

Microfibre-Based Fabrics in Surface Decontamination in Healthcare Facilities

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Microfibre-based cleaning cloths are tremendously popular of late as they have been lauded with near miraculous decontamination qualities. In homes, commercial and healthcare facilities, microfibre cloths are promoted as an adjunct to, and sometimes even a replacement for cleaning chemicals. However, as with all claims, to make an informed decision, one must look beyond the hype, and turn to the science.

Origins of Microfibre

Although ultra-fine fibers date back to the 1950s, only samples of random length could be manufactured leaving only a very few applications possible. The most promising attempts to develop a consistent and mass-reproducible fibre took place in Japan in 1970 by Dr. M. Okamoto and Dr. T. Hikota who designed the first marketable non-woven fabric, "Ultrasuede®." Further commercial development continued and blossomed into a multi-billion dollar business worldwide.

A microfibre fabric may consist solely of synthetic fibres (polyester, nylon), or a blend of synthetic and natural fibres (cotton, wool, silk). Each fibre generally is thinner than a strand of human hair and can be bundled into a number of shapes and designs based on the function of the fabric. Cleaning fabrics are designed to maximize surface area and retention. A typical microfibre cloth can hold nearly six times its weight in wa-

ter and is positively charged to better attract dust and soil.

Advantages and Limitations

The synthetic nature of microfibres offers numerous advantages to both the user and to the environment. Microfibre-based fabrics can be much lighter than cotton-based cloths and thus require less effort to clean a surface. However, the gliding motion of a microfibre cloth is quite different from that of other types of fabrics and one must adapt to the feel to avoid undue strain and injury. The synthetic nature of the cloths makes them hypoallergenic and able to withstand repeated washings. However, they cannot be used with fabric softeners or bleach to reduce the presence of allergens. Finally, as evidenced in the table based on a study conducted at the University of California Davis Medical Center, by switching to microfibre-based cloths water and chemical usage is significantly reduced although not eliminated. The current belief that microfibre cloths are equally effective dry or wet is untrue. To ensure efficient microbial decontamination of surfaces, microfibre-based cloths must first be prewetted with a chemically compatible disinfectant.

Decontamination of Environmental Surfaces by Wiping

A preliminary laboratory-based study at CREM has compared the ability of microfibre and cot-

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"The secret of success is constancy of purpose"

Benjamin Disraeli

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An Assessment of Infection Control Surveillance in BC Acute Care Facilities

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Manager, Provincial Infection Control Network-BC

The following is a precise of an article previously published in the American Journal of Infection Control 2008; 36:706-10.

In 2005, the Provincial Infection Control Network (PICNet) of British Columbia (BC) undertook a review of the scope and nature of surveillance activities for health care-associated infections (HAI) in BC acute care facilities (ACF). The goal of this review was to enable future development of surveillance programs at the local and potentially the provincial level. Identification of required resources, barriers and impediments, as well as opportunities for standardization of surveillance, were key to developing a foundation for future successful collaboration.

Surveillance for healthcare associated infections is a fundamental part of any infection control program. HAI surveillance data are used to improve the quality of patient care in health care settings through quality improvement activities and assessing the effectiveness of infection prevention programs. Surveillance data can also be used to quickly identify and confirm outbreaks so they can be controlled.

For the purposes of this survey, a questionnaire was developed by mem-

bers of PICNet and sent to a sample of ACF in BC. The questionnaire incorporated questions on organism-specific surveillance, disease-specific surveillance and general surveillance activities.

Overall the results showed that participation in organism specific surveillance in ACF was excellent but activity was less than optimal for disease specific monitoring. Participation in surveillance of methicillin resistant *Staphylococcus aureus* (MRSA), vancomycin resistant Enterococci (VRE) and *Clostridium difficile* associated disease (CDAD) was high but surveillance methodologies were inconsistent. Of note, was the variation in the definition of community-acquired MRSA. This is particularly problematic given the well-documented increase in the community-associated strain of MRSA (USA 300) in disadvantaged populations in our province.

More than half of facilities did not calculate rates for MRSA, VRE and CDAD. Without the calculation of incidence rates, trending over time is difficult and the ability to use the numbers as quality of care indicators can be problematic. Also many facilities did not characterize isolates, limiting the ability to provide epidemiological and molecular information. Most facilities did not save samples or cultures

for *Clostridium difficile* limiting the ability to perform molecular characterization to detect newer more virulent isolates such as the recently documented tcdC deletion strains.

