



Is It Time to Change How We Clean and Sanitize Food Contact Surfaces with Reusable Wiping Towels?

Each year, the U.S. Centers for Disease Control and Prevention (CDC) publishes a report summarizing domestic foodborne disease outbreaks based on the data collected by state, local, and territorial health departments.¹ The 2017 report (which reviewed data up to 2015) identified restaurants, specifically those with sit-down dining, as the most commonly implicated locations associated with foodborne disease outbreaks. A total of 779 outbreaks were reported in 2015, of which 469 were attributed to dining in a restaurant. In cases with a confirmed causative microorganism and where a contributing factor (e.g., cross-contamination via hands or surfaces like reusable towels/cloths, improper hot or cold holding, etc.) was identified, cross-contamination of ingredients was the most commonly cited factor, and *Salmonella* was the most commonly implicated pathogen. These cross-con-

Risk of cross-contamination could prompt shift to disposables

tamination events could probably be reduced with proper cleaning and sanitizing of food contact and nonfood contact surfaces.

The purpose of traditional interventions to prevent cross-contamination, like hand hygiene and hard-surface cleaning/sanitization, is to reduce the load of pathogenic microorganisms that can make humans sick. Reduction of those pathogens is intended to limit human exposure below the infectious dose. As hygiene interventions have evolved, some have been found to be too risky for continuation. For example, bar soaps and open-refillable bulk soap systems have been shown to harbor pathogens and cause outbreaks—thankfully, CDC no longer allows them in U.S. healthcare.² Another example of the evolution of an old hygiene paradigm is cloth hand drying in public restrooms, whereby a roll could allow for reuse of the same portion.

The 2017 U.S. Food and Drug Administration (FDA) Food Code allows for the use of reusable towels/cloths to wipe food contact surfaces and equipment, but the towels/cloths must be held between use in a chemical sanitizer solution at a concentration specified under Section 4-501.114.³ The procedures and requirements summarized here include the following:

1. Storage of clean, wet reusable towels/cloths in a container with appropriate sanitizer at the required concentration when not in use.
 - All wet reusable towels/cloths should be laundered or discarded daily. The wiping cloths may be laundered in a mechanical washer, a sink designated only for laundering wiping cloths, or a warewashing equipment (dishwasher)

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- or food preparation sink that is cleaned and sanitized before use.
- All wet reusable towels/cloths used for wiping surfaces in contact with raw animal foods should be stored and used separate from wet reusable towels/cloths used for other purposes [e.g., ready-to-eat (RTE) food prep surface].
 - All wet reusable towels/cloths and the sanitizer solution in which they are held between uses should be free from food debris and visible soil.
 - The containers of chemical sanitizer solutions used to store wet reusable towels/cloths between uses should be stored off the floor and used in a manner that prevents contamination of food, equipment, utensils, linens, and single-service/use articles.
2. Clean and sanitize food contact surfaces with reusable towels/cloths.
 - When cleaning a food contact surface, the wet towel should be removed from the solution and the excess solution wrung out of the towel.
 - The scraping of any visible food debris off the food contact surface.
 - Cleaning of the surface properly to remove organic material, including oil, grease, fat, and remaining food debris by applying an appropriate detergent on the surface and wiping the surface clean to sight and touch.
 - The application of a chemical sanitizer of adequate temperature and chemical concentration, allowing it to remain on the surface for the specific contact time [according to the manufacturer’s U.S. Environmental Protection Agency (EPA)-registered label].
 - Allowing the chemical sanitizer to air-dry on the surface or wiping the sanitizer off the surface using a reusable towel/cloth.
 3. Storage of clean, damp reusable towels/cloths in a container with appropriate sanitizer at the required concentration when not in use.

Presumably, storing the cloths in a sanitizer solution should destroy the organisms picked up during the cleaning process. However, organic material present in sanitizing solutions can potentially bind to the active agent, lowering the concentration below that which is effective. This allows organisms that are picked up during the wiping process to survive that treatment and be transferred to subsequent surfaces. Additionally, during the cleaning/sanitizing process, the towel being used may collect materials that would offer protection to the microbes in question. Fats and proteins may form films on the towels, which can sequester microorganisms, allowing them to “hide” from the molecules of active ingredient present in the solution. These films may also be transferred to subsequent surfaces during the cleaning protocols, thus transferring their filth as well as microorganisms. The food safety risk when using reusable wiping towel/cloths improperly is the following:

- Pathogenic bacteria survive or grow on the reusable, soiled (grease, oil, fats) tow-

el/cloth (because towels/cloths are not replaced and/or laundered daily), which then cross-contaminates previously cleaned food contact surfaces used to prepare RTE foods.

