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Comparative Effect of Heat Shock on Survival of O157:H7 and Non-O157 Shiga Toxigenic *Escherichia coli* and *Salmonella* in Lean Beef with or without Moisture-Enhancing Ingredients

Vasan A¹, Ingham SC², Ingham BH¹

¹ Department of Food Science, University of Wisconsin-Madison, 1605 Linden Drive, Madison, Wisconsin 53706; ² Division of Food and Recreational Safety, Wisconsin Department of Agriculture, Trade and Consumer Protection, P.O. Box 8911, Madison, Wisconsin 53708, USA.

Abstract

Thermal tolerance of pathogenic bacteria has been shown to increase after exposure to sublethal elevated temperatures, or heat shock. We evaluated the effect of heat shock at 48°C on thermal tolerance (D55°C) of cocktails of O157 and non-O157 Shiga toxigenic *Escherichia coli* (STEC) and *Salmonella* in lean ground beef with or without moisture-enhancing ingredients. Beef was moisture enhanced to 110% (w) with a 5% NaCl-2.5% sodium tripolyphosphate (w/w) brine. Meat, with or without added brine, was inoculated (~108 CFU/g) and heat shocked at 48°C for 0, 5, or 30 min, followed by isothermal heating at 55°C. Inoculated control samples were unenhanced and were not subject to heat shock. From the linear portion of the log CFU per gram surviving cells over time plots, D55°C-values (minutes) were calculated. D55°C was 20.43, 28.78, and 21.15 min for O157, non-O157, and *Salmonella* controls, respectively. Overall, heat shock significantly increased D55°C, regardless of pathogen ($P < 0.05$). After 30 min of heat shock, D55°C increased 89 and 160% for O157 STEC, 32 and 49% for non-O157 STEC, and 29 and 57% for *Salmonella*, in unenhanced and enhanced samples, respectively, relative to the pathogen control. D55°C for *Salmonella* was the same or significantly less than for O157 and non-O157 STEC, regardless of heat shock, and was significantly less than for O157 and non-O157 STEC in all trials with moisture-enhanced meat ($P < 0.05$). Moisture-enhancing ingredients significantly increased D55°C, regardless of pathogen ($P < 0.05$). We suggest that thermal processes validated against *Salmonella* may not prove effective against STEC in all cases and that regulators of the beef industry should focus attention on STEC in nonintact moisture-enhanced beef products.

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