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## Meat and Muscle Biology™



## Reduction of Salmonella in Post-Harvest Chilled Pork Head Meat Using Multiple Interventions

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### Objectives

*Salmonella* continues to be a leading cause of morbidity due to foodborne illness in the United States, accounting for 11% of the total annual foodborne illness cases (> 1 million). Pork is known to carry *Salmonella*, and it is critical that interventions be validated in simulated industry settings to demonstrate effective reductions of this pathogen. The purpose of this study was to determine the efficacy of various FSIS approved interventions on the reduction of *Salmonella* on post-harvest chilled pork head meat.

### Materials and Methods

Fresh pork cheek meat, that was chilled to 4°C, was inoculated with a 5-strain cocktail of Rifampicin Resistant *Salmonella* strains (*S. Newport* T1–473, *S. Typhimurium* R1–089, *S. Enteritidis* T1–496, *S. Montevideo* 11TTU382B, and *S. Anatum* 11TTU158B). Pork samples were dipped into a *Salmonella* solution of approximately 7.00 Log<sub>10</sub> CFU/ml for a final inoculated concentration of nearly 5.00 Log<sub>10</sub> CFU/cm<sup>2</sup> on the pork surfaces. Interventions tested in this study included: 1) Sulfuric acid and sodium sulfate (pH 1.3), 2) Peracetic acid (350 ppm), 3) Lactic acid (3%), 4) Citric acid (1.3%), 5) Hypobromous acid (300 ppm), 6) Lauramide arginine ethyl ester (200 ppm), 7) Peracetic acid (400 ppm) with 2% acetic acid, and 8) Sulfuric acid and sodium sulfate (pH 1.3) combined with peracetic acid (350 ppm). Treatments were prepared according to manufacturers' recommendations to desired concentrations and confirmed using a pH meter, chemical titration and test kits specified for each intervention prior to treatment of the pork meat. A commercial CHAD cabinet (CHAD Equipment LLC., Olathe, KS., United States) was used to apply individual treatments at ambient temperature (21°C)

at a speed of 30.5 cm/2.5 sec at a pressure of 275.8 kPa. *Salmonella* on the pork was enumerated before treatments, and 5 min and 24 h after treatment. *Salmonella* was enumerated on Tryptic Soy Agar modified to have a concentration of 100 mcg/mL of rifampicin within agar solution. Each experiment was replicated 3 times and statistically analyzed using ANOVA and pairwise *t* tests.

### Results

A *P*-value of 0.1 was used to determine significance during statistical analysis. Five-min post treatment *Salmonella* reductions showed significant reduction with the application of sulfuric acid and sodium sulfate combined with peracetic acid with a 1.71 Log<sub>10</sub> CFU/cm<sup>2</sup> reduction (*P* = 0.07). After 24 H post treatment showed significant *Salmonella* reductions with sulfuric acid and sodium sulfate combined with peracetic acid (3.98 Log<sub>10</sub> CFU/cm<sup>2</sup> reduction; *P* < 0.001), peracetic acid (3.43 Log<sub>10</sub> CFU/cm<sup>2</sup> reduction; *P* < 0.001), lactic acid (3.06 Log<sub>10</sub> CFU/cm<sup>2</sup> reduction; *P* < 0.001), sulfuric acid and sodium sulfate (2.83 Log<sub>10</sub> CFU/cm<sup>2</sup> reduction; *P* < 0.001), water (2.06 Log<sub>10</sub> CFU/cm<sup>2</sup> reduction; *P* < 0.001), lauramide arginine ethyl ester (1.71 Log<sub>10</sub> CFU/cm<sup>2</sup> reduction; *P* < 0.001), hypobromous acid (1.69 Log<sub>10</sub> CFU/cm<sup>2</sup> reduction; *P* < 0.001), and citric acid (1.64 Log<sub>10</sub> CFU/cm<sup>2</sup> reduction; *P* < 0.001).

### Conclusion

It is pivotal for the industry to validate the efficacy of antimicrobial interventions in an industry setting to demonstrate their effectiveness. The results of this study indicate that the application of sulfuric acid and sodium sulfate combined with peracetic acid reduce *Salmonella* significantly in chilled pork and could improve the safety of pork products.