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FOOD SERVICE – MULTI-UNIT FRANCHISE, INDEPENDENT, AND HIGH-INDEPENDENT UNITS

Final Report on the EvaClean Environmental Sanitation Program

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ABSTRACT

To prevent foodborne illness, sanitation protocols must be implemented and followed in the food industry. Newer protocols have been developed to decrease the time employees spend sanitizing surface areas. EarthSafe Alternative Chemicals has created the protocol EvaClean Infection Prevention and Control Program that includes the use of an electrostatic sprayer and chlorine sanitizer. The aims of this study was to evaluate EarthSafe's newly designed sanitation protocol compared to those established currently in the industry. Preliminary and additional testing of the sanitizing protocols were tested for average log reduction and percent reduction by ATP surface testing at a total of five different food establishments – multi-unit franchise, independent, and high-independent – in the New Orleans, LA area. The electrostatic sprayer method was tested for reduced time by a current employee in one of the tested food establishments. Overall, EvaClean's sanitizer showed a consistent trend of the largest average log reduction and percent reduction, but no statistical difference between the sanitizers. The analysis of the additional testing conducted indicated that EarthSafe's sanitizing protocol sanitized irregular surfaces better than that of the compared protocol. EvaClean's method had a 70% time reduction for sanitizing.

INTRODUCTION:

Foodborne illness occurrence in the United States is an estimated 76 million cases with only 13.8 million confirmed.5 The cases of known etiology were roughly due to 30% bacteria, 67% viruses, and 3% parasites.4 Public health agencies that reported incidences of foodborne illness are documented through the reporting system FoodNet.5

Foodborne illness, also referenced as foodborne poisoning, is defined as any illness that resulted from the ingestion of contaminated food. Food is contaminated through a variety of mechanisms such as inadequate handwashing, cross-contamination, storage and cooking temperatures, and contamination of food by animal waste. Symptoms of foodborne poisoning severity vary from mild to severe. Common symptoms of foodborne poisoning are most associated with vomiting, diarrhea, fever, and aches are included. In severe cases of foodborne illness, hospitalization occurred. The United States Department of Agriculture (USDA) reported that 53,245 Americans were hospitalized and of those 2,377 deaths occurred.7 The group of highly infectious foodborne pathogens, commonly known as the "Big 5" include Norovirus, Salmonella Typhi, E.coli O157:H7 (Enterohemorrhagic or Shiga toxin-producing E.coli), Shigella spp. (causes shigellosis), and Hepatitis A virus.6 These pathogens are also easily transmitted to food by employees.

Annually, foodborne poisoning has cost the economy more than $15.6 billion.7 In the last decade, food establishments such as Nestle, Chipotle, and University

of Rochester have an estimated cost of $50 million, $53 million, and more than $400,000, respectively.8 The food industry has implemented various effective control measures to limit potential hazards. In the foodservice sector, Sanitation Standard Operating Procedures (Sanitation SOPs) and education of the food preparer and server on personal hygiene have minimized the risk of contamination of food and food contact surfaces. Sanitation is defined as the process where conditions are created that promote the safe production of food by cleaning and sanitizing through multiple steps. The five step process – pre-cleaning, wash, rinse, sanitize, and air dry – must be completed in order given for most effective outcome. Indicated in an establishment's Sanitation SOPs are daily protocols, before and during operations, that are conducted by an assigned employee(s) for the prevention of direct contamination.9 Proper hand washing techniques and usage of various types of food prep gloves as an additional sanitary barrier are crucial to the foods prepared.

Sanitation protocols commonly found in food establishments include the methods such as aerosol spray, manual removal, trigger spray, etc. EarthSafe Chemical Alternatives has recently developed an alternative method of sanitation that has improved the efficacy of the entire process in the reduction of infection rates.8 In EarthSafe's sanitation protocol, EvaClean Infection Prevention and Control Program, the Protexus cordless electrostatic spraying technology is combined with the sanitizer PURTABS (EPA registered). The touchless sanitizing and disinfection solution protocol has allowed for enhanced workflow, simplified training, and reduced costs. EvaClean has the ability to disinfect and sanitize triple the space with 80% reduction of time typically required.8

Electrostatics has been a proven technology in the agriculture and automotive industries and is now being integrated into healthcare settings.3 In reference to Coulomb's law, and electrostatic disinfectant application system has the ability to apply disinfectant more evenly to all surfaces.1,2 EvaClean's sanitation protocol has optimized adhesion and attraction of the positively charged electrostatic spray application and the negatively or neutral charge of surfaces. Research conducted by EarthSafe has indicated that their electrostatic spraying technology method has dramatically simplified training and maintenance, but also surfaces are disinfected and sanitized with a 360 coverage. EvaClean allows for the disinfectant to be more targeted, consistent coverage, and like two magnets, opposite charges are attracted with incredible force.

