MATH Igo

Title: Measuring and modeling the influence of temperature and relative humidity on the survival of *Enterobacter aerogenes*

Introduction: The survival of microorganisms on food contact surfaces is an important part of understanding cross-contamination. Temperature, relative humidity, and surface type all appear to play a role. Primary and secondary models for describing microbial behavior under these circumstances are limited.

Purpose: The purpose of this study was to measure and develop primary models for the effects of temperature and relative humidity on the survival of the non-pathogenic surrogate *Enterobacter aerogenes* (B199A).

Methods: Stainless steel tiles were inoculated with ~6 log CFU *E. aerogenes* per tile and dried for 2 hours at room temperature. Tiles were placed in desiccators containing saturated salt solutions at ~15, 50, and 100% relative humidity at 7 and 21°C. Tiles were sampled at appropriate time intervals ranging from 8 hr to 21 days. Samples were plated in duplicate and experiments were repeated in triplicate. Survival modeling was conducted using DMfit software.

Results: *E. aerogenes* survival generally showed a decline followed by a plateau, and could be modeled using Biphasic or Baranyi and Roberts models with no lag. R squared values for the primary models ranged from 0.60 to 0.89 indicating relatively good fit. Final concentration of *E. aerogenes* at 7°C were 4.5, 4.9 and 5.0 log CFU/surface after 21 days at 15, 50 and 100% RH respectfully. *E. aerogenes* generally did not survive as well at 21°C with final concentrations of 1.3 and 2.7 CFU/tile at 15 and 50% RH respectfully, but showed either growth or injury recovery at 100% RH, with a final concentration of 6.5 log CFU/tile.

Significance: These results show the potentially complex interactions between temperature and relative humidity on survival of microorganisms. More research is needed to develop secondary mathematical models for survival of microbes on surfaces at different temperatures and environmental RH values.