

# AN EVALUATION OF SODIUM FERRATE AS A GREEN PROCESSING CHEMISTRY

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## I. OBJECTIVES

Ferrate (VI) is an oxidized state of iron with oxidation-reduction capacity superior to all other commercial chemical oxidizers and disinfectants used in wastewater treatment. Ferrate can be produced from relatively inexpensive commercial chemicals: trivalent ferric chloride (FeCl<sub>3</sub>), sodium hypochlorite (NaOCl), and sodium hydroxide (NaOH); sodium ferrate (Na<sub>2</sub>FeO<sub>4</sub>), sodium chloride salt (NaCl), ferric hydrate (Fe(OH)<sub>3</sub>), and water are the odorless reaction products. The objective of this research was to determine the efficacy of sodium ferrate (SF) tested using a commercial electrostatic misting system and boneless, skinless chicken thighs.

## II. MATERIALS AND METHODS

An inoculum was made to approximately 5 log CFU/mL of *Salmonella* Typhimurium (resistant to rifampicin) in phosphate buffered saline. Thigh meat was aseptically cut into 100 g samples then spread on each side with 10<sup>5</sup> CFU per sample using a sterile cell spreader. Samples were aseptically stored for 45 min for *Salmonella* attachment. After 45 min, all samples ( $n = 32$ ) were randomized and assigned to 4 treatments. Samples from 3 treatments passed through an electrostatic misting system treated with: deionized water (DI) positive control, DI + 0.15% SF, or DI + 0.30% SF for 15 s. The fourth treatment received no electrostatic misting. After treatment, samples were stored in sterile bags at 4°C for 2 h then diluted in 100 mL of buffered peptone water and stomached for 1 min. Next, a 20 mL aliquot was removed and diluted in 80 mL of buffered peptone water. Duplicate 10<sup>-1</sup> serial dilutions were made in phosphate buffered saline, then 50 µL amounts were automatically spiral plated onto xylose lysine Tergitol 4 agar containing 20 µg/mL rifampicin. Plates were incubated at 37°C for 24 h, and then colonies were counted and CFU/g calculated.

## III. RESULT

Both 0.15% and 0.30% SF significantly ( $P < 0.0001$ ) reduced *Salmonella* recovery by 0.65 and 0.89 log CFU/g, respectively, as compared to NC. However, levels of *Salmonella* recovered between 0.15% and 0.30% treatments were not significantly different ( $P = 0.4267$ ).

## IV. CONCLUSION

Further investigation will elucidate the antimicrobial properties of SF using various application systems in poultry processing, and measure meat quality attributes after treatment with ferrate.

Keywords: antimicrobial, ferrate, green chemistry