"Effect of novel Ozone Intervention in the Reduction of *Salmonella* and Shiga Toxin Producing *Escherichia coli* (STEC) in Beef Chuck trim."

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Introduction

There are some foodborne Pathogens associated with meat products, those that are of interest to the industry and regulators include: Salmonella and the Shiga toxin-producing E. coli (STEC) (Escherichia coli O157: H7, O26, O103, O45, O111, O121, and O145). Salmonella is one of the most common foodborne pathogens in the United States, causing over 1 million illnesses per year (Scallan et al., 2011).

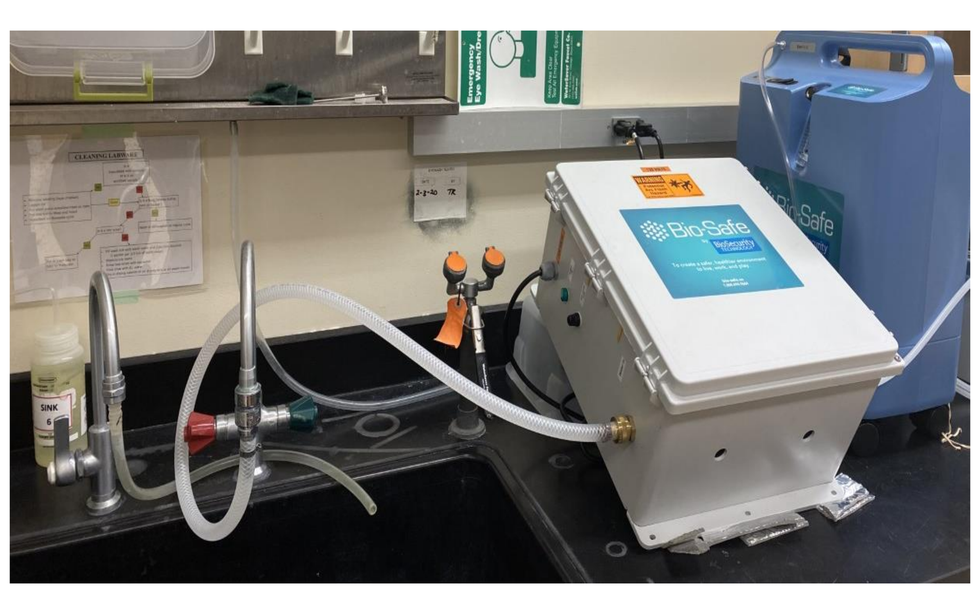
Ozone has the ability to oxidize and destroy membrane components in certain microorganisms (bacteria, fungi, viruses and parasites) causing their deaths, and changes in DNA .

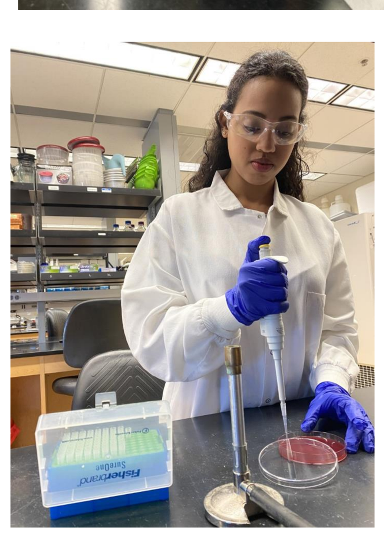
Objective

Determine the best time and method of ozone application in beef chuck trim samples for the reduction of *Salmonella* and Shiga toxin producing *Escherichia coli* (STEC).

Statistical analysis

- The R project.
- Completely randomized design.
- Experimental Unit: beef chuck trim cubes.
- Fixed effects treatment method and treatment Time. With repeated time measures at 0 and 24 hours.
- Posthoc test : pairwise T-test with bonferroni correction.





