EVALUATION OF PEROXYACETIC ACID SOLUTION AS AN ANTIMICROBIAL INTERVENTION TREATMENT FOR FRESH BEEF TRIMMINGS

Effective meat interventions to mitigate microbial contamination are paramount in the meat industry. Nanobubbles are extremely small gas bubbles (diameter <1 micrometer) in a liquid medium that have unique physical properties, such as negative buoyancy and long lifespan. They are used in wastewater treatment, food processing, and medical applications for enhancing processes like oxygenation, sterilization, and drug delivery. Peroxyacetic acid (PAA) is an antimicrobial intervention treatment applied during raw beef manufacturing to reduce the risk of pathogens like *Salmonella* and Shiga toxin-producing *E. coli* in consumer products. The objective of this project was to determine the effectiveness of treating frozen, diced beef trimmings with a chilled municipal tap water solution containing PAA. Kansas State University has partnered with American Beef Processors of Oregon (APBO) to conduct studies to separate lean and fat tissue of commercial beef trimmings (50:50 ratio of lean to fat) while increasing the shelf life and reducing the presence of pathogens in finished ground beef. For the trials, chilled solutions of nanobubble water (evaluated in a cohort experiment) and tap water (control) mixed with 0, 200, and 400 ppm PAA were prepared. Frozen beef trimmings provided by ABPO were thawed for 24 hours, spray-inoculated with a mixed cocktail of *E. coli* surrogates (5 strains approved by USDA) to 10^5 cfu/g, and refrozen in 25 g units. Similar units of non-inoculated meat were prepared to evaluate treatment effects on native spoilage microflora. Units were immersed in the solutions for 30 seconds and 3 minutes, and 100 mL of

double-strength D/E Neutralizing Broth was added immediately to stop lethality. Serial dilutions of each treatment were plated using ECC and APC Petrifilm to enumerate surviving *E. coli* surrogate and aerobic bacterial populations, respectively. Microbial reductions observed in tap water versus nanobubble water (cohort) studies are compared to estimate the contribution of nanobubbles in the antimicrobial process.

Keywords: nanobubbles, beef, peroxyacetic acid, *E. coli*surrogates, antimicrobial intervention