

BEEF INDUSTRY SAFETY SUMMIT
March 4-6, 2014
Dallas, TX

Project Title: Efficacy of Detergent and Quaternary Ammonium Sanitizer on Shiga-toxin Producing *Escherichia coli* Attached to Stainless Steel

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Category: Post-harvest Pathogen Reduction

Objective/Hypothesis: The objective was to determine efficacy of detergent and quaternary ammonium based sanitizer (QAS) against STEC attached to stainless steel coupons. Understanding how STEC from serogroups O26, O45, O103, O111, O121, O145 and *E. coli* O157:H7 grow and interact while in the food processing environment is important to food safety. We believe the efficacy of using both detergent and QAS against STEC on SS will vary depending on strain tested and will result in biofilm removal.

Experimental Treatments: Seven strains (one from each serogroup) previously determined to have a strong affinity for attachment and one strain determined to have a low affinity for attachment were used in this study. Strains were used to inoculate 2.2 cm x 2.2 cm stainless steel coupons in M9 minimal salt media and incubated at 25°C for 24 h. Coupons (n=5/strain) were rinsed to remove loosely attached cells and assigned to treatment (no treatment, control (water/water), detergent (detergent/water), sanitizer (water/sanitizer), or detergent/sanitizer combination. Treatments were applied by immersion with a contact time of 5 min for each step and a sanitizer concentration of 200 ppm. Coupons were rinsed, dried, and crystal violet was applied. Crystal violet was removed from the coupon and solution absorbance at 590 nm was measured.

Key Results: Significant differences ($p < 0.0001$) were found between treatments. All treatments significantly reduced bacteria present as compared to the untreated control. The detergent/sanitizer combination resulted in the largest reduction of attached bacteria and was significantly ($p = 0.018$) more effective than a control rinse of only water. Differences in strain ($p < 0.0001$) were also observed, although this was expected

as previous research has noted differences in ability to attach and form biofilms between strains.

How can this information be applied in the industry: These results show that a complete sanitation program including both detergent and quaternary ammonium based sanitizer can help to remove STECs attached to surfaces of stainless steel. This study used an approved sanitizer concentration for food contact surfaces and coupons were treated by immersion only. Further research is needed to understand how removal of these bacteria occur under varying environmental conditions, such as other equipment surfaces, varying temperatures, and when different concentrations of sanitizers are applied.

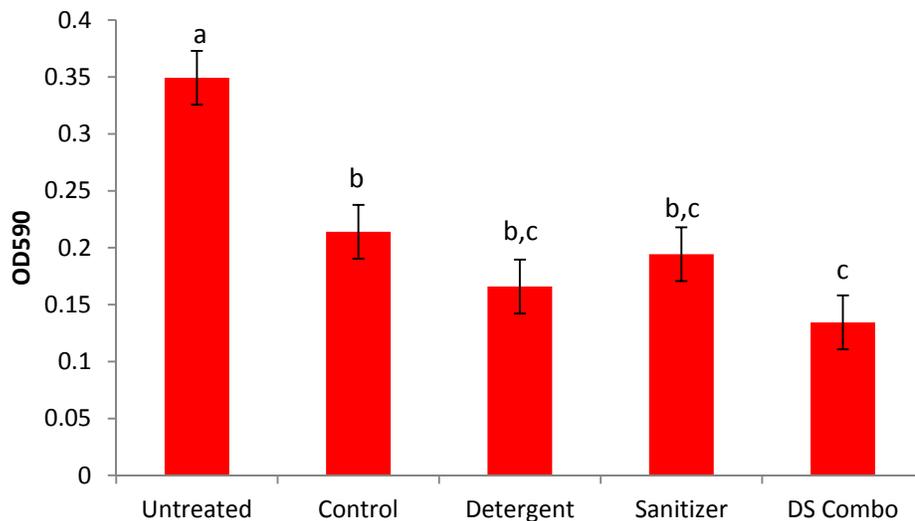


Figure 1: Treatment differences for STEC removal from stainless steel.