Three swipes and you’re out: How many swipes are needed to decontaminate plastic with disposable wipes?

Andrea E. Berendt, BMSc, a LeeAnn Turnbull, MLT, b Donald Spady, MD, c Robert Rennie, PhD, d and Sarah E. Forgie, MD e

Edmonton, Alberta, Canada

At our hospital, health care workers use commercially available wipes to reduce bacterial counts on plastic surfaces. The workers use the wipes in a cursory fashion—swiping objects once for one to two seconds. We sought to measure the ability of wipes to reduce bacterial counts when swiped across plastic surfaces using various routines.

**Key Words:** Infection/prevention and control; fomites; contamination.

Bacteria have been found on various plastic items in the hospital, including pagers and cell phones.1,2 At our hospital, health care workers are encouraged to clean these items with commercially available wipes, which have been shown to be effective in reducing bacterial counts when used as directed.1 However, we have observed health care workers using wipes in a cursory fashion, swiping objects only once for 1-2 seconds.

To evaluate the efficacy of these products when used in this manner, we carried out a pilot project to measure the ability of various wipes to reduce bacterial counts when swiped across plastic 1, 3, or 5 times.

Dilutions of 0.5 McFarland (1.5 × 10⁸ colony-forming units/mL) suspensions of methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus faecalis* (VRE), and *Pseudomonas aeruginosa*, as well as a 2.0 McFarland suspension of *Candida albicans*, were prepared in sterile saline. To mimic contaminated surfaces, 100 μL of each suspension were streaked evenly onto sterile plastic Petri dishes (10 cm diameter) and allowed to dry. Each dish except a control dish was then rubbed with one of the following: a saline-moistened tissue (5 mL of sterile normal saline placed on a folded dry tissue [KimWipes; Kimberly-Clark, Dallas, TX], with the tissue lightly squeezed until no longer dripping but still wet), a 5% ethanol wipe (GreenWorks Natural Cleaning Wipes; Clorox Company, Oakland, CA), a quaternary ammonium compound wipe with 14.30% isopropanol and 0.23% di-isobutylphenoxyethyl dimethyl benzyl ammonium chloride (CaviWipes; Metrex Research, Orange, CA), a 0.5% hydrogen peroxide wipe (Accel TB Wipes; Virox Technologies, Oakville, Canada), or a 0.5% chlorhexidine-70% isopropyl alcohol wipe (Solu-IV Antiseptic Swabs; Solumed, Laval, Canada). Wipes were swiped 1, 3, or 5 times over the entire dish surface with the same wipe (contact time of approximately 1 second per swipe) and allowed to dry for 10 minutes. The plate surfaces were then flooded with 1 mL of trypticase soy broth, to resuspend any remaining bacteria. A total of 100 μL of this suspension was streaked onto blood agar plates and incubated for at least 24 hours at 35-37°C. Colonies were then counted. All procedures were performed by one investigator (A.E.B.). Results were analyzed by one-way analysis of variance using Stata version 9 (StataCorp, College Station, TX).

In all cases, control plates for both MRSA and VRE produced too many colonies to count; thus, the percent decrease from one wipe to zero swipes was not calculated. For all 5 wipe types, swiping the surface 3 or 5 times eliminated more bacteria than only one swipe (P < .05; n = 10) (Fig 1). Although not statistically significant, a reduction in the number of bacterial colonies was seen with 3 swipes of saline-moistened tissue compared with 1 swipe.

At both 3 and 5 swipes for both MRSA and VRE, no type of wipe eliminated significantly more bacteria compared...
with the others. At one swipe, the chlorhexidine-alcohol wipes eliminated significantly more MRSA than the saline-moistened wipe, and the quaternary ammonium compound wipe, the chlorhexidine-alcohol wipe, and the accelerated hydrogen peroxide wipe eliminated significantly more VRE than the saline-moistened wipe ($P < .05; n = 10$).

A complete statistical analysis was not performed for Candida and Pseudomonas due to overall low colony counts.

We found dramatic decreases in bacterial counts with an increasing number of swipes, regardless of the type of wipe used (including saline-moistened tissues). Swiping 3 times decreased the bacterial load by 88% (on average) relative to swiping just once. When the surface was swiped 3 or more times, the saline wipe appeared to be equally effective as disinfectant wipes. This is consistent with the findings of Rutala et al., who showed that wiping plastic computer keyboard keys for 5 seconds with water-containing wipes had excellent efficacy in reducing bacterial contamination. In our study, disinfecting wipes showed an advantage over the saline wipe only when surfaces were swiped a single time.

This small pilot study is limited by its in vitro results. We are confident that these results can be extrapolated to the clinical setting, however, because the bacterial inocula used exceeded the concentration of bacteria commonly found on plastic items in the hospital. However, to better understand the use of these cleaning products in the health care setting, future studies should be done in vivo, observing and comparing swiping regimens on plastic items used in the hospital.

In conclusion, these in vitro results indicate that swiping plastic surfaces with any type of moist wipe decreases the bacterial burden. When surfaces are swiped 3 or more times, a saline-moistened wipe appears to be just as effective as disinfectant wipes. However, if a health care worker swipes a plastic object only once, then a disinfectant wipe should be used.

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References