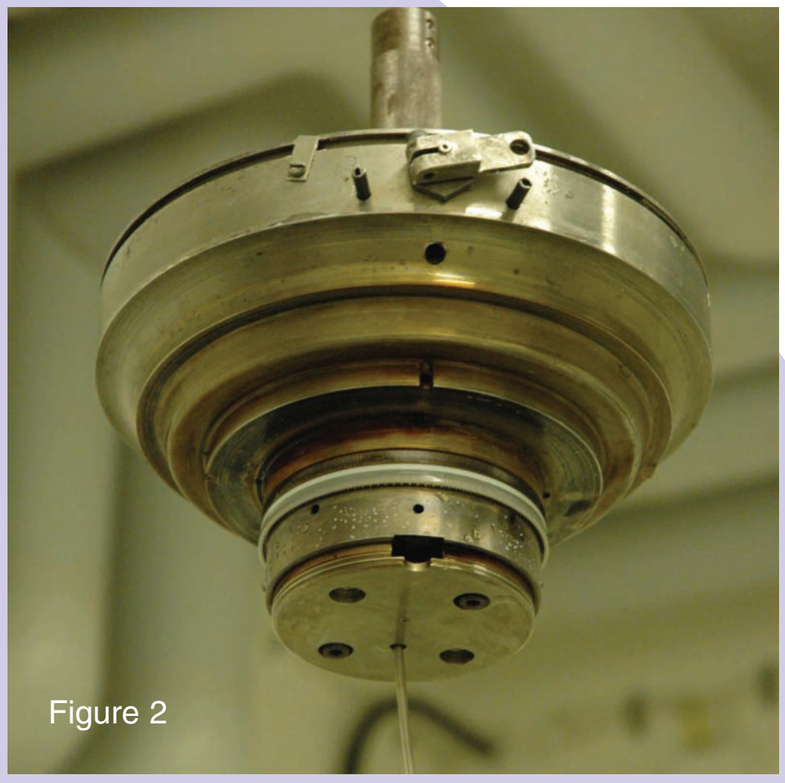

Figure 2

Results

The TVC of the transmitting fluids of the commercial units ranged from 10^0-10^3 cfu/ml whilst the TVC on packed product contact surfaces ranged from10^0-10^5 cfu/cm^2. Highest counts were associated with the sealing arrangement and closure (see Figure 2). Differential survival with pressure was observed for Gram +ve microorganisms, Gram –ve microorganisms, yeasts and moulds at 300MPa in suspension and in surface adhered niches (see Figure 1). There was no survival of organisms at 600MP though bacteria grown as biofilms were more resistant than their planktonic counterparts at the higher pressures (500MPa – 600MPa) and less resistant at the lower pressures (300MPa – 400MPa). The migration studies showed that there was no significant difference between the number of pouches with microbial growth which were treated and not treated with 300MPa pressure.

Discussion

A potential risk of leaker spoilage was demonstrated for HPP products which can be controlled by minimizing contamination in the HPP units and via more hygienic pack handling. These results will be incorporated into a NovelQ guideline document on Good Manufacturing Practice associated with High Pressure food manufacturing.

Acknowledgements

The work conducted was part of the Integrated Project, contract no: 015710-2, 'Novel processing methods for the production and distribution of high-quality and safe foods', funded by the European Commission, within the sixth Framework Programme.

Campden BRI, Station Road, Chipping Campden, Gloucestershire, UK, GL55 6LD, Tel: +44(0)1386 842000 Fax: +44(0)1386 842100
www.campden.co.uk