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HOW EFFECTIVE AND NECESSARY ARE SANITIZING SOLUTIONS IN RETAIL FOOD OPERATIONS?

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Sanitation regulations make a big point about the use of sanitizers in retail food operations, but there are essentially no government studies showing their effectiveness. I would like to report on studies that show that sanitizers really contribute little to the reduction of bacteria on a surface and should not be required.

When I do a typical validation of cleaning a surface, I let hamburger sit at room temperature for 24 hours so that the total plate count is approximately 10,000,000. Then, I smear this over a cutting board, for example, so that there are about 5,000,000 CFU per 8 square inches. Finally, I do a washing test to determine how effective a specific wash process is.

In a typical test, washing cutting boards in a 3-compartment sink, where the sanitizing concentration is 50 ppm fresh chlorine, I start with about 5,000,000 microorganisms per 8 sq. in. I pre-rinse and scrub with a brush and flowing water, and the count is reduced to 5,000 CFU / 8 sq. in. Then, I scrub the cutting board in the detergent sink, and there are about 50 / 8 sq. in.--a safe level. The rinse step may reduce them to about 30 / 8 sq. in. Whether I sanitize or air dry, the final count is about 3 to 5 / 8 sq. in.

When I have taken a fresh sanitizer solution of 50 ppm chlorine and wiped a cutting board that has been purposefully contaminated with raw chicken bacteria or old hamburger, I find that I have reduced the bacteria no more than 10 to 1. Mechanical removal of organisms using a clean rag accounts for most of this reduction. Sanitizers will not penetrate the organic material.

Commonly, when I measure the microorganisms in sanitizer buckets, I find more than 1,000 microorganisms per ml in the buckets. What has happened is that the organics from the food in the wiping rag, and maybe some detergent, have neutralized the sanitizer's ability to destroy microorganisms on surfaces. The food bacteria on the rag are in the neutralized sanitizer solution. It is common, then, to have the sanitizer rag in this ineffective solution spreading these mostly spoilage bacteria back onto a surface, rather than destroying them.

If one wants to use a sanitizer, one must start with a detergent solution of about one gallon, a rinse solution of a gallon of clean water, and then, the sanitizer needs to be in a squirt bottle, so that the free chlorine remains at full strength all day. The free chlorine, which is what destroys the bacteria, becomes useless very quickly when dirty rags or dirty hands are put into a solution. Remember, there was never any scientific justification for the rag in the sanitizer bucket. That was the opinion of one of the FDA writers of the 1976 FDA food code, Bill Wohlschlager, who decided that he never wanted to smell another sour rag in a foodservice operation. Therefore, he put the rag-in-the-sanitizer-bucket requirement into the code. This is typical of how our food code is written--no scientific foundation for most of the requirements.

Probably one of nicest experiments that points out what is really important in removing bacteria from a food contact surface is a report made for the PMI Food Equipment Group (Hobart) by NSF International (1992) on dishwashing machines. In this study, NSF used a Hobart low-temperature C-64A chemical sanitizer conveyor dishwasher to evaluate the reduction of *E. coli* on glasses run through the machine. In some of the experiments, the glasses were coated with a mixture of *E. coli* (ATCC 11229) and skim milk. In other experiments, they were covered with a mixture of the same *E. coli*, egg, cereal, and spinach.

In the first set of experiments, glasses, previously washed and sanitized, were soiled with *E. coli* and skim milk suspension, air dried, and run through the dishwasher under five different conditions.

1) In the first test, the wash, rinse, and sanitize compartments were operational, and detergent was used.
2) In the second test, the glasses were run through the wash cycle, and detergent was used.
3) In the third test, the glasses were run through the wash cycle, but no detergent was used.
4) In the fourth test, the glasses were run through the rinse cycle only.
5) In the fifth test, the glasses were sent through the final rinse cycle with sanitizer only.

In the second part of the study, the glasses were also soiled with an egg-cereal-spinach mixture inoculated with *E. coli* and run through the machine under the same five test conditions.

In the first test with inoculated skim milk on the glasses, using a swabbing technique to evaluate counts on the glasses, the initial count was 12,000,000 bacteria. Under all conditions, the bacteria came out at less than 1 per glass. In the second experiment using glasses with inoculated, dried, skim milk, any of the first four washing methods gave less than 1 *E. coli* per glass. When only the final rinse (i.e., chemical sanitizing) was used, all of the glasses had high *E. coli* counts on them, ranging from 20,000 to 100,000 bacteria on a glass. This points out that when removing dried, *E. coli*-contaminated skim milk from glasses, the final sanitizing rinse only reduces the bacteria by 1,000 per glass, and leaves plenty of pathogens, if they are present, on glasses.

In the experiments done with glasses coated with the egg-cereal-spinach mixture, whereby the glasses had approximately 60,000,000 bacteria per glass prior to washing, after washing in only the first section of the machine, the bacteria were undetectable. After washing without detergent in the first section, the counts ranged from less than 1 to 64 per glass. When the soiled glasses were run through the rinse cycle only, the counts ranged from about 33 to 1,000 per glass. When the glasses were run through the final sanitizer rinse (using 50 ppm chlorine sanitizer), the counts ranged from 1,000,000 to 8,000,000 per glass.

In summary, we have a critical situation regarding the food code in that the industry, historically, has believed that the food code provides scientific fact, when it has actually been written with little scientific validity for many requirements, to include all of the sanitizing requirements. Soap and water do all of the work in terms of removing bacteria--not chlorine / quat sanitizers. FDA personnel have specifically said that they understand this, but they like sanitizers, because they provide an "insurance factor." Actually, this takes employees' attention away from the critical control point--the detergent wash and rinse. People need to be taught that sanitizers by themselves do not make food contact surfaces safe. A soap-and-water wash and a clean-water rinse provide the necessary removal of bacteria from surfaces. If a facility wants to use sanitizer, it should not be considered a critical control procedure, but rather, a GMP (Good Manufacturing Practice), and should not be regulated at all. It should be up to the manager to decide if sanitizer is to be used.

In addition, all inspectors need to stop judging microbiological safety based on visual observation. Instead, they should use simple Petrifilm(TM) microbiological test kits to evaluate the actual cleanliness of a surface.

If inspectors do not have a micro-tipped thermocouple, a pH meter, airflow meter to evaluate cooling rates in refrigerators, and a Petrifilm(TM) (or equivalent) microbiological measuring system that they can bring to their unit evaluations, they are wasting everyone's time, because they have no idea how safe a food control procedure is, especially when they spend, say, two hours once a year at a facility.

HACCP is built on science. We have not been using science, especially with the FDA food code. The USDA, on the other hand, is trying to apply correct scientific information in specifying process performance requirements. This kind of thinking needs to be carried over into FDA, so that nothing is written into the code that is not justified by a published, scientific document that can be retrieved from a library and read. This way, one can find out the justification and necessity for a particular critical control to make food safe in retail food operations.

Reference:

NSF International. 1992 (January 24). Report on bacteriological swab tests. NSF. Ann Arbor, MI.