Surgical-site infections (SSI), the third most common nosocomial infections, cause substantial morbidity and mortality and increase hospital costs. Surveillance programs have been shown to be an effective measure in reducing SSI rates. However, procedures under surveillance in most BC hospitals did not necessarily correlate with the most commonly performed operations. As well, they did not correlate to those procedures associated with higher morbidity and mortality from a post-operative infection. Only Caesarean sections were followed post-operatively in the majority of facilities surveyed.

The high proportion of facilities participating in this survey and the enthusiasm for the project by the ICP community suggests that development of uniform provincial surveillance system is an achievable goal. With this in mind, PICNet has developed standardized surveillance methodology to collect data on CDAD and will be working with the facilities, province-wide, to standardize surveillance methodologies for other healthcare acquired infections. PICNet continues to work with our community of practice in BC to improve surveillance for HAI province-wide and to improve the quality of patient care.



Virox Update

Virox Recognized on SickKids Donor Wall

Over the past 3 years Virox has been an active supporter of the SickKids Foundation by sponsoring the annual Patient Safety Symposium and sponsorship of a clinical study on patient safety. As a result of this continued support was recognized in October as a Donor of the Week and has recently received an acknowledgment Plaque in the SickKids Foundation Donor Hall.

Study Sponsorship at SickKids Complete

Virox and JohnsonDiversey are excited to be partnered with Dr. Anne Matlow and the Infection Control Team at SickKids for a study titled "Knowledge, Environment and HAIs". The study was focused on understanding the knowledge base and concerns of housekeeping staff and how this knowledge can be translated into creating education programs that will lead to improved hospital cleaning and disinfection. The final study will be presented at the 2009 SHEA Conference this March in California

Virox Receives United States EPA's DfE Safer Detergents Stewardship Initiative (SDSI) Award

The United States Environmental Protection Agency (EPA) awarded Virox Technologies Inc. the Chemical Manufacturers and Product Formulators Champion Status, (the highest level of recognition

offered under the SDSI) identifying the Accelerated Hydrogen Peroxide® (AHP®) technology as a sustainable technology and Virox Technologies Inc. as an industry leader. The Safer Detergents Stewardship Initiative (SDSI), EPA's Design for the Environment (DfE) Program recognizes environmental leaders who voluntarily commit to the use of safer surfactants. Safer surfactants are surfactants that break down quickly to non-polluting compounds and help protect aquatic life in both fresh and salt water. Nonylphenol Ethoxylates, commonly referred to as NPEs, are an example of a surfactant class that does not meet the definition of a safer surfactant.

Virox Launches Webinar Training Sessions

In a continued effort to provide free educational opportunities to the infection control community, Virox has recently launched the WebEx program allowing our Professional & Technical Services team to provide on-demand and pre-recorded training sessions. The currently available sessions can be viewed at www.virox.com, Infection Control Resources. If you are interested in learning about future sessions and being included on the invitation list please contact Melissa Rempel at mrempe1@virox.com.

If you are interested in learning more about how the Professional and Technical Services team at Virox can provide educational or consulting opportunities at your facility please contact Lee Nesbitt at 1-800-387-7578 x118 or via email at lnesbitt@virox.com.

Conference & Education Spring Schedule

Virox representatives will be participating in the following functions during the upcoming months:

March 3rd to 6th - Pacific Dental Conference in Vancouver, British Columbia.

April 28th to 30th - JohnsonDiversey Sustainability Forum in Washington, D.C.

April 29th to 30th - CSSA Can Clean 2009 in Toronto, Ontario.

May 3rd to 9th - CIPHI National Conference in Kananaskis, Alberta.