Materials and methods

- Treatments: Spray, Immersion
- Bacteria: *Salmonella,* STEC's
- Repeated measurements over time (0, 24h)
- Intervention Times:

a) Before Intervention

b) 5 seconds intervention

c) 10 seconds intervention

d) 15 seconds intervention

e) 20 seconds intervention

STEC SEROGROUP	CODE	SHIGA TOXIN	SOURCE
O26	ECRC 0.1302	+	Bovine
O45	ECRC 2.1064	-	Bovine
O103	ECRC 97.1377	+	Bovine
O111	ECRC 3.1009	+	Bovine
O121	ECRC 3.1064	-	Human
O145	ECRC 9.0538	+	Ground Beef
O157:H7	ATCC 51657	+	Bovine

Figure 1. Strains of *Escherichia coli.*

PATHOGEN	STRAIN	CODE	SOURCE
Salmonella	*Typhimurium*	BAA712	Human
Salmonella	*Newport*	ATCC 6962	Human
Salmonella	*Enteritidis*	ATCC 31194	Human

Figure 2. Strains of *Salmonella.*

- *Salmonella* and STEC isolates were initially enriched in 3 ml of brain heart infusion broth (BHI) and incubated at 37°C for 24h. A cocktail was made with *Salmonella* and STEC. Chuck trim meat cubes of 2x2x2 cm were inoculated. The meat cubes were allowed to rest for 5 minutes as an attachment period. The pieces of meat were placed in 24 oz Whirlpack bags. A total of 25 ml of BPW were added to each bag and homogenized in a stomacher at 230 RPM for 1 minute. Samples were serially diluted and plated. Colonies were counted and transformed into log CFU/cm2 for statistical analysis.

