Analysing and modelling the growth behaviour of Listeria monocytogenes on RTE cooked meat products after a high pressure treatment at 400 MPa

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Abstract

Various predictive models are available for high pressure inactivation of *Listeria monocytogenes* in food, but currently available models do not consider the growth kinetics of surviving cells during the subsequent storage of products. Therefore, we characterised the growth of *L. monocytogenes* in sliced cooked meat products after a pressurization treatment. Two inoculum levels (10^7 or 10^4 CFU/g) and two physiological states before pressurization (freeze-stressed or cold-adapted) were evaluated. Samples of cooked ham and mortadella were inoculated, high pressure processed (400 MPa, 5 min) and subsequently stored at 4, 8 and 12 °C. The Logistic model with delay was used to estimate lag phase (λ) and maximum specific growth rate (μ_{max}) values from the obtained growth curves. The effect of storage temperature on μ_{max} and λ was modelled using the Ratkowsky square root model and the relative lag time (RLT) concept.

Compared with cold-adapted cells the freeze-stressed cells were more pressure-resistant and showed a much longer lag phase during growth after the pressure treatment. Interestingly, for high-pressure inactivation and subsequent growth, the time to achieve a concentration of *L. monocytogenes* 100-fold (2-log) higher than the cell concentration prior to the pressure treatment was similar for the two studied physiological states of the inoculum. Two secondary models were necessary to describe the different growth behaviour of *L. monocytogenes* on ready-to-eat cooked ham (lean product) and mortadella (fatty product). This supported the need of a product-oriented approach to assess growth after high pressure processing. The performance of the developed predictive models for the growth of *L. monocytogenes* in high-pressure processed cooked ham and mortadella was evaluated by comparison with available data from the literature and by using the Acceptable Simulation Zone approach. Overall, 91% of the relative errors fell into the Acceptable Simulation Zone.