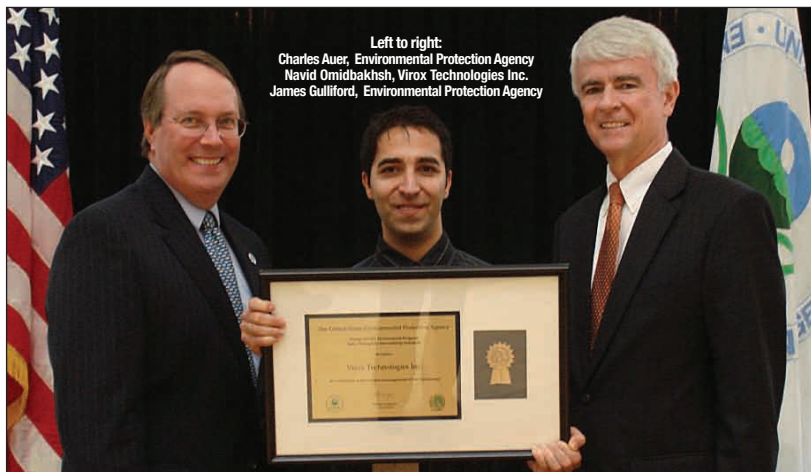
May 9th to 14th - CHICA-Canada Annual Conference in St. John's, Newfoundland.

May 24th to 27th - APII Annual Conference in Montreal, Quebec.

June 7th to 11th - APIC Annual Conference in Ft. Lauderdale, Florida.

June 11th to 12th - CHICA - NWO Infection Control off the Map in Thunder Bay, Ontario.

We are 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.



Left to right:
Charles Auer, Environmental Protection Agency
Navid Omidbakhsh, Virox Technologies Inc.
James Gulliford, Environmental Protection Agency

*Challenges are what
makes life interesting;
overcoming them is what
makes life meaningful.*

- Barack Obama

Virox Technologies Inc. Receives Champion Status in the Design for the Environment Program's Safer Detergents Stewardship Initiative (SDSI).



The Safer Detergents Stewardship Initiative (SDSI), EPA's Design for the Environment (DfE) Program recognizes environmental leaders who voluntarily commit to the use of safer surfactants. Safer surfactants are surfactants that break down quickly to non-polluting compounds and help protect aquatic life in both fresh and salt water. Nonylphenol Ethoxylates, commonly referred to as NPEs, are an example of a surfactant class that does not meet the definition of a safer surfactant. Virox Technologies Inc. was awarded the Chemical Manufacturers and Product Formulators Champion Status, (the highest level of recognition offered under the SDSI) identifying the Accelerated Hydrogen Peroxide® (AHP®) technology as a sustainable technology and Virox Technologies Inc. as an industry leader. As a Champion Award recipient, Virox Technologies Inc. has been invited to attend the Safer Detergents Stewardship Awards Ceremony on November 19th, 2008 in Washington, DC. Virox Technologies Inc. is the only Canadian Company to receive recognition with the Safer Detergents Stewardship Initiative. For more information about the Design for Environment Program (DfE) and the Safer Detergents Stewardship Initiative (SDSI) Award please visit www.epa.gov/dfe/index.htm

Virox Supports Teleclass Education in 2009

The Virox team is pleased to once again support the Teleclass Education program in 2009. Teleclass Education brings to the global infection control community some of the top researchers on the science (and art) of infection control. Professor Syed Sattar and Paul Webber created this lecture series in 2001, and it has become a worldwide phenomenon. We are proud to play our part in the success of Teleclass Education and will be sponsoring several teleclasses this year. We hope that you will join these teleclasses, they're going to be outstanding.

- ***Clostridium difficile* – Prevention is Better than Cure** - Featuring Prof. Mark Wilcox of Leeds University
- **Strategies for Improving Cleaning and Disinfection of Environmental Surfaces** - Featuring Prof. John Boyce of Yale University
- **The Socioeconomic Cost of Enteric Disease** - Featuring Dr. Paul Socket of Health Canada
- **Voices of CHICA** - Featuring Board members and guests of the Community and Hospital Infection Control Association of Canada.

You can see all of the teleclasses in the 2009 schedule at www.webbertraining.com. If you would like to register for the teleclasses above as our guest, contact: Melissa Rempel (mrempel@virox.com)



www.webbertraining.com

Surfactants: A Toxicity Review

Navid Omidbakhsh, P.Eng., Virox Technologies Inc.

In a recent article published in a Canadian periodical, Nicole Kenny and I looked in-depth at facts and common myths about the toxicity of surfactants in use in healthcare. It's a field that causes a great deal of confusion, particularly with regards to disinfection abilities and bacterial resistance.

