572d Quasi-Chemical Kinetics Model and Statistical Secondary Models for the Inactivation of Escherichia Coli Atcc 11229 and Listeria Monocytogenes Osy - 8578 in Surrogate Foods by High Pressure Processing

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There is a need for mathematical models capable of assessing non-linear kinetics associated in foods associated with high pressure processing (HPP). First-order models are not adequate to characterize HPP inactivation kinetics that show “lag times” or “tailing.” The Quasi-chemical model was originally developed to monitor growth-death kinetics for several pathogenic microorganisms (E. coli, S. aureus, L. monocytogenes), in a variety of intermediate moisture foods (bread, turkey meat, ham, cheese) as a function of several hurdles (Aw, pH, storage temperature, lactate, plum pureé). The objective of this paper is to expand the application of the Quasi-chemical model to include non-linear inactivation kinetics by HPP and develop appropriate secondary models.

We investigate the inactivation kinetics of E. coli and L. monocytogenes to various conditions of high pressure, temperature, and time. High pressure kinetics of inoculated whey protein samples were carried out in a 2-Liter EPSI unit (30,000 – 60,000 psi and 20 - 60 C) and colonies were enumerated using appropriate recovery media.

The Quasi-chemical model gave excellent fits to the data. An analysis of the fitted curves also produced kinetics parameters such as lag times and inactivation rate constants, that were interrelated with the process control parameters (P and T) to generate secondary models that predict the conditions of pressure, temperature, and time required to pasteurize a food product (kill 105) with respect to these pathogens. Additionally, we present an Equivalence Chart that describes equivalent sets of processing conditions that equally well effect a pasteurization process in temperature- or pressure-sensitive foods (eg, fruit juices or fish fillets, respectively). The Quasi-chemical kinetics models is a useful tool that discerns the roles of P and T in microbial inactivation by HPP and predicts equivalent pasteurization conditions that can guide food processors in producing safe and acceptable products.