The purpose of this study was to evaluate the effectiveness of EarthSafe Chemical Alternatives sanitation procedure EvaClean on the reduction of bacteria of direct surface areas and time efficiency compared to current protocols in the food industry. The comparison of the three sanitizers were tested by the measurement of adenosine triphosphate (ATP) on surfaces. Two of the three tested sanitation protocols were used to measure the amount of time needed to complete the associated method.

MATERIALS AND METHODS:

The study took place was performed at multi-unit franchise, independent, and

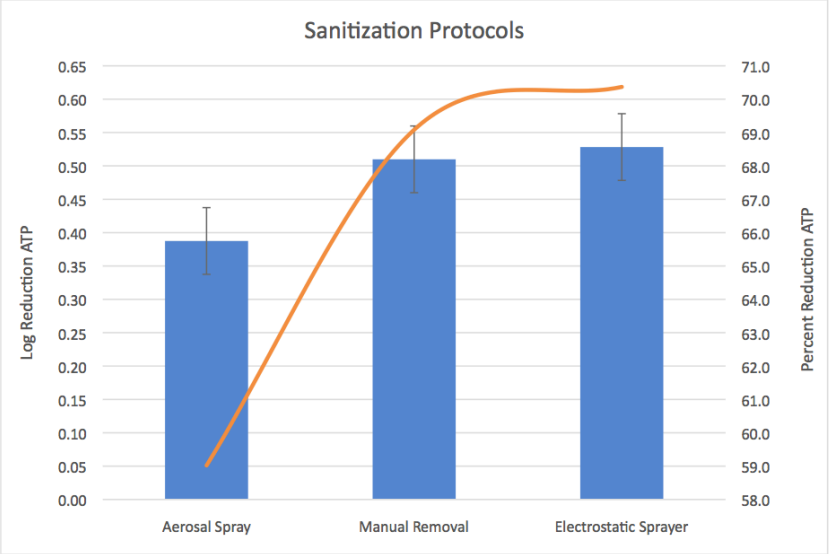
Protocol #	Method	Sanitizer
Protocol 1 (P-1)	Aerosol Disinfectant Spray	Ethanol + Alkyl Dimethyl Benzyl (ADB) Ammonium
Protocol 2 (P-2)	Manual Removal	Quaternary Ammonium Compounds (QAC)
Protocol 3 (P-3)	Electrostatic Sprayer	Chlorine

Table 1: Sanitation protocols

high-independent units in the Greater New Orleans Metro area. Preliminary testing was conducted at two different food service establishments to investigate the reduction of bacteria on direct surface areas on sanitation procedures before cleaning using three sanitation procedures – randomization of direct surfaces within the selected room/area were tested at different times for the protocols. The sanitation procedures included the sanitation methods and associated sanitizers (Table 1). Testing was also conducted to measure the amount of time used to complete two of the sanitization protocols' methods. Additional research was performed at three additional food service establishments in the same manner as previous testing.

Surface ATP test. In this experiment, pre- and post-ATP readings were collected and recorded according to the direct contact surfaces such as door handles, water fountains, scoops, table tops, etc. The materials needed to conduct the ATP surface test included Ultrasnap swabs (EnSure™ Monitoring System, Hygiena, LLC, Camarillo, CA) and Hygiena luminometer (EnSure™ Monitoring System, Hygiena, LLC, Camarillo, CA). To properly swab the surfaces, the swab was removed from tube and a 4 x 4 in area was swabbed with even coverage. To activate Ultrasnap, the swab was replaced in the tube, snap valve broken, and bulb squeezed twice to expel liquid into the tube. The tube was shook to remove air bubbles. To properly calibrate Hygiena luminometer, the instrument was powered and the automated 15 second calibration verification was performed. The tube was inserted into the luminometer and measurement of ATP from tested sample was initiated. Test results are conducted in 15 seconds.

Sanitation procedures. In the preliminary testing, the three sanitation protocols P-1, P-2, and P-3 were prepared in accordance to associated methods and sanitizers. In the additional testing, the two sanitation protocols P-2 and P-3 were prepared accordingly. For P-1, the mixture of Ethanol and ADB ammonium (Lysol ® Brand, Reckitt Benckiser LLC, Parsippany, NJ) was purchased from a local grocery store in New Orleans, Louisiana. To sanitize, the surfaces were sprayed at a distance of 6 to 8 in. for approximately 3 to 4 s or until covered holding the can in upright position. For P-2, the QAC sanitizer (Super San Food Service Sanitizer, Ecolab Inc., St. Paul, MN), sanitizer bucket (Kleen-Pail®, San Jamar, Elkhorn, WI), and disposable rag (Tork, SCA Tissue North America LLC, Philadelphia, PA). To sanitize, the disposable rag was rinsed in sanitizing solution for each usage. For P-3, the chlorine sanitizer (Puratabs, EarthSafe Chemical Alternatives, Brain-



*Error bars represent standard error of log reduction.