Surfactants constitute the most important group of detergent components. They are wetting agents that lower the surface tension of a liquid, allowing easier spreading, and lower the interfacial tension between two liquids. Surfactants play an important role in many practical applications and products, including detergents, fabric softeners, vaccine formulations, drug delivery/medical treatment, emulsifiers, paints, adhesives, inks, anti-fogging, wetting, ski wax, snowboard wax, foaming/defoaming agents, biocides (sanitizers), hair conditioners (after shampoo), and more.

Detergent formulations contain surface-active agents (surfactants), which remove dirt, stains, and soil from surfaces and fabrics. The first man-made surfactant was raw soap. Indeed, soap was already known to the Sumerians (Babylonians) as early as 2500 years BC. Vegetable oils were cooked with potassium carbonate from burnt wood. The next evolution was the use of potassium hydroxide made from potash and calcium oxide. In this way, soap has been produced for millennia, mainly by the reaction of potassium hydroxide and tallow. During the 17th century, Marseille, in particular, was well known for its production of soap.

Surfactants have historically been classified according to the charge they carry when dissociated in water at neutral pH. This results in four categories - nonionic surfactants (do not ionize in solution), anionic surfactants (carry a negative charge when dissociated in water), cationic surfactants (carry a positive charge when



dissociated in water), amphoteric surfactants (can carry both a positive and a negative charge when dissociated in water).

Surfactants Toxicity / environmental profile

It is not possible to generalize the toxicity profile of surfactants since each have very distinct chemical structures and consequently totally different properties. For example, chained alkyl linear benzenesulfonic acids are not biodegradable while linear ones are. Alkyl phenol ethoxylates (APE) and their degradation products are more toxic to aquatic life, while linear alkylbenzenesulfonic acids (LAS) and alcohol ethoxylates (AE) are readily biodegradable and the potential for secondary poisoning effects of these surfac-

tants is extremely low. LAS in particular, a petroleum-based surfactant, has been found safe for many applications including teat-dip solutions for which residuals can be found in milk. Thus, we cannot generalize surfactants as to their toxicity.

Surfactants in surface cleaning/ disinfection

There is an ongoing debate about whether, on one side a cleaning agent alone is sufficient for decontaminating healthcare surfaces, or on the other side, a disinfectant is preferable. There is consensus, however, that at least one of them should be used. And if a cleaner is to be used, it should have good cleaning performance (cleaning performance of a detergent comes primarily from the contribution of the surfactants used in the formulation). If surfactants are removed from a detergent formulation, the wetting capability and consequently the cleaning performance decrease dramatically.

That said, there are number of reasons to encourage use of disinfecting products to decontaminate environmental surfaces. (1) Epidemiologically important microbes (eg, VRE, MRSA, *Clostridium difficile*, and viruses) can survive on environmental surfaces for extended peri-

ods, and using a disinfectant can eliminate them or significantly reduce their number while using a non-antimicrobial surfactant agent might result in cross contamination. (2) Detergents, both in their concentrated form and in ready-to-use dilutions, can become contaminated and thus potentially seed the healthcare environment with microbes. Disinfectants are more effective than detergents in reducing the microbial load. (3) The advantage of using a single product for decontamination of semicritical and non-critical surfaces (including floors) simplifies both training and practice.

Microbial resistance

Resistance to cationic surfactants, such as those commonly use in quaternary ammonium chloride disinfectants, has been found in several types of bacteria. Non-ionic surfactants have no antimicrobial activity and therefore no acquired microbial resistance would be developed for them. Anionic surfactants have very low antimicrobial activity (only in acidic solution), and do not have any active residual activity, making it extremely unlikely that microorganisms would develop any resistance against them. In all my research I have found no study that shows evidence of microbial resistance to nonionic or anionic surfactants.

Conclusions

Surfactants are a large class of chemicals and have different physical/chemical/toxicity properties. Some like quaternary ammonium compounds (cationics) have microbicidal activity while others such as nonionics do not. Some including alkyl phenol ethoxylates are toxic to aquatic life, and not environmentally favourable, and some such as LAS, and AE are readily biodegradable and do not accumulate in the environment. All that said, the responsibility remains on the shoulders of the product manufacturers to develop products which balance performance and environmental profile.

