

Title Models of the behavior of *Escherichia coli* O157:H7 in raw sterile ground beef stored at 5 to 46 °C  
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### Abstract

*Escherichia coli* O157:H7 can contaminate raw ground beef and cause serious human foodborne illness. Previous reports describe the behavior of *E. coli* O157:H7 in ground beef under different storage conditions; however, models are lacking for the pathogen's behavior in raw ground beef stored over a broad range of temperature. Using sterile irradiated raw ground beef, the behavioral kinetics of 10 individual *E. coli* O157:H7 strains and/or a 5- or 10-strain cocktail were measured at storage temperatures from 5° to 46 °C. Growth occurred from 6 to 45 °C. Although lag phase duration (LPD) decreased from 10.5 to 45 °C, no lag phase was observed at 6, 8, or 10 °C. The specific growth rate (SGR) increased from 6 to 42 °C then declined up to 45 °C. In contrast to these profiles, the maximum population density (MPD) declined with increasing temperature, from approximately 9.7 to 8.2 log cfu/g. Bias ( $B_p$ ) and accuracy ( $A_p$ ) factors for an *E. coli* O157:H7 broth-based aerobic growth model (10 to 42 °C) applied to the observations in ground beef were 1.05, 2.70, 1.00 and 1.29, 2.87, 1.03, for SGR, LPD and MPD, respectively. New secondary models increased the accuracy of predictions (5 to 45 °C), with  $B_p$  and  $A_p$  for SGR, LPD, and MPD of 1.00, 1.06, and 1.00 and 1.14, 1.33, and 1.02, respectively. These new models offer improved tools for designing and implementing food safety systems and assessing the impact of *E. coli* O157:H7 disease.