Results

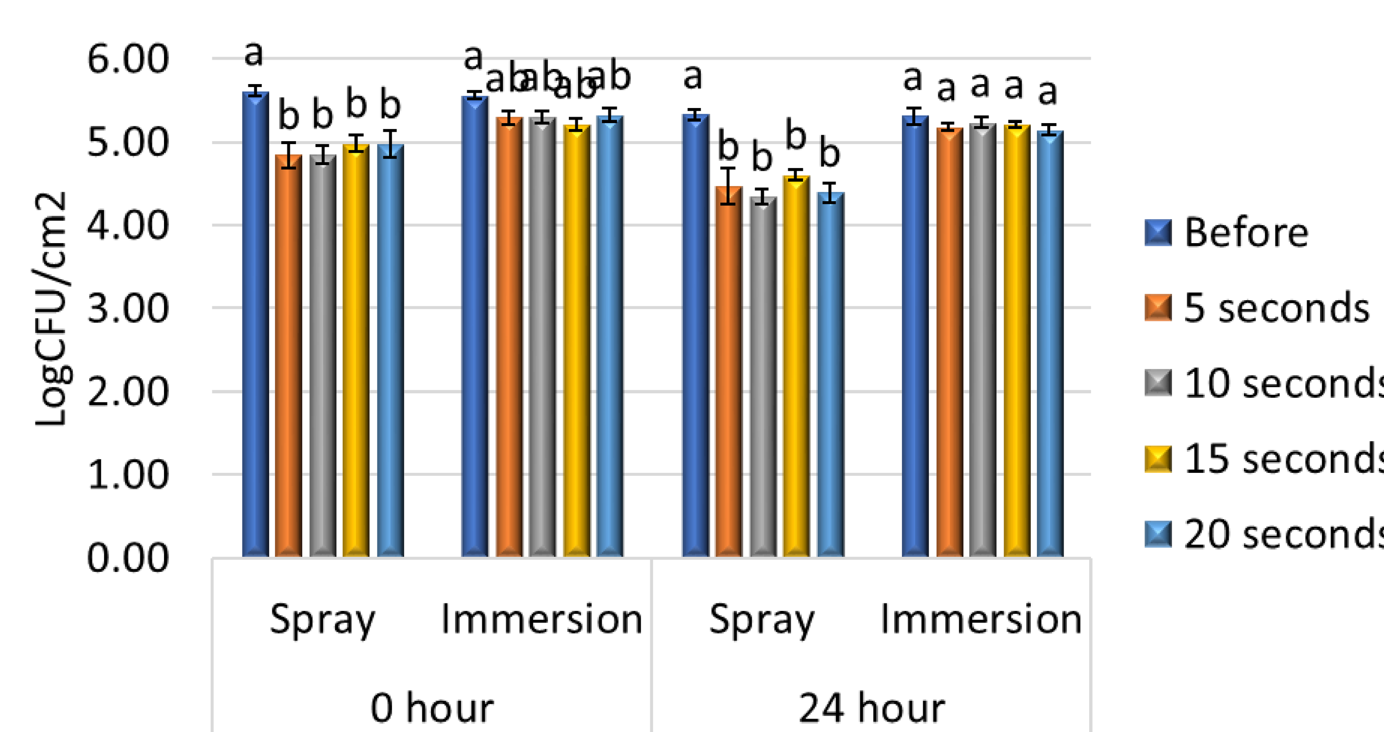
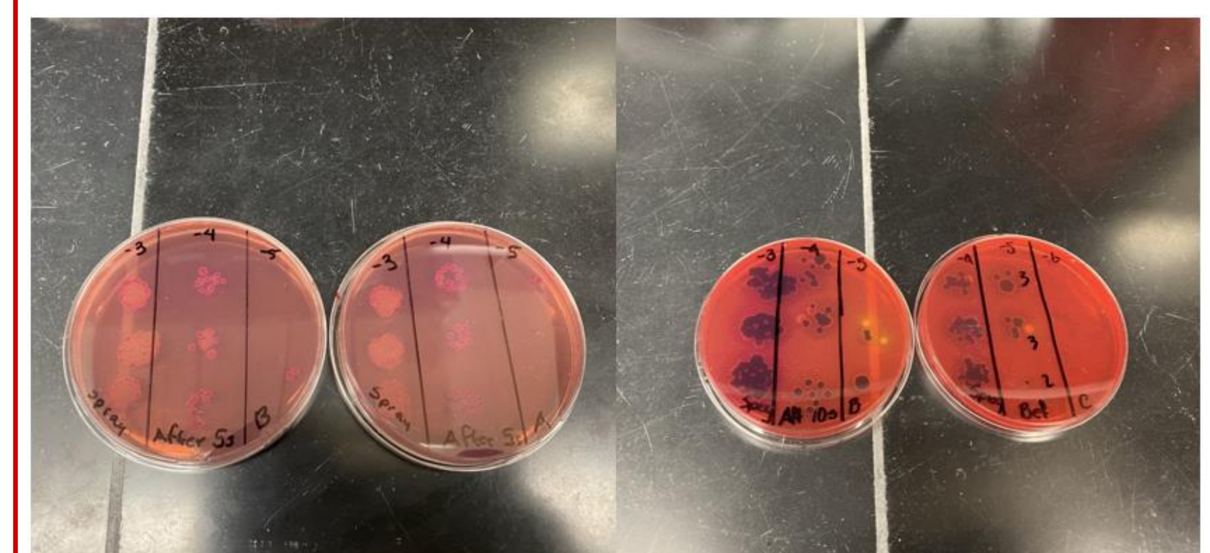


Figure 3. Efficiency of ozone application in pieces of meat inoculated with STEC.

Figure 4. Efficiency of ozone application in pieces of meat inoculated for *Salmonella.*



STEC'S

SALMONELLA

The spray intervention achieved a significant reduction after 5s of treatment for Salmonella and STEC. No significant reduction in process was observed by immersion in both *Salmonella* and STEC. These results demonstrate that an ozone intervention alone is not capable of significantly reducing the presence of the pathogens analyzed in the pieces of meat. 24 hours after treatment, the residual effect was verified and a greater reduction was observed with the spray method.

Conclusions

The application of ozone without the help of other interventions does not prove to be very efficient, taking into account the quantity of microorganisms inoculated in the pieces of meat; however, it is a very helpful alternative in the industry, supporting in conjunction with other interventions such as the application of hot water, lactic acid, among others. The application of ozone has helped decrease the presumed positives of the presence of microorganisms in the corpses and this is possible because ozone has the ability to denature the DNA of the bacteria.

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