- Pathogenic bacteria survive or grow in the sanitizer because of a soiled solution (because it is not replaced with fresh sanitizer solution when soiled), which then cross-contaminates previously cleaned food contact surfaces used to prepare RTE foods.
- Pathogenic bacteria from raw animal food prep surfaces are transferred via a reusable towel to previously cleaned food contact surfaces used to prepare RTE foods because towels are not separated for use with raw animal food prep surface cleaning.
- Food contact surfaces are not cleaned and sanitized properly because reusable soiled towels/cloths are used to wipe surfaces without using a cleaner and sanitizer (some pathogenic bacteria like *Listeria* remain on the food contact surface).
- Food contact surfaces are not cleaned and sanitized properly because a reusable soiled towel/cloth is used to wipe surfaces after using a sanitizer only (no cleaner used, so some pathogenic bacteria remain on the food contact surface).
- Pathogenic bacteria survive or grow on the reusable clean towel/cloth, which then cross-contaminates previously cleaned food contact surfaces used to prepare RTE foods because sanitizer solution used was not established and then maintained at the proper concentration (replaced regularly) when storing towel/cloth.
- Pathogenic bacteria like *Listeria* survive on the reusable clean towel/cloth, which then cross-contaminates previously cleaned food contact surfaces used to prepare RTE foods

because the sanitizer solution selected, even when maintained at the proper concentration, does not kill all foodborne disease pathogens like *Clostridium perfringens* or norovirus.

- Pathogenic bacteria survive or grow in the solution, which then cross-contaminates previously cleaned food contact surfaces used to prepare RTE foods because towel/cloth type

-negative organisms, respectively, but may not accurately reflect the susceptibilities of all bacterial pathogens that may be present on surfaces. Additionally, as the EPA test utilizes a suspension assay, it cannot accurately reflect what will happen to microorganisms present on different surfaces such as tables, seats, or countertops. It is well established that microorganisms attached to surfaces exhibit greater resistance to sanitizing treatments than do their counterparts suspended in solution.^{9,10}

Also, by definition, a sanitizer cannot make antiviral claims or claims against spores; only EPA-registered disinfectants can. This means that most of these sanitizers will not be effective against viruses, such as norovirus or hepatitis A, or against spores like *C. perfringens*. Both norovirus and hepatitis A can be extremely resistant

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used (cotton) absorbs the sanitizer in solution during storage, reducing the effective concentration of the sanitizer in solution.

Chlorine and quaternary ammonium compounds (quats) are two common active ingredients used for food contact surface sanitation in retail food environments. Both are known to be less effective in the presence of hard water or organic soils, and especially when targeting bacteria dried onto surfaces.⁴⁻⁶ For example, the addition of just 1% milk (semi-skimmed) has been shown to dramatically reduce the activity of quat solutions.⁷ In addition, the EPA testing for food contact surface sanitizers does not require additional soil load be added to the surfaces being sanitized, thus approved sanitizers should only ever be used on clean surfaces.⁸ However, care does need to be taken to ensure that the cleaning agent used does not interfere with the sanitizers. For example, quats may be inactivated by binding with anionic surfactant-based soap residues.⁷

Additionally, not all microorganisms will even be susceptible to these sanitizers. Current EPA testing of food contact sanitizers requires a 5-log CFU reduction of *Escherichia coli* and *Staphylococcus aureus* in a 30-second suspension assay.⁸ Manufacturers of food contact surface sanitizers may test other organisms to add additional claims to their labels, but these are the only two required by federal regulations. *S. aureus* and *E. coli* do represent both Gram-positive and

to many antimicrobial treatments and are unlikely to be inactivated by common food contact surface sanitizers. CDC recommends a 1,000–5,000 ppm bleach solution to inactivate norovirus; however, this is much higher than what the EPA allows for sanitizing food contact surfaces (200 ppm).^{11,12} If an employee working while sick brings norovirus or hepatitis A virus into the kitchen and touches surfaces with their contaminated hands (a common contributing factor to foodborne disease outbreaks), it is unlikely that the cleaning and sanitation procedure will eliminate the viruses before cross-contamination occurs.

We also know that viruses can easily be transferred from contaminated surfaces onto previously clean surfaces by the towels/cloths used to clean and sanitize.¹³ One study found that typical cotton bar towels used by restaurants can remove approximately 3-log PFU but can transfer as much as 2-log PFU back to surfaces.¹³ Surveys of used cloths in food retail environments have shown them to be heavily contaminated with various bacterial species, with one study reporting that 74% of cloths ($n = 131$) used for cleaning in raw and prepared food spaces were contaminated with *E. coli*, *S. aureus*, *Enterococcus faecalis*, and/or *C. perfringens*.¹⁴ Specifically, *E. coli* was isolated from 74 cloths, with 25 of those carrying more than 5-log CFU. There is also evidence to suggest that this gets worse the longer the cloth is used.¹⁵ Single-use products (e.g., paper towels, wet wipes, etc.) avoid these issues by being discarded after each use.

