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No financial support has been provided by Virox Technologies Inc. to authors of articles included in this newsletter.

## Microbial Contamination of Hospital Reusable Cleaning Towels

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Hospital housekeeping staff routinely use cloth towels soaked in a hospital disinfectant to clean patient rooms (including terminal cleaning) and other areas of the hospital. These cloth towels are typically immersed in a bucket containing hospital disinfectants until needed, wrung out, and used to clean surfaces inside patient rooms. The towels are then either washed in-house or sent out to a central laundering facility, and the clean towels are stored and then reused in the same manner. In a recent study (Am J Infect Control. 2013 Mar 22) we undertook a project to examine the effects on the microbial loads on the cloths of laundry and cleaning practices commonly used in hospitals.



Ten hospitals were surveyed regarding their cleaning procedures and use of disinfectants for sanitizing rooms after patient discharge. A survey of cleaning practices was conducted at each hospital, and 3 laundered towels were obtained from each location. Swab samples were also collected from the inside surfaces of the buckets in which the towels were soaked in quaternary ammonium disinfectant. The towels and swabs were cultured for the presence of colony-forming units (CFU) of aerobic spore-forming bacteria, *Clostridium difficile*, molds, heterotrophic bacteria, *S aureus* (including MRSA), total coliforms, and *Escherichia coli*.

## 2013 Conference Update

### October

**October 2** – Annual Long Term Care Infection Prevention and Control Education Day

**October 2 to 5** - ID Week Conference

**October 3** – Middlesex London Health Unit's Infection Prevention and Control Education Day

**October 4** – Grey Bruce Health Unit's Infection Control Education Day

**October 10** – Annual Sarnia-Lambton Infection Control Seminar

**October 10** – Peel LTC IPAC Education Day

**October 16** – Windsor Essex Infection Control Conference

**October 17** – Oxford County's Infection Prevention and Control Workshop

**October 24 to 25** – CHICA –NS Educational Symposium

**October 28** – CHICA- BC Education Day

**October 30 to 31** – BC Health Leaders Conference

### November

**November 12** – IPAC Exchange Conference

**November 21** – Lakeridge Health Conference

Virox is very excited about participating in each of these conferences & education days. We wish the best to all of the various organizers and would like to thank them for their dedication and effort in organizing these very important educational opportunities. We look forward to attending and talking to all of the participants.

## Fall 2013 Virox Update

### Accel US Product Updates



#### Accel TB Wipes Refill Wipe Program

Virox is pleased to announce the launch of the Accel TB Wipes Refill Program. The program consists of extra-large wipes (12"x12") in a pouch and a reusable bucket. The Refill Pouches offer an environmentally conscious and sustainable alternative to the standard practice of disposing of consumed wipes buckets and replacing them with new ones. The reusable bucket can be cleaned and disinfected manually, or through an automated machine.

Accel TB Wipes provide SUPERIOR SPEED of DISINFECTION with a rapid contact time of 1 minute for bacteria and viruses! Accel TB is the product of choice for both daily cleaning and disinfection, outbreak intervention or for seasonal outbreak prevention. Cleaning and disinfection is key to help slow the spread of influenza, norovirus, and other pathogens of concern before and during the outbreak season. The pre-saturated wipes ensure disinfection protocol compliance. Accel TB is ideal for clinical areas and surfaces such as workstations and shared patient care equipment.



#### The Accel Product Line has a new look!

Our Accel brand has a fresh new look! The new look represents our commitment to providing the infection prevention and control community with innovative disinfectants for the war against microbes. Accel provides the perfect balance of speed, germicidal performance, responsibility, and environmental sustainability to meet the needs of healthcare professionals. This change affects the look of the products only. The product itself remains the same AHP disinfectants you know and trust. For more information on our new look, please email [mchito@virox.com](mailto:mchito@virox.com).

Accel disinfectant products are based on our revolutionary globally patented Accelerated Hydrogen Peroxide® (AHP®) disinfectant technology. AHP is the FIRST and ONLY disinfectant chemistry that can be formulated for hands, surfaces and devices. To learn more about the AHP Technology, please visit [www.virox.com](http://www.virox.com).



To learn more about Accel US, please visit [www.viroxaccel.com](http://www.viroxaccel.com).

### PTS Talk Clean To Me Blog

The Talk Clean To Me blog has covered a wide range of topics over the last few months and would like to thank our loyal followers for posting so many great comments and questions! We have included our 4 favorite blogs from this summer.

