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Project Title: Novel Electrolyzed Oxidizing Water Based Clean-In-Place Meat Grinder Sanitization Process Development and Optimization

Presenter: Ravi Jadeja and Yen-Con Hung
Presenters email address: raviraj.jadeja@gmail.com
Mailing address: University of Georgia
Department of Food Science & Technology
Griffin, GA 30223

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Objective: This study was designed to develop and optimize an electrolyzed oxidizing (EO) water based Clean-In-Place method for meat grinders.

Experimental Design & Analysis:

In this study, effectiveness of EO ice treatment to reduce/ eliminate cross-contamination during beef grinding operation was measured. In each study, beef grinders were spiked with the targeted pathogens by direct spot inoculation or through processing pre-inoculated beef pieces (2 X 200g) to build up the contamination in the grinders. This experiment was conducted in three parts; 1) Optimum amount (250, 500 or 1000g) of EO ice (Prepared from 200 mg/L chlorine containing EO water) to reduce *Escherichia coli* O157:H7 from inoculated meat grinders, 2) Antimicrobial potential of various combinations of EO ice (1000 g) and EO water (200, 400 or 600 ml of 150 mg/L free chlorine EO water) to reduce pathogen from inoculated meat grinder and 3) Efficacy of EO ice+ EO water treatment to reduce *E. coli* O157:H7 or *Salmonella* Typhimurium DT 104 from the meat grinders inoculated by processing beef containing approximately 6 or 3 log CFU/g pathogen. After each treatment, five 200 g uninoculated beef pieces were ground and ground samples were collected. Each sample was individually quantitatively analyzed for the presence of the targeted pathogens. Efficacies of EO ice based treatments were compared with deionized water ice (DI ice) and no treatment controls.

Key Results:

In the first set of experiments, 1000 g EO ice was found optimum and cross-contamination ranging from 3.29 to 1.92 log CFU/g for samples 1 to 5, respectively. EO ice and EO water combination treatments further decreased *E. coli* O157:H7 cross-contamination and 1000 g EO ice with 600 ml EO water treatment was found most effective and significantly reduced *E. coli* O157:H7 in all ground beef samples (2.43 to <1 log CFU/g) than the similar DI ice+ DI water treatments (3.46 to 2.07 log CFU/g). In the last part, when grinders were inoculated with beef spiked with low levels of pathogens, 1000 g EO ice +600 ml EO water treatment completely eliminated *E. coli* O157:H7 and *S. Typhimurium* DT 104 cross-contamination from grinders. Recoveries from the grinders inoculated with higher level of pathogens were 3.52 to <1 and 3.06 to <1 log CFU/g in ground beef samples 1 to 5 for *E. coli* O157:H7 and *S. Typhimurium* DT 104, respectively.

Industry Application:

The EO ice treatment in combination with EO water has potential to reduce cross-contamination and could serve as an easy to apply CIP treatment to improve overall safety of ground beef.

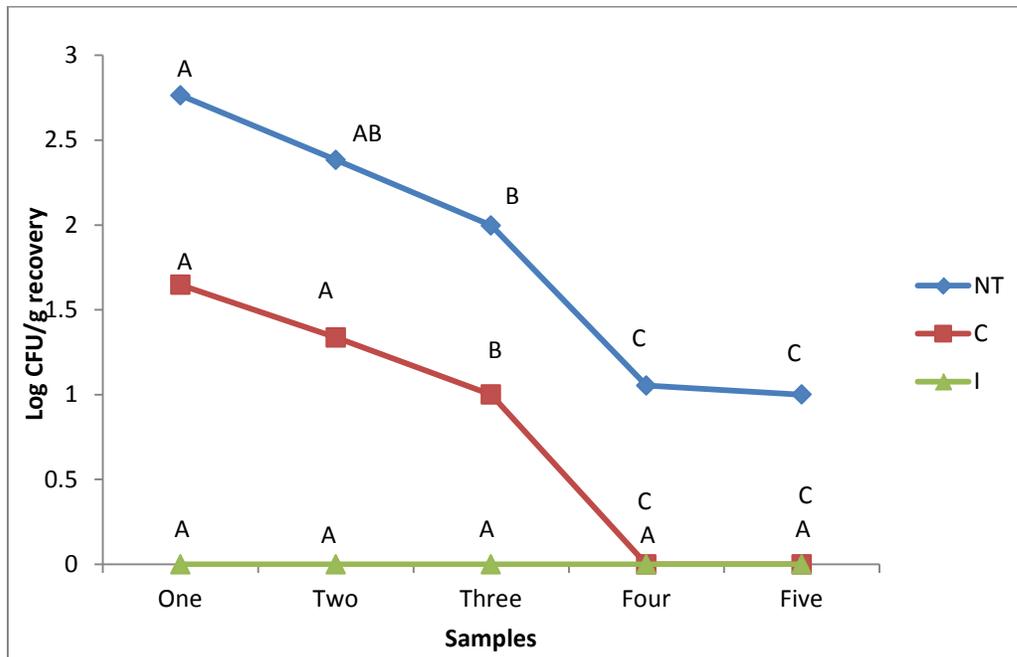


Figure 1: Efficacy of EO water ice to reduce low levels of *E. coli* O157:H7 from the beef grinder
NT: no treatment, C: 1000 g DI water ice +600 ml DI water and I: 1000 g EO water ice +600 ml EO water
A-C, means bearing with no common letter for each treatment are significantly different ($P \leq 0.05$)