Title Development of a dynamic growth–death model for *Escherichia coli* O157:H7 in minimally processed leafy green vegetables

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Abstract

Escherichia coli O157:H7, an occasional contaminant of fresh produce, can present a serious health risk in minimally processed leafy green vegetables. A good predictive model is needed for Quantitative Risk Assessment (QRA) purposes, which adequately describes the growth or die-off of this pathogen under variable temperature conditions experienced during processing, storage and shipping. Literature data on behaviour of this pathogen on fresh-cut lettuce and spinach was taken from published graphs by digitization, published tables or from personal communications. A three-phase growth function was fitted to the data from 13 studies, and a square root model for growth rate (μ) as a function of temperature was derived: $\mu = (0.023*(\text{Temperature}-1.20))^2$. Variability in the published data was incorporated into the growth model by the use of weighted regression and the 95% prediction limits. A log-linear die-off function was fitted to the data from 13 studies, and the resulting rate constants were fitted to a shifted lognormal distribution (Mean: 0.013; Standard Deviation, 0.010; Shift, 0.001). The combined growth–death model successfully predicted pathogen behaviour under both isothermal and non-isothermal conditions when compared to new published data. By incorporating variability, the resulting model is an improvement over existing ones, and is suitable for QRA applications.