- School Absenteeism Due to Illness - Fact or Fiction?
- Cyclospora....the new salad topping?
- iPads, iPhones and Blackberrys...oh my!!
- Safe, Safer, Safely, Safest - Who knew they were "Bathroom" words!

For more great blogs and to join us on all our social channels, please visit [www.virox.com](http://www.virox.com) Online Community Page. **Let's get social!**



## The Battle for 'Clean' Surfaces

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When hospitals are threatened by increasing infection rates, it is unsurprising that administrators would seek a rapid solution. The rising popularity of automated no-touch systems, such as those that radiate UV light or disperse hydrogen peroxide, illustrates a predictable managerial reaction to outbreaks. In keeping with twenty-first century ethos, automated systems offer labour-saving decontamination, and we should be grateful for the technology. However, there is a concern that managers might choose push-button gadgets rather than reduce bed occupancy or employ more cleaners. I discussed this recently in the *Journal of Hospital Infection* (2013 Aug;84(4):339-40).

Automated systems radiating UV light or dispersing hydrogen peroxide eliminate a range of surface pathogens as would be expected following such exposure. In one published review, the hydrogen peroxide decontamination device resulted in patients being 64% less likely to acquire any multiply drug-resistant organism, and 80% less likely to acquire vancomycin-resistant enterococci (VRE). However, not mentioned in that review was that the risk of acquiring *Clostridium difficile*, Methicillin-resistant *Staphylococcus aureus* and multidrug-resistant Gram-negative bacilli was 'not significantly reduced'. The microbicidal effects of the hydrogen peroxide decontamination devices are impeded by surface properties and debris, e.g. linen, soft furnishings, and organic soil. The automated systems cannot be used where rapid turnover of rooms is required, nor when rooms are occupied, and there are continuing risks of accidental exposure to people, plants, and animals.

Is current evidence on clinical benefit sufficiently plentiful and robust to allocate scarce healthcare resources for these systems? Is anyone promoting the benefits of basic cleaning with soap and water? Not only is physical removal of bioburden a vital component of the cleaning process, it is just as effective as many hospital disinfectants for controlling environmental microbes. This is partially, but not solely, explained by the fact that the microbicidal activity of many disinfectants is inversely proportional to the degree of organic soiling on a surface.

Hospital cleaners are still not valued for the work that they do and there are too few in most facilities. If hospitals want to use automated systems, then the caution offered in this opinion will not stop them. But before discarding mops and buckets, managers should remember that, smart as they are, these automated devices cannot yet remove a puddle of urine, nor can they retrieve the potato-crisp packet from under the bed. For those of us with a mind to Darwinism, the cumulative effect of repeated microbial obliteration does not bode well for the future.

## All hands on deck!

Norovirus season will be here before you know it. Often in the news as a cruise ship problem, norovirus is making waves in healthcare too. According to a study published in the *American Journal of Infection Control* (February 2012, Vol. 40, No. 1), "Norovirus is emerging as an increasingly common hospital-associated organism causing outbreaks in non-acute settings and may lead to unit/department closures". Another study highlights that norovirus in hospitals and long-term care facilities now accounts for more than 25% of outbreaks in the United States (*American Journal of Infection Control*, June 2010 issue).

So what can we do to prevent the spread of this nasty and highly contagious pathogen and how will we intervene if an outbreak occurs? Routine cleaning and disinfection is key in both prevention and intervention. All Accelerated Hydrogen Peroxide (AHP) disinfectant cleaners are effective against norovirus in rapid contact times providing confidence that disinfection has occurred. To learn more about norovirus and AHP, please visit [www.virox.com](http://www.virox.com).

## Norovirus - 5 key points

- 1 Norovirus gastroenteritis outbreaks occur mainly between November and April.
- 2 Outbreaks are particularly common in hospitals and semi-closed settings such as residential healthcare, schools, and workplaces.
- 3 Outbreaks in hospitals commonly lead to bed closures.
- 4 Isolation of infected individuals can limit the spread of outbreaks.
- 5 Stringent hygiene measures are vital for infected individuals and anyone coming into contact with them.

# Addressing Contaminated Surfaces in Hospital Settings

LEE NESBITT, VIROX TECHNOLOGIES INC.

