

PEC1.45 Population-based and Individual-based modelling of high hydrostatic pressure effect in *Listeria monocytogenes* on sliced dry-cured ham

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Listeria monocytogenes is one of the most relevant pathogen microorganisms in ready-to-eat foods. Several treatments can be carried out in order to improve the safety of these products, high hydrostatic pressure (HHP) being one of them. The effects of such treatment on bacterial cells, and the reason why some bacteria resist the treatment, are not yet fully understood. The study of the relationship between pressure profiles and the decrease in bacterial population is an essential step toward understanding this phenomenon at the cellular level.

A set of 118 experimental measurements of *L. monocytogenes* inactivation on sliced dry-cured ham induced by HHP treatments (350 to 850 MPa) were analysed and used to build a Population-based model (PbM) and an Individual-based Model (IbM). PbM and IbM are top-down and bottom-up approaches, respectively, that have been successfully used in the framework of predictive microbiology. The former considers the population as a whole, and is usually formalized with classic continuous mathematical methods. The latter considers the behaviour of individual cells, and the dynamics of the population emerges from the interactions among them and with the local environment. The use of both methodologies in parallel is a good strategy to progress in the understanding of microbial processes.

The dependence of the population decrease on the applied pressure, the duration of the treatment and the pressure gradients achieved during the come-up and the release have been observed and incorporated into the models. At the population level, we have focused in particular on the dynamics of the decrease rate during the treatment. At the individual level, we have focused on the changes in death probabilities of bacterial cells during the different phases of the treatment. Finally, the resulting models provide valuable information for the design of new experimental measurements to move forward in the understanding of the effects of HHP on bacterial communities.