



Impact of Fat Content of Beef on Heat Resistance of Non-O157:H7 Shiga Toxin Producing Escherichia Coli

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Keywords: Big Six E. coli, D-value, ground beef, meat safety, STEC
Meat and Muscle Biology 1(2):122

doi:10.221751/rmc2016.118

Objectives

To quantify the effect of fat content on heat resistance of non-O157:H7 Shiga toxin producing *Escherichia coli* (STEC) in ground beef

Materials and Methods

The thermal inactivation of six strains of non-O157 group, *Escherichia coli*: O26:H1, O45:H2, O103:H2, O111:H8, O121:H9, and O145: non-motile was studied. Previously, we studied the decimal reduction values (D-values) of non O157:H7 STEC strains individually in Tryptic soy broth (TSB). Data indicated no significant differences ($p > 0.05$) in the D-values among the strains at 55, 60, and 65°C. Hence, we used a cocktail mixture of these strains to calculate D-values in ground beef. For this study, six fat levels 5, 10, 15, 20, 25, and 30% of ground beef were obtained and stored at -20°C; thawed at 4°C for 24 h before use. Nalidixic acid (NAL) resistant strains were used in the study to differentiate background flora of meat. Bags containing 5 g of inoculated ground beef were submerged in a circulating water bath set at 3 temperatures- 55, 60, and 65°C. Samples were taken out from the water bath at fixed time interval (7.5 min at 55°C, 30 s at 60°C and 5 s at 65°C) and surviving populations was enumerated by plating onto plate count agar (PCA) supplemented with 50-ppm of NAL. Survival curve was plotted between the log survival population and exposure time with a cor-

relation coefficient (r^2) > 0.9 . D-value was calculated by taking the negative inverse of the slope of the survival curve. All experiments were performed in triplicate

Results

A log-linear decline was observed in the population of STECs by heating of ground beef. The $D_{55^\circ\text{C}}$ in 5% fat was 15.93 min. and a significant decrease ($p < 0.05$) to 12.66 min. at 25% was observed, which further decreased significantly ($p < 0.05$) to 11.69 min. at 30% fat content. There were no significant differences ($p > 0.05$) in other fat levels at 55°C. However, increase in fat content did not have a significant impact ($p > 0.05$) on $D_{60^\circ\text{C}}$ and $D_{65^\circ\text{C}}$. The $D_{60^\circ\text{C}}$ were 1.15, 1.16, 1.10, 1.10, 0.91, 1.12 min and $D_{65^\circ\text{C}}$ were 0.16, 0.14, 0.12, 0.12, 0.12, 0.08 min at 5, 10, 15, 20, 25, and 30% fat content, respectively. The z-values were 5.07, 5.16, 4.94, 4.96, 4.94, and 4.62°C for 5, 10, 15, 20, 25, and 30% fat contents, respectively.

Conclusion

A negative correlation was observed between the D-values of non-O157 STECs and fat content, indicating more kill rate with high fat content of ground beef at 55°C. The impact of fat level on D-value of non-O157 STECs is not available in the literature. The results provided are new finding and will help to successfully eliminate non-O157 STECs from cooked and ready-to-eat meat products