The transmission routes of pathogens are complicated and difficult to investigate, so studies focused on the role of surfaces in transmission have been rare until relatively recently. The role played by contaminated environmental surfaces in the transmission of nosocomial pathogens was recently addressed in an American Journal of Infection Control article (2013 May;41) that presented the latest data evaluating the role of contaminated surfaces in transmission and discusses the various strategies available to address environmental contamination in hospitals. This article is excerpted from that review.

Data suggesting that contaminated surfaces play a role in transmission come from: studies modeling transmission; microbiologic studies in vitro and in situ; observational epidemiologic studies; intervention studies aimed at improving the efficacy of cleaning and disinfection; and outbreak reports.

**Modeling transmission routes** can provide “proof of principle” that contaminated surfaces are involved in transmission: for example, monitoring the spread of nonmicrobial markers, the use of animal models, and mathematical modeling.

**Microbiologic studies** have established that certain hospital pathogens can survive on dry hospital surfaces for extended periods. VRE in particular seems to have remarkable survival properties, with a recent study showing that VRE can remain viable on dry surfaces for almost 4 years. The recent discovery of biofilms on dry hospital surfaces may provide a mechanism through which vegetative bacteria could survive on dry surfaces for such extended periods without a nutrient source. Several in vitro microbiologic studies have investigated the transfer of pathogens from surfaces to the hands or gloves of health care personnel in the absence of direct patient contact. Contact with an environmental surface carries approximately the same risk of acquiring MRSA, VRE and *C difficile* hand or glove contamination as touching an infected or colonized patient.

Carefully performed **observational epidemiologic studies** have established that contaminated surfaces are involved in the transmission of certain pathogens. For example, one study concluded that at least 3 of 26 patients acquired MRSA directly from contaminated environmental surfaces. It is somewhat difficult to determine the independent role of contaminated surfaces in these studies.

**Intervention studies**, including the use of a black-light marker or a specific change in cleaning methodology, are often used to evaluate the impact of improved cleaning and disinfection. Several prospective studies have demonstrated that interventions aimed at reducing surface contamination also reduces the transmission of hospital pathogens. These can be broadly divided into studies of a change in disinfection agent, or educational improvements using existing agents.

**Outbreak reports**, and the findings thereof, are often limited by lack of controls, multiple interventions, and the potential for regression to the mean. However, many outbreak reports implicate contaminated surfaces in the transmission of *C difficile*, MRSA, VRE, MDR gram-negative rods, and noroviruses.

Despite the limitation of the evidence base, more needs to be done to address environmental contamination in hospitals to deliver the safest possible health-care. Strategies to address environmental contamination can be divided into reducing and containing the shedding of pathogens, and improved cleaning and disinfection.

## Improved cleaning and disinfection

Effective cleaning and disinfection relies on the operator to repeatedly ensure adequate selection, formulation, distribution, and contact time of the agents used. Educational improvements designed to modify human behaviour can be attempted with the support of various tools including fluorescent markers or adenine triphosphate assays, and monitoring and feedback can improve the frequency of surface cleaning, reduce the level of environmental contamination, and reduce the acquisition of pathogens. However, no studies have evaluated the sustainability of such systematic improvements. Indeed, recent evidence indicates that altering the location of fluorescent dye spots reduced the proportion of objects that were cleaned from 90% to approximately 60%.

Improvements in hospital design and materials, novel disinfectants, and cleaning/disinfection technologies should be evaluated to determine their effectiveness in improving cleaning and disinfection. For example, there has been recent discussion on “no-touch” automated room disinfection (NTD) systems, which remove or re-



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# Norovirus and Contaminated Surfaces

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Viruses are the most common cause of community-acquired gastroenteritis in people of all age groups, and viruses known as “noroviruses” (including Norwalk, Snow Mountain, and Hawaii viruses) are particularly contagious. Within the general community, norovirus can cause sporadic cases and small clusters of gastroenteritis outbreaks. Larger outbreaks also occur frequently, particularly during the winter months and often in workplaces, healthcare facilities, hotels, and schools.

Although the specific means of transmission is not frequently identified, food handlers working while ill are often presumed to be the cause of norovirus outbreaks, and health departments may often focus on food and food handlers without sufficiently considering other possibilities. Other environmental exposures are increasingly recognized as the cause of both sporadic cases and outbreaks.

