IndoorAirHygiene
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# Market Opportunity: Cleaning/Remediation Protocol Changes

## Executive Summary

Cleaning and disinfecting protocols are largely driven by EPA guidelines and approvals. The first step is to clean soiled surfaces. Then decontamination can proceed. All of the 374 EPA SARS-approved disinfectants are certified for hard nonporous surfaces; only 2 of these 374 disinfectants are EPA approved for porous (soft) surfaces as well (see EPA List N Approved Disinfectants). Demands for cleaning and disinfecting services will increase; demands for the time required to clean and disinfect will decrease, and the demand for trained/certified technicians will increase.

## Explanation of the Science

Cleaning and remediation protocols are largely focused on hard, non-porous surfaces. The EPA distinctly defines three levels of decontamination: sanitizing, disinfection, and sterilization. Before any decontamination process, the surface must be cleaned first. Decontamination is the process of removing or neutralizing hazardous substances.

For soft surfaces decontamination, laundering at 160°F for at least 25 minutes is the first option (see CDC Laundering Guidelines). If the surface cannot be laundered, then cleaning the surface with a hydrogen peroxide-based disinfectant is the only current solution.

> Cleaning involves removing organic and inorganic particulate from the surface. For a surface to be either disinfected or sterilized it must have been properly cleaned first.

Sanitizing reduces the bacteria population on the inanimate environment by significant numbers but does not destroy or eliminate all bacteria.

Disinfection reduces the number of microbes to levels that won't cause infection. Disinfection produces surfaces safe to contact for non-sterile body spaces and mucous membranes. Bacterial and fungal spores are not destroyed by typical disinfection processes. Disinfection can be accomplished by methods including chemicals, metals, heat, and UV radiation.

Sterilization is any process that eliminates, removes, kills, or deactivates all forms of life present on surfaces.

Log reduction is a measure of how thoroughly a decontamination process reduces the concentration of a contaminant. It is commonly used in the medical and laboratory decontamination industry. A log reduction increment of 1 corresponds to a reduction in concentration by a factor of 10.

| Log reduction | Percentage |
|---|---|
| 1-log reduction | 90% |
| 2-log reduction | 99% |
| 3-log reduction | 99.9% |
| 4-log reduction | 99.99% |
| 5-log reduction | 99.999% |

## Different Disinfectant Chemical Platforms (see CDC Disinfection in Healthcare Facilities)

Alcohol – 8 of the 374 EPA SARS-approved disinfectants are alcohol-based. Refers to two water-soluble chemical compounds—ethyl alcohol and isopropyl alcohol—that have generally underrated germicidal characteristics. These alcohols are rapidly bactericidal rather than bacteriostatic against vegetative forms of bacteria; they also are tuberculocidal, fungicidal, and virucidal but do not destroy bacterial spores. Their cidal activity drops sharply when diluted below 50% concentration, and the optimum bactericidal concentration is 60%–90% solutions

in water (volume/volume). Alcohols are flammable and consequently must be stored in a cool, well-ventilated area. They also evaporate rapidly, making extended exposure time difficult to achieve unless the items are immersed.

Chlorine Compounds – 56 of the 374 EPA SARS-approved disinfectants are chlorine-based. Hypochlorites, the most widely used of the chlorine disinfectants, are available as liquid (e.g., sodium hypochlorite) or solid (e.g., calcium hypochlorite). The most prevalent chlorine products in the United States are aqueous solutions of 5.25%–6.15% sodium hypochlorite, usually called household bleach. They have a broad spectrum of antimicrobial activity, do not leave toxic residues, are unaffected by water hardness, are inexpensive and fast acting, remove dried or fixed organisms and biofilms from surfaces, and have a low incidence of serious toxicity.

Chlorine Dioxide is widely used for the treatment of drinking water. The molecule is an effective oxidizing agent and can disinfect surfaces and air. High concentrations can be explosive. Chlorine dioxide remains a dissolved gas in water; this mixture is used to disinfect agricultural products, kill bacteria on surfaces and in water, and as a deodorant powered by the off-gassing of $ClO_2$ from the water. No gaseous chlorine dioxide system is FDA cleared.

Hydrogen Peroxide - 87 of the 374 EPA SARS-approved disinfectants are chlorine-based. Literature contains several accounts of the properties, germicidal effectiveness, and potential uses for stabilized hydrogen peroxide in the health-care setting. Published reports ascribe good germicidal activity to hydrogen peroxide and attest to its bactericidal, virucidal, sporicidal, and fungicidal properties. Commercially available 3% hydrogen peroxide is a stable and effective disinfectant when used on inanimate surfaces. Hydrogen peroxide was effective in spot-disinfecting fabrics in patients' rooms.

Phenolics - 10 of the 374 EPA SARS-approved disinfectants are phenolic-based. Many phenolic germicides are EPA-registered as disinfectants for use on environmental surfaces (e.g., bedside tables, bedrails, and laboratory surfaces) and noncritical medical devices. Phenolics are not FDA-cleared as high-level disinfectants for use with semi-critical items but could be used to preclean or decontaminate critical and semi-critical devices before terminal sterilization or

high-level disinfection. The use of phenolics in nurseries has been questioned because of hyperbilirubinemia in infants placed in bassinets where phenolic detergents were used.

Quaternary Ammonium Compounds - 203 of the 374 EPA SARS-approved disinfectants are quaternary ammonium-based. The quaternary ammonium compounds are widely used as disinfectants. The quaternaries are good cleaning agents, but high water hardness and materials such as cotton and gauze pads can make them less microbicidal because of insoluble precipitates or cotton and gauze pads absorb the active ingredients, respectively. The quaternaries commonly are used in ordinary environmental sanitation of noncritical surfaces, such as floors, furniture, and walls. EPA-registered quaternary ammonium compounds are appropriate to use for disinfecting medical equipment that contacts intact skin.

Thymol - 5 of the 374 EPA SARS-approved disinfectants are thymol-based. Thymol is a constituent of oil of thyme, a naturally occurring mixture of compounds in the thyme plane. Thymol is an active ingredient in pesticide products registered for use as animal repellents, fungicides, medical disinfectants, tuberculocides, and virucides. Products are liquids applied by spray, mop, brush-on, wipe-on, aerosol, immersion, and spot treatment. Thymol is listed by the FDA as food for human consumption. They are considered Generally Recognized as Safe or GRAS (see EPA RED Facts – Thymol).

# Approved Cleaning/Disinfecting Methods (see CDC Cleaning and Disinfecting Protocols)

## Hard (Non-porous) Surfaces

- If surfaces are dirty, they should be cleaned using a detergent or soap and water prior to disinfection.
- For disinfection, most common EPA-registered household disinfectants should be effective.
    - Follow the manufacturer's instructions for all cleaning and disinfection products for concentration, application method and contact time, etc.

- Additionally, diluted household bleach solutions (at least 1000ppm sodium hypochlorite) can be used if appropriate for the surface. Follow manufacturer's instructions for application, ensuring a contact time of at least 1 minute, and allowing proper ventilation during and after application. Check to ensure the product is not past its expiration date. Never mix household bleach with ammonia or any other cleanser. Unexpired household bleach will be effective against coronaviruses when properly diluted.

## Soft (Porous) Surfaces

- For soft (porous) surfaces such as carpeted floor, rugs, and drapes, remove visible contamination if present and clean with appropriate cleaners indicated for use on these surfaces. After cleaning:
  - If the items can be laundered, launder items in accordance with the manufacturer's instructions using the warmest appropriate water setting for the items and then dry items completely.
    - Otherwise, use products that are suitable for porous surfaces.

## Electronics

- For electronics such as tablets, touch screens, keyboards, remote controls, and ATM machines, remove visible contamination if present.
  - Follow the manufacturer's instructions for all cleaning and disinfection products.
  - Consider use of wipeable covers for electronics.
  - If no manufacturer guidance is available, consider the use of alcohol-based wipes or sprays containing at least 70% alcohol to disinfect touch screens. Dry surfaces thoroughly to avoid pooling of liquids.

## Linens, Clothing, and Other Items That Go in the Laundry

- In order to minimize the possibility of dispersing virus through the air, do not shake dirty laundry.

- Wash items as appropriate in accordance with the manufacturer's instructions. If possible, launder items using the warmest appropriate water setting for the items and dry items completely. Dirty laundry that has been in contact with an ill person can be washed with other people's items.
- Clean and disinfect hampers or other carts for transporting laundry according to guidance above for hard or soft surfaces.

CDC does not yet recommend disinfectant fogging. "More research is required to clarify the effectiveness and reliability of fogging, UV irradiation, and ozone mists to reduce norovirus environmental contamination. (No recommendation/ unresolved issue)" (see CDC Summary of Recommendations for Environmental Control).

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