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

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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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