Figure 1: Sanitation protocol ATP surface test results*Error bars represent standard error of log reduction.

tree, MA) and electrostatic sprayer (Protexus PX200 Electrostatic Sprayer (ES), EarthSafe Chemical Alternatives, Braintree, MA) was received from the company EarthSafe Chemical Alternatives located in Braintree, Massachusetts. To sanitize, the chlorine sanitizer was prepared according to EvaClean Infection Control System (EarthSafe Chemical Alternatives, Braintree, MA) instructions, the electrostatic was turned to the on position, the nozzle was adjusted to the disinfectant setting, and tested contact areas were sprayed approximately 2 to 3 feet away from surface. The QAC and butane mixture, QAC, and chlorine sanitizer were diluted to a concentration of 1000, 200, and 100 ppm, respectively.

Time measurement test. The sanitation protocols that were measured for time included the methods for P-2 and P-3. An employee of the multi-franchise unit was selected and trained on the usage instructions of the electrostatic sprayer. The cleaning procedures of the company were carried out as normal. The employee was instructed to sanitize the surfaces that were sanitized in normal procedures by both sanitation methods. Total time was measured by a stopwatch and recorded.

ANALYSIS:

Surface ATP data were collected on paper forms and entered into Microsoft Excel 2016 (Redmond, WA, USA). The efficacy of the sanitation protocols for removal of ATP from direct surfaces was defined as the average log reduction in comparison to one another. A single factor ANOVA was used to assess the significance of the sanitation methods and associated sanitizers on log reduction of ATP. Analysis was performed in Microsoft Excel 2016.

RESULTS:

ATP surface test results. Preliminary testing: Data regarding the mean values of the average log reduction and percent reduction of the sanitizers (Figure 1) showed that P-2 and P-3 were similar with average log reductions of 0.51, 0.53 and reductions of 69.1%, 70.4%, respectively. The lowest value was found in P-1 with 0.39 average log reduction and 59.0% reduction. There was no statistically significant difference of the tested protocols.

Additional testing: Data regarding the mean values of the average log reduction and percent reduction of the sanitizers showed that P-2 had an average log and percent reduction of 0.23 and 40.6%, accordingly. The highest value was found in P-3 with 0.34 average log reduction and 54.4% reduction. There was no statistically difference of the tested protocols.

Time measurement test results. The results for time measurement are shown in Figure 2. It is apparent from the analysis that greater amount of time is required to complete P-2 than P-3 with 70% reduction.

CONCLUSION:

In conclusion, this study researched the sanitizers and methods of different sanitation protocols. ATP surface testing

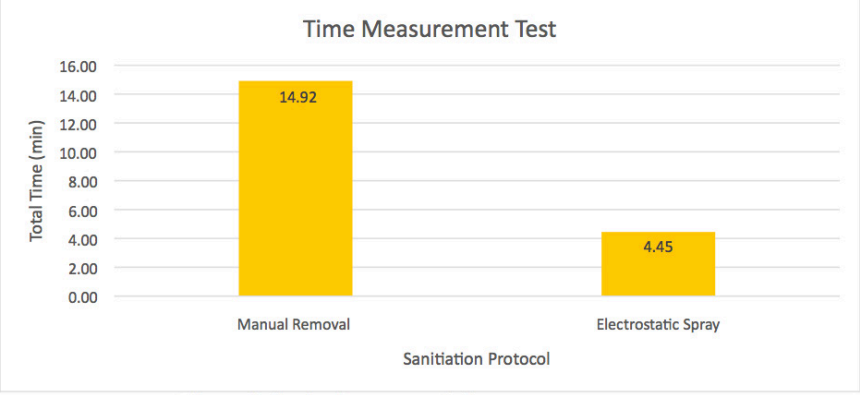


Figure 2: Sanitation protocol time measurement test.

was performed to evaluate the average log reduction and percent reduction of each sanitizer pre-cleaning. Analysis testing for both preliminary and additional research did not show a statistically difference with the sanitation protocols. The trend of the reduction between QAC and chlorine sanitizer was consistent. Chlorine sanitizer had the highest average log reduction and percent reduction of the protocols, slightly higher than that of P-2. This indicates that the chlorine sanitizer used reduced the amount of bacteria in accordance to current sanitizers used in the food industry or even greater. The analysis of the additional testing conducted indicated that the method of P-3 sanitized irregular surfaces better than that of P-2. Time was measured at one of the tested food service units by a current employee who completed standard store procedures of sanitation for both the manual removal and electrostatic sprayer methods. A 70% reduction of time was seen in the usage of the electrostatic sprayer. The significant time reduction of the electromagnetic sprayer coincides with previous research conducted by EarthSafe. Additional testing of this study was conducted to further collect data from other food establishments in the New Orleans Metro area for verification of a believed statistical difference between the manual removal and electrostatic sprayer protocols. Aerosol disinfectant spray was not further evaluated due to concerns with food safety. Employees of the tested food service units appreciated the concept of EarthSafe's electrostatic sprayer protocol and the projected time efficiency, but concerns were addressed in regards to the durability of the Protexus. Further evaluation will be tested at the high-independent unit by employees pre-, during, and post-production hours.

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