

Title Development of a hierarchical Bayesian model to estimate the growth parameters of *Listeria monocytogenes* in minimally processed fresh leafy salads

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Abstract

The optimal growth rate μ_{opt} of *Listeria monocytogenes* in minimally processed (MP) fresh leafy salads was estimated with a hierarchical Bayesian model at (mean \pm standard deviation) $0.33 \pm 0.16 \text{ h}^{-1}$. This μ_{opt} value was much lower on average than that in nutrient broth, liquid dairy, meat and seafood products ($0.7\text{--}1.3 \text{ h}^{-1}$), and of the same order of magnitude as in cheese. Cardinal temperatures T_{min} , T_{opt} and T_{max} were determined at $-4.5 \pm 1.3 \text{ }^{\circ}\text{C}$, $37.1 \pm 1.3 \text{ }^{\circ}\text{C}$ and $45.4 \pm 1.2 \text{ }^{\circ}\text{C}$ respectively. These parameters were determined from 206 growth curves of *L. monocytogenes* in MP fresh leafy salads (lettuce including iceberg lettuce, broad leaf endive, curly leaf endive, lamb's lettuce, and mixtures of them) selected in the scientific literature and in technical reports. The adequacy of the model was evaluated by comparing observed data (bacterial concentrations at each experimental time for the completion of the 206 growth curves, mean \log_{10} increase at selected times and temperatures, *L. monocytogenes* concentrations in naturally contaminated MP iceberg lettuce) with the distribution of the predicted data generated by the model. The sensitivity of the model to assumptions about the prior values also was tested. The observed values mostly fell into the 95% credible interval of the distribution of predicted values. The μ_{opt} and its uncertainty determined in this work could be used in quantitative microbial risk assessment for *L. monocytogenes* in minimally processed fresh leafy salads.