(For more information on this topic and what steps Virox Technologies has taken to minimize personal and environmental toxicity, please contact Lee Nesbitt, lnesbitt@virox.com)

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ton fabrics to decontaminate environmental surfaces. Disks of stainless steel were contaminated with either *Staphylococcus aureus* or the feline calicivirus (a surrogate for human norovirus), and then wiped. The fabrics were tested dry or pre-wetted with hard water, a neutral detergent or a quaternary (quat) ammonium-based disinfectant.

Neither cloth removed either of the pathogen well when used dry, yet could transfer a significant amount of the removed contamination to a clean surface on contact. When wetted with hard water, the microfibre cloth performed comparatively better than the cotton fabric while also sequestering the acquired contamination well. Using a neutral detergent instead of water provided similar results. On average, both water- and detergent-wetted microfibre cloths removed about 99% of the contamination and transferred less than 1% of what was retained. For *S. aureus*, wiping with the microfibre cloth wetted with the quat proved to be quite effective both in removal of the contamination and its sequestration. As for the virus, the find-

ings were similar to those with *S. aureus*, except that the microfibre cloth wetted with the quat transferred nearly 100-fold more virus as compared to wetting with water or the detergent alone. This may be due to the better detergent action of the quat with no detectable virucidal activity.

Conclusions

Evidence available so far reinforces the higher efficiency of microfibre-based fabrics in the removal and sequestration of contamination when used for wiping

environmental surfaces. However, not all such fabrics are created equal and the selection of the right material must be combined with the correct disinfectant as well as proper training of the house-keeping staff to optimize the benefits with regards to cost-savings, workplace safety and reductions in the use and disposal of disinfectant chemicals. In addition to a higher initial expense, a microfibre-based system requires a different perspective and management style for its successful implementation and maintenance.

Comparative features of microfibre and wet loop mops for wiping floors at the University of California Davis Medical Center*

Feature compared	Microfibre mop	Wet loop mop
Cost of each mop	U.S. \$17.40	U.S. \$5.00
Estimated washing lifetime	500-1000	55-200
Rooms cleaned between each washing	1	22
Chemical use in ounces/day	0.5 (14 g)	10.5 (298 g)
Water use in U.S. gallons/day	1	21
Electricity used for washing/mop	\$0.03	\$1.00
Total cost/100 rooms/day	U.S. \$468-470	U.S. \$497

*Modified From Environ. Best Practices for Health Care Facilities, U.S. Environ. Protection Agency, Nov. 2002.

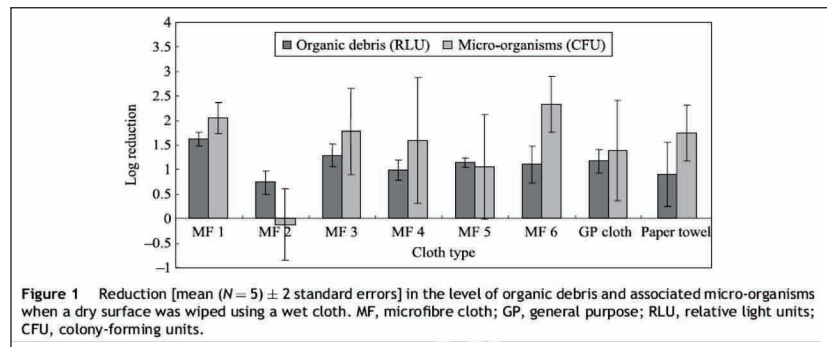


Figure 1 Reduction [mean (N = 5) ± 2 standard errors] in the level of organic debris and associated micro-organisms when a dry surface was wiped using a wet cloth. MF, microfibre cloth; GP, general purpose; RLU, relative light units; CFU, colony-forming units.

Not All Microfibre are Equal

In Prof. Mark Wilcox's January teleclass he identified very clearly that not all microfibre cloths are equal in their performance. In fact, as Figure 1 identifies, when the performance of six different types of microfibre cloths was tested against a general purpose cleaning cloth and paper towel (removal of organic soil, and microbes), at least one cloth performed dramatically worse than even paper towel. Unfortunately the good and the bad are not easily identifiable.

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