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

VOLUME 40

# Practical Approaches for Assessment of Daily and Post-Discharge Room Disinfection in Healthcare Facilities

PROF. CURTIS DONSKEY, VETERANS AFFAIRS MEDICAL CENTER, CLEVELAND



Effective cleaning and disinfection in healthcare facilities is essential to ensure patient safety. Thus, all healthcare facilities should have programs in place to monitor cleaning to ensure the adequacy of their cleaning practices. Unfortunately, multiple studies have demonstrated that contamination of surfaces is not uncommon after completion of manual cleaning and disinfection. Such contamination has been attributed primarily to suboptimal application of disinfectants, a common problem in healthcare facilities. In our recent review of daily and post-discharge room disinfection (*Curr Infect Dis Rep* (2017) 19: 32) we examined practical strategies to assess and improve the effectiveness of different processes.

We recognize three strategies that have been demonstrated to improve environmental disinfection in recent years. First, disinfectant product substitutions have been used to obtain enhanced activity against pathogens (e.g., substitution of sporicidal for non-sporicidal disinfectants for control of *C. difficile*). In two recent studies, substitution of an improved hydrogen peroxide disinfectant for a daily cleaning agent or quaternary ammonium disinfectant has been associated with significant

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# 2017 Fall/Winter Virox Update

## Introducing Rejuvenate™!

You asked, we delivered. After being asked for an Accelerated Hydrogen Peroxide® disinfectant for US Professional Beauty establishments, Virox is excited to introduce Rejuvenate™ for use in spas, salons, and clinics. Launching in 2018, Rejuvenate™ is a disinfectant that goes above industry standards ensuring that disinfection is achieved. Staff no longer have to worry about harsh chemicals, toxic fumes, or causing harm to the environment. Rejuvenate™ is the compromise free disinfectant and comes with an entire line for various applications found within Professional Beauty Settings.



## Virox Supports Women in the Cleaning Industry

Virox is passionate about empowering women in the workplace. In September Virox was proud to support the 2017 ISSA Hygieia Network Awards which celebrates and recognizes individuals and companies who have made an outstanding contribution to the global cleaning industry. The Hygieia Network was created to advance women in the world's cleaning industry by providing ongoing education, networking, professional development, and personal recognition to any woman working in, or associated with, the industry.

## On a Mission to Protect the Health of Canadians

At Virox we value our relationship with the Canadian Institute for Public Health Inspectors (CIPHI). We believe in their mission to protect the health of all Canadians. As such, we want to provide education and resources to Public Health Inspectors which contributes to healthy Canadians. Virox is excited to support the 78th CIPHI Ontario Branch Annual Education Conference, and the 83rd National Annual Education Conference.

With themes of courage and innovation, we look forward to advancing knowledge and education among Public Health as it pertains to chemical disinfection and infection control.



## What's In Your Bottle?

Do you suffer from Safety Indifference Syndrome, Cleaning Confusion, Efficacy Extremism, Dwell Time Disease, Sustainability Shortcomings, or Compatibility Complex? Our new educational campaigns via our Insights Blog, clears the confusion on the different characteristics of chemical disinfectants to ensure your facility makes educated and informed decisions with the products you use in your facility. Follow us on the Virox Insights blog and Talk Clean to Me blog to see and understand what's in your bottle!



2017 Hygieia Awards Ceremony

## AHP® Reduces HAI's by 23%!

A new study by Boyce et al, published in the American Journal of Infection Control showcases the tremendous ability of AHP® to reduce hospital association infections including VRE, MRSA, and *Clostridium difficile* by 23% when 80% cleaning compliance was achieved. This study indicated that to achieve HAI reduction there were three key components: a clearly defined housekeeping protocol with education, routine housekeeping cleaning compliance monitoring with a minimum of 80% compliance, and the use of an effective disinfectant cleaner such as Accelerated Hydrogen Peroxide®.

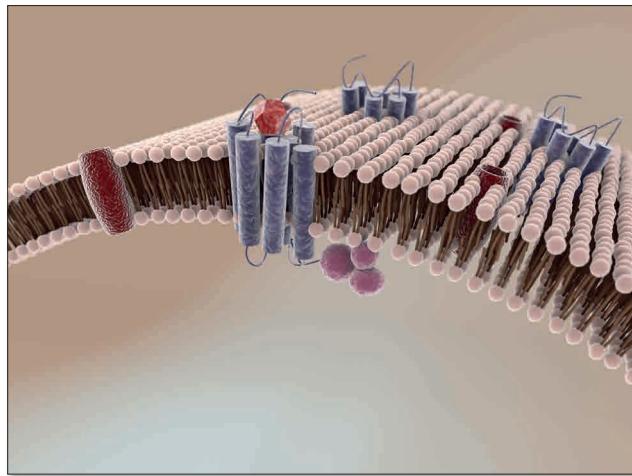
Talk **CLEAN** to Me 

**insights**blog

# Effectiveness of Cleaning-Disinfection Wipes and Sprays, and What I Learned About ATP

OLIVIA LATTIMORE, MANAGER, PROFESSIONAL AND TECHNICAL SERVICES, VIROX TECHNOLOGIES INC

It's interesting. Sometimes when you read a journal article, and don't skip over the "Methods" and "Results" sections, you can find some revealing gems. Unfortunately, more often than not you will find that the authors have reached conclusions that are not really supported in their results (these papers are typically recognizable in their "Discussion" section, by the large number of references to other papers in which the actual results were more favorable than their own results). However, sometimes there can be found a discovery that makes you look at things just a little differently.



