New insights on Listeria monocytogenes growth in pressurised cooked ham: A piezo-stimulation effect enhanced by organic acids during storage

The aim of the present study was to understand growth and survival responses of Listeria monocytogenes during the storage of high pressure processed (HPP) cooked ham formulated with organic acids to inhibit growth of the pathogen. Cooked ham batches were manufactured without organic acids (control), with potassium lactate (2.8% or 4%) or with potassium lactate and sodium diacetate (2.0%+0.11% or 2.0%+0.45%). Products were aseptically sliced and inoculated with 107cfu/g or 102cfu/g of either L. monocytogenes CTC1034 (a meat isolate) or a cocktail of three isolates (12MOB045Lm, 12MOB089Lm and Scott A). Vacuum-packed samples with 107cfu/g were HPP at 600MPa for 3min, whereas samples with 102cfu/g were not HPP. Growth or survival of L. monocytogenes was determined during subsequent storage at 8, 12 and 20°C. Growth or survival was characterized by fitting the experimental data using the primary logistic model and the log-linear with shoulder model, respectively. Secondary models were fitted to characterize the effect of temperature on growth kinetic parameters without or with HPP. For cooked ham without organic acids, growth rates of L. monocytogenes were slightly increased by HPP and lag times were longer. Interestingly, for cooked ham with organic acids, the HPP had a significant stimulating effect on subsequent growth of L. monocytogenes (piezo-stimulation). At 20°C, the growth rates of L. monocytogenes in cooked ham with lactate were up to 4-fold higher than those of the same product without HPP. The observed enhancement of the piezo-stimulating effect of organic acids on growth rates during storage of HPP cooked ham represents a challenge for the use of organic acids as antimicrobial in these products. A predictive model available as part of the Food Spoilage and Safety Predictor (FSSP) software seemed useful to predict growth and growth boundary of L. monocytogenes in non-pressurised cooked ham. This model was calibrated to take into account the observed piezo-stimulating effect and to predict growth of L. monocytogenes in HPP cooked ham with organic acids.

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