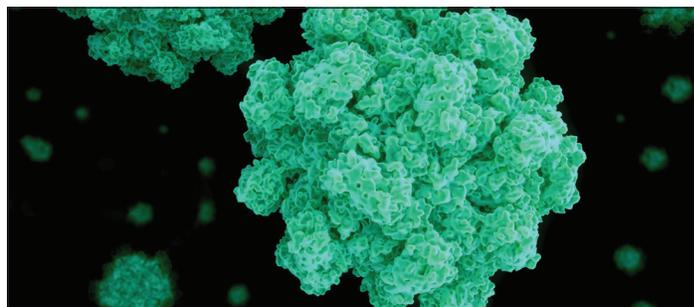
In one recent study (*J Infect Dis.* 2013 Jul 15;208(2):295-8), the authors investigated a point-source norovirus outbreak that initially appeared to be caused by consumption of contaminated food. Further investigation revealed that, contrary to expectation, the outbreak had an environmental origin.

Submarine sandwiches, chips, and condiments from a nearby fast-food restaurant had been provided to 16 people for a staff meeting at a local auto dealership. Within 72 hours after the meeting 12 of the attendees developed vomiting and/or diarrhea. The dealership complained to public health department, presuming that it was the food and the restaurant from which it came that had caused the outbreak.

Environmental health staff evaluated the operations of the restaurant that provided the food, paying particular attention to hand hygiene, food preparation practices, and recent employee illness. No recent gastrointestinal illness (within previous 2 weeks) had been reported by food handlers or restaurant managers. No other restaurant patrons had complained of illness. The restaurant food was discounted as the source of the norovirus infection.

When the staff at the auto dealership was interviewed, the investigators were told of an incident that took place just 15 minutes before lunch was served at the meeting. A female staff member had entered the women’s washroom and discovered a customer with a toddler. The toddler had experienced explosive diarrhea, spraying fecal material over the wall-mounted diaper changing station, and the floor, walls, and trash can. The employee attempted to clean up with dry paper towels, without gloves or disinfectant, and then reported washing her hands.

The same staff member who had cleaned up the fecal matter touched the handles of at least one door, and several other surfaces before the lunch arrived and was the first person to take one of the unwrapped sandwiches off of the platter. All but two employees of the dealership reported eating a sandwich, and every female member of the staff visited the washroom.



All of the female employees working that day became ill, along with just over half of the male employees. None of the men entered the ladies’ restroom. Stool specimens taken from the child and from some of the employees were positive for norovirus.

The authors of the study looked in particular at the diaper-changing station. Since the incident with the child, the washroom and the diaper-changing station had twice been professionally cleaned by a company using a quat disinfectant. Swabs taken from the plastic, wall-mounted station were positive for norovirus. The manufacturer’s printed recommendations for cleaning the diaper-changing stations included cleaning with a detergent followed by sanitizing with a disinfectant—neither of which were specified. When contacted, the manufacturer discouraged the use of chlorine bleach, which might damage the changing station components.

It would have been easy to blame the outbreak on the food, or on food handlers at the sandwich shop, and indeed the restaurant in question had historically done poorly on routine inspections. However, 2 employees mentioned the incident with the mother and child in the washroom, which suggested another scenario. The identification of matching genogroup virus in the child’s specimen and on the diaper-changing station confirmed that the child was the source of the outbreak, not the luncheon food. The female employees were likely exposed to contaminated surfaces in and around their restroom, and induced sufficient contamination of the wider environment, including uncovered sandwiches and shared-contact surfaces, to expose many of the male employees.

This outbreak underscores the importance of environmental cleaning in the control of norovirus transmission. Studies with surrogate viruses suggest that norovirus can persist on surfaces for weeks with minimal loss of infectivity. Many common disinfectants, including the quaternary ammonium product reportedly used at the dealership, are of limited efficacy against noroviruses. Viruses can be readily transferred from contaminated fingers to environmental surfaces (eg, faucet, door handles, and telephones). Adequate environmental decontamination is critical to prevent the initiation and spread of norovirus outbreaks because of the high viral load in feces and the ease of transmission. The authors of the study recommend that high-risk restroom surfaces, such as diaper-changing stations, be sanitized with an antimicrobial product considered effective against norovirus.

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### Questionnaire

The survey of cleaning practices included questions about the protocols used for cleaning rooms, towel use, and laundry procedures. Other questions involved the disinfectant(s) used, whether the towels were soaked or sprayed in the disinfectant, exposure time, frequency of disinfectant changes, fabric content of the cleaning towels, towel washing and drying practices, and towel storage conditions.