There is a paper, recently published in the American Journal of Infection Control (AJIC, 2017 Aug 1;45(8):e69-e73), in which the authors set out to compare the effectiveness of commercially available products in simultaneous cleaning and disinfection with 2 different application methods – wipes vs. sprays. They certainly provided some useful information on that topic and the paper was worth the read if only for that alone, but they accidentally proved that adenosine triphosphate (ATP) is not as effective at measuring contamination as we would like to believe.

## Wipes vs. Sprays

The authors note that ready-to-use cleaning-disinfecting wipes and sprays are becoming desired formats for cleaning and disinfection in hospitals. The ease of use of the wipes and sprays has the potential to save time and reduce barriers for health care workers to apply these ready-to-use products. Currently, there is a lack of evidence that these products are truly effective in cleaning and disinfecting at the same time.

Using test protocols developed by Syed Sattar and his group at the University of Ottawa, the authors of this study contaminated ceramic tiles with each of the test organisms - Vancomycin-resistant *Enterococcus faecium*, *Klebsiella pneumoniae* OXA-48, and *Acinetobacter baumannii*. With the exception of *A. baumannii*, each organism had been collected from a hospital where it had caused an outbreak. Each organism was cultured on 3 separate tiles to accommodate the two disinfectant methodologies and a positive control.

The authors conducted the disinfection experiment with 2 different test soils, low and high soil content, to mimic all possible clinical situations. The standardized procedures for the tests were: to moisturize the surface properly with the wipe to keep the surface moistened for 5 minutes; use the spray 30 cm from the surface and then wiped with a paper towel or a cloth. Prof. Sattar's "Wiperator" device was used to ensure consistency of application and pressure. Before and

after testing each tile, they were analyzed for colony forming units (CFU), and relative light units (RLU), which is how ATP is described.

For all but one of the test bacteria, the ready-to-use cleaning-disinfection products reduced the microbial count by  $>5\text{-log}_{10}$  with 5-minute exposure time. In the exception, one of the disinfectant sprays had an average  $4.43\text{-log}_{10}$  CFU reduction of VRE, although the wipe version of that product achieved a greater than  $5\text{-log}$  reduction. This is generally the result that would be expected.

## CFU vs. ATP

What I find particularly interesting about this paper is the other discovery. The results in this study show that the 2 outcome measures, bactericidal effect as CFU reduction and protein residue as RLUs, did not correlate. The CFU reduction was highest for *K. pneumoniae* for all tested products, whereas the RLU reduction was lowest for *K. pneumoniae*. *K. pneumoniae* produces a layer of polysaccharide, which forms a biofilm on surfaces. The layer of polysaccharide helps the bacteria to adhere to surfaces, which presumably makes it harder to clean a surface properly. *E. faecium* had on average the lowest CFU reduction, but the highest RLU reduction. *E. faecium* is a gram-positive bacterium, which possibly has a higher tolerating desiccation against disinfectants. Although the exact reasons are unknown, the different bacterial properties obviously influence the results regarding CFU and RLU reduction.

The authors note that ATP testing is quick and easy to practice on hospital surfaces. Unfortunately, ATP meters from different suppliers have different sensitivities and can also react with the detergent, which makes it hard to set a threshold for this measurement. Biocides often quench the ATP signal (indicating a low RLU), whereas the presence of an organic load may increase the RLU value significantly. Several quality standards have been used as RLU thresholds, ranging from 100-500. As demonstrated in this paper, a standardized quality standard needs to be developed.

In general, the CFU log reduction for all tested products, in wipe form and in spray form, was (with the one exception) appropriate for clinical use. Although ATP may show a difference between pre- and post-cleaning, RLU reduction does not correlate with actual CFU reductions. One wonders then about the wisdom of our increasing reliance on ATP as a surrogate measurement of environmental contamination.

# Effectiveness of Various Cleaning and Disinfectant Products on *Clostridium difficile* Spores of Different PCR Ribotypes

NICOLE KENNY, VICE PRESIDENT, PROFESSIONAL AND TECHNICAL SERVICES, VIROX TECHNOLOGIES INC.



Prof. Andreas Voss and his colleagues in the Netherlands published the results of their study that put several cleaners and disinfectants up against 4 different *Clostridium difficile* ribotypes (Kenters et al. Antimicrobial Resistance and Infection Control (2017) 6:54 DOI 10.1186/