The importance of breaking the chain of transmission of pathogens from environmental surfaces to individuals (analogous to breaking the chain of cross-contamination in foodservice) is not lost on healthcare practitioners where cleaning and disinfection of surfaces is critical to prevent the transmission of infectious diseases. Because of this, in part, an attempt to use alternative methods, including single-use disposable wipes to clean and disinfect surfaces, was established. The first EPA-approved germicidal wipe was introduced to the market in the late 1980s and quickly adopted by hospitals as an additional means to break the chain of infectious disease transmission from surfaces to patients and healthcare workers. For example, the use of single-use disposable wipes was one method found to be especially effective in removal of bacteria off surfaces by wiping down “high-touch” surfaces (surfaces that are touched often, such as digital devices, keyboards, etc.).¹⁶

While foodservice may not seem to have the same risk requiring a means to break the chain of disease transmission as hospitals and the healthcare industry, foodborne illnesses can be severe, and outbreaks continue year to year. The cost of these illnesses to the public is extremely high. The U.S. Department of Agriculture Economic Research Service estimates that foodborne illness represents a \$15 billion burden on the U.S. economy each year from deaths, medical costs, and lost productivity.¹⁷

To assess the important opinions of different foodservice food safety and local regulatory authorities for their perceptions of the risks associated with the use of reusable towels in foodservice, a survey was designed for each group and was open only to confirmed participants, based on solicitation to their respective organizations.¹⁸

Of the 45 food safety professionals who responded, 93% stated that their company allows the use of reusable towels; of these, 79% stated that their company requires Standard Operating Procedures (SOPs) on how to properly use and store reusable towels, and only 29% allow the use of synthetic fiber towels to be used once daily and then discarded. However, 88% reported that their companies allow reusable towels to be used again after laundering in the restaurant. Interestingly, of these, 60% require reusable towels to be stored separately if used for raw animal

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food prep, as prescribed by the FDA Food Code vs. RTE food prep, but 40% either did not have this requirement or did not know. More than half of those using reusable towels agreed that there was potential risk of cross-contamination, even when proper procedures were followed. Finally, of the 79% whose companies perform third-party audits of their retail foodservice establishments, 46% and 27% reported that they were aware of compliance issues of maintaining proper sanitizer concentrations or proper cleaning and sanitation using reusable towels, respectively, in 25% of these audits in the past 12 months; many also observed occasional or frequent repeat violations.

Of the 35 regulatory authorities who responded, 89% were from Texas, and 97% worked at a health department that allows the proper use of reusable towels, as described above. Thirty-four individuals agreed that there was a potential risk of cross-contamination, even when proper procedures were followed, and 91% often saw improper storage of reusable towels. Many offered suggestions for improvements, whereas almost an equal number did not believe that improvements were needed. Finally, of the 46% who recalled past health inspections of foodservice establishments in the last 12 months, 39% and 46% were aware of compliance issues of maintaining proper sanitizer concentrations or proper cleaning and sanitation using reusable towels, respectively, in 25% of these inspections in the past 12 months; many also observed occasional or frequent repeat violations.

The call to action of this article is to of course know and use the proper procedures defined in the FDA Food Code when using reusable towels/cloths to clean and sanitize food contact surfaces and therefore reduce the risk of cross-contamination (including the critical separation of use and storage of reusable towels/cloths between raw animal and RTE food prep contact surface cleaning). However, it is self-evident to those who have used reusable towels/cloths in their cleaning and sanitation SOPs in foodservice and who have struggled with compliance with the requirements (even without the information in this article) that improvements could be made. These improvements (and research needed to validate the prevention of cross-contamination) could include:

- Single-day use disposable wiping towels/cloths that do not absorb all current sanitizers in use
- Reusable towels/cloths that prohibit biofilms/grease/oil/fats and pathogen survival on surfaces (antimicrobials built into the towel/cloth)
- Validated towel/cloth laundering methods that eliminate biofilms/grease/oil/fats and kill pathogens
- Food contact surface sanitizers (used to store towels/cloths) that kill all foodborne disease-causing pathogens including (but not inclusive of all) norovirus, *C.*

perfringens, *Listeria*, hepatitis A, *Campylobacter*, and *Salmonella*

- Sanitizer solution concentration-indicator technology or better methods to alert users when the sanitizer concentration has dropped below required levels
- Single-use disposable wipes that kill all foodborne disease-causing pathogens for use on high-touch surfaces and lightly soiled food contact

surfaces as replacements for reusable towels/cloths (it is likely that safe use of reusable towels/cloths would still be needed for cleaning heavily soiled equipment and other surfaces in foodservice establishments)

- Improved color-coded storage of reusable towels/cloths for cleaning raw animal food prep surfaces (e.g., yellow container and yellow towels/cloths for raw chicken) and RTE food prep surfaces (white container and white towels/cloths)

In a future article, we will review and discuss these and other methods the foodservice industry is using to ensure all food contact surfaces are cleaned and sanitized properly to prevent cross-contamination and foodborne disease outbreaks. ■

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