

Efficacy of Different Cleaning and Disinfection Methods against *Clostridium difficile* Spores: Importance of Physical Removal versus Sporicidal Inactivation.

W.A. Rutala, MF Gergen, DA Weber. Infect Control Hosp Epidemiol. 2012; 33(12):1255-8



BACKGROUND

The scientific evidence suggests that contamination of hospital environmental surfaces and hands of healthcare workers plays an important role in the transmission of *Clostridium difficile* (*C. difficile*). However, the most effective method to clean contaminated surfaces has not been determined.

PURPOSE

To test the effectiveness of liquid cleaner or disinfectant sprays and wipes against *Clostridium difficile* (*C. difficile*) spores and determine the importance of physical removal and inactivation.

METHODS

Formica surfaces were diagramed with the outline of five Rodac plates in a Z-shape and each template inoculated with approximately 4-5 log of *C. difficile* spores in a solution of trypticase broth containing 10% fetal calf serum to mimic conditions under which *C. difficile* spores are likely to be found (i.e. protein contamination). The surface was allowed to dry for more than 10 minutes. Disinfectants were applied using one of six methods: four spraying (nozzle held 6-8 inches from the surface) or two wiping (wiped in a smooth motion with approximately 1lb of pressure). After being allowed to dry, the surfaces were cultured with Rodac plates, the plates incubated and spores enumerated.

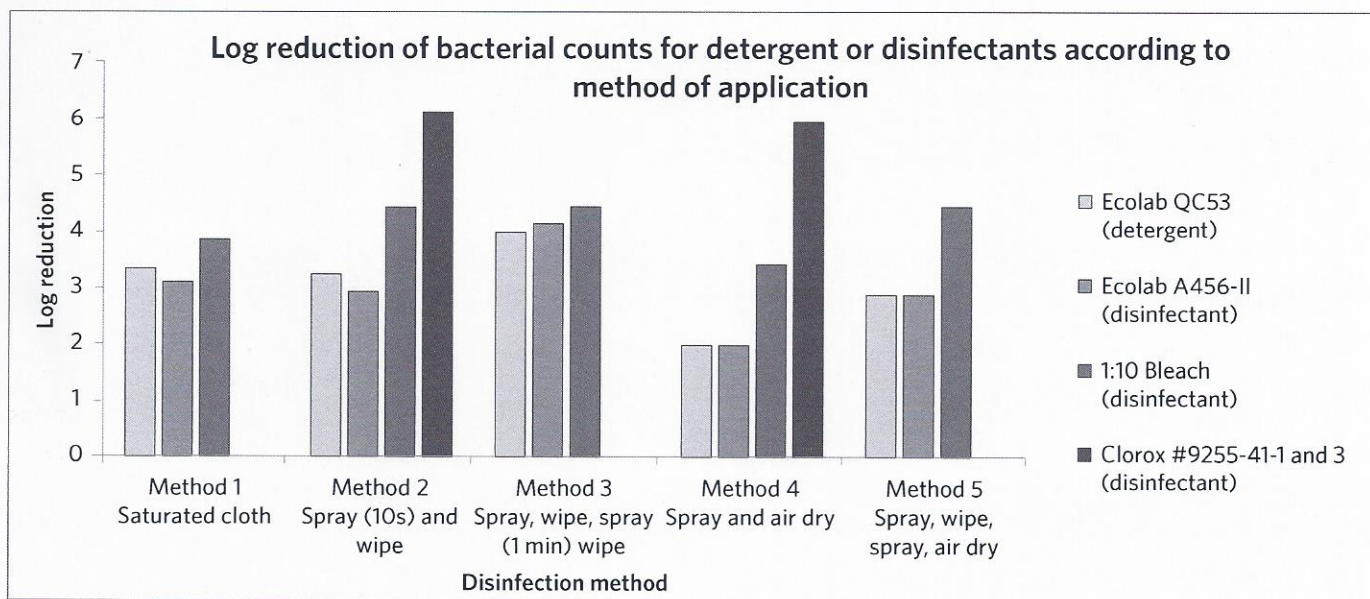
Six products (one detergent and five disinfectants) were used in the study:

