

Efficacy of Chlorine Dioxide Gas Against *Salmonella* & *E. Coli* O157:H7 on
Freshly Harvested Tomatoes & Cantaloupes
Alison Stargel

ABSTRACT

Fruit and vegetable consumption are a vital part of a healthy diet. However, produce has been implicated in numerous disease outbreaks. To ensure public health and safety, produce must be free of microbial pathogens. Thus, the effective disinfection of produce is an essential priority. In this study, a novel gaseous chlorine dioxide delivery system was evaluated for the disinfection of bacterial pathogens inoculated onto cantaloupes and tomatoes. This procedure was also compared to the traditional washing of produce in dilute chlorine baths for the inactivation of the inoculated pathogens. The pathogens used for inoculation were *Salmonella enterica*, *Salmonella Saintpaul*, and *Escherichia coli* O157:H7. These pathogens were chosen based upon their prevalence on produce and have been implicated in outbreaks, hospitalizations, and illnesses. A total of six *Salmonella spp* strains and three *E. coli* strains were used for challenge studies. Tomatoes and cantaloupes were purchased at a local market in boxed containers. Produce was removed from containers, inoculated with the pathogen suspension, and then placed back into the containers. The boxed produce was then treated by exposure to the gaseous treatment for the specified time in an enclosed area. The chlorine dioxide was generated using a proprietary procedure. This involved the mixing of Fast Release Activator and Fast Release Precursor to generate the disinfectant gas. Chlorine dioxide generation was confirmed using chemi-indicator exposure coupons. Boxed tomatoes were treated for three hours and boxed cantaloupes were treated for six hours. Following treatment the produce was aired and the number of pathogens on treated and untreated produce was determined. Based on the obtained data the chlorine dioxide treatment consistently demonstrated excellent disinfection properties. All pathogen-produce combinations treated with chlorine dioxide gas showed significant reductions in bacterial populations (>99.9%). The average percent reduction for cantaloupes inoculated with *Salmonella spp.* or *E.coli* O157:H7 was 99.93%. Tomatoes inoculated with *Salmonella spp.* demonstrated an average 99.96% reduction after treatment whereas those inoculated with *E. coli* O157:H7 showed a 99.97% average reduction. For chlorine washes, inoculated cantaloupes were placed into 30 gallons of water with 200ppm of total free hypochlorite and continuously agitated for three minutes. This treatment resulted in average percent reductions in the number of pathogens on the produce surface by an average of 89.0%. The effectiveness of chlorine dioxide gas on produce when compared to the traditional chlorine bath renders this novel disinfection process a viable option for ensuring the safety of produce.