In the questionnaires on cleaning and laundry practices, 8 of the 10 hospitals reported using cotton towels, and the other 2 reported using microfiber towels. Two hospitals sent their linens to be laundered in a central facility, and the others laundered their towels in-house. All but 1 of the hospitals reported soaking their cleaning towels in a bucket with disinfectant.

### Microbial Recovery

We discovered that the microbial load was higher on the clean towels than on the swab samples taken from the buckets containing disinfectant. The mean total number of bacteria found on the towels was 133 CFU/cm<sup>2</sup>, whereas the mean total number of bacteria found on the inside surface of the disinfectant buckets was 0.605 CFU/cm<sup>2</sup>. Viable bacteria were detected on 93% of the towels, but on only 67% of the soak buckets. Spore-forming bacteria were isolated from 56% of the towels and 44% of the buckets. Coliform bacteria were found on 23% of the towels and 12% of the buckets. Neither MRSA nor *C difficile* were isolated from the towels or the buckets in this study, but other studies found both organisms on both surfaces.

There were significant differences among hospitals in terms of the numbers and types of microorganisms recovered. Possible explanations for these findings include the substantial variation in laundering and cleaning practices among the hospitals, as well as variations in methods of disinfectant application, towel materials, and conditions for storage of the cleaning towels, resulting in habitats more or less conducive to microbial proliferation.

### Soaking vs. Spraying

Significant differences in the presence of bacteria and mold were observed based on the disinfectant application method used. One hospital in the study sprayed disinfectant on their cleaning towels with a power sprayer, and this method was associated with a higher microbial load than soaking, likely because spraying does not completely saturate the towel fibers with disinfectant. But even though soaking resulted in a smaller overall microbial load on the towels, coliforms were still isolated from the disinfectant buckets.

All of the bacterial species isolated from the cleaning towels and soak buckets have reported significance in nosocomial infections. Interestingly, aerobic spore-forming bacteria were isolated more frequently in the towels compared with other bacterial contaminants, indicating that spore-forming bacteria are better able to survive the laundering process, including the washing and drying. In another recent study, *B cereus* present in linens after in-house launder-

ing was a major source of contamination, and was isolated from clean towels, washing machines, and dryers.

### Cotton vs. Microfibre

A significant difference was observed in the bacterial numbers recovered from cotton and microfiber towels. Bacteria have been shown to adhere more tenaciously to microfiber towels, allowing them to spread or transfer onto different surfaces as the towels are used. In a recent study evaluating the efficacy of reusable towels for decontamination of surfaces, microfiber towels showed superior results when used in new condition, but after reprocessing, the cotton towels more effectively removed bacteria from surfaces. The decontamination efficacy of microfiber towels was reduced after just 20 washing cycles, contrary to the manufacturer's indications of sustained efficacy after 500 washes.

### Conclusion

Typical hospital laundering practices are not sufficient to remove all viable microorganisms and spores from towels, regardless of whether they are sent to a central laundering facility or laundered in-house. It is unclear whether bacteria remain trapped in the towel fibers through the laundering process or are reintroduced through subsequent storage or handling. Although hospital disinfectants show efficacy against the organisms found in the towels, these findings suggest that current treatment practices should be reevaluated. Our results in this project indicate that future studies should evaluate the potential role of cloth towels as a reservoir for nosocomial pathogens, along with their possible role in overall cleaning procedures at hospitals, clinics, and long-term care institutions. Furthermore, the development of guidelines for the reuse of cloth towels in healthcare environments should be considered as part of the larger picture of medical institution cleaning.

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duce the reliance on the operator to achieve adequate distribution and contact time of the active agents. HPV, aerosolized hydrogen peroxide, ultraviolet C, and pulsed-xenon ultraviolet radiation NTD systems have all shown promise and improved efficacy when compared with conventional methods. HPV has been associated with reductions in patient acquisition and evaluations of other NTD systems with a clinical outcome are eagerly awaited. NTD systems are only appropriate for certain applications and should be introduced in parallel with an educational campaign to improve conventional methods.

The finding that admission to a room previously occupied by a patient with a hospital pathogen increases the risk of acquiring that pathogen, combined with intervention studies showing that this increased risk can be mitigated by improved environmental decontamination, provides the most powerful evidence that contaminated surfaces contribute to transmission and that more needs to be done to improve surface decontamination. The most appropriate strategies to address surface contamination will depend on the setting and on local epidemiology.