Product Name	Active Ingredient	Category
Ecolab QC-53	No active disinfectant	Detergent
Ecolab A456-II	6.510% octyl decyl dimethyl ammonium chloride; 2.604% dioctyl dimethyl ammonium chloride; 3.906% didecyl dimethyl ammonium chloride; 8.680% alkyl (50% C14, 40% C12, 10% C16) dimethyl benzyl ammonium chloride	Disinfectant
1:10 Bleach	6% sodium hypochlorite	
Clorox #9255-41-1 and 3	4,000 ppm hypochlorous acid	
Kimtech One-Step Germicidal Wipe	4.4% hydrogen peroxide; 0.23% peracetic acid; excipient ingredients = 4.9% acetic acid	
Clorox Germicidal Wipe	0.55% sodium hypochlorite	

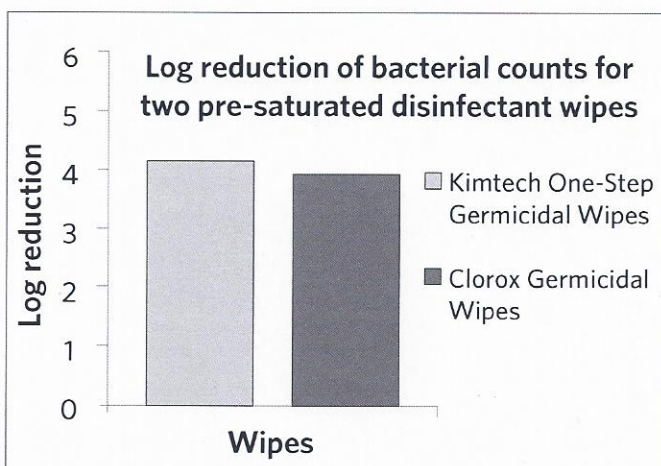
RESULTS

Liquid spray cleaners or disinfectants (Figure 1): Physical removal by wiping with a saturated cloth or after spraying is able to remove almost 3 log₁₀ units of *C. difficile* spores, even if a non-disinfecting product is used (Methods 1 and 2). Using a sporicidal disinfectant is such as the Clorox hypochlorous acid spray (#9255-41-1 and 3), the log reduction increases to around 6 log₁₀ (Method 2). A second spraying and wiping cycle further increases the log reduction by around 1 log₁₀ for the three products tested (Method 3). Dry times for all products that were wiped after application were around 2-6 minutes. Physical removal is not necessary to obtain high disinfection efficacy. Spray application of the Clorox hypochlorous acid sporicidal disinfectant and drying resulted in a 6 log₁₀ reduction in *C. difficile* (Method 4).

Adding an additional spray and wipe step prior to spraying and air drying resulted in an additional 1 log₁₀ unit reduction in *C. difficile* for the three products tested (Method 5). Dry times for products that were allowed to air dry were high - on the order of 28-40 minutes, times that are not practical in a hospital setting.



Pre-saturated wipes (Figure 2). Using pre-saturated sporicidal wipes resulted in an approximately 4 log₁₀ reduction for each of the products tested, both of which are advertised as sporicidal.



CONCLUSION

The study showed that *C. difficile* spores can be removed from an environmental surface by the physical action of wiping with even a non-disinfecting wipe. However, bacterial reductions are greater when sporicidal products are used, either by spraying and wiping or by spraying and leaving to dry. Because use of a spray alone does not remove dirt and debris and results in long dry times that are unacceptably high for routine hospital use, the authors concluded that *“the use of a wiping procedure with a sporicidal agent provides excellent removal and inactivation of spores and is an integral part of C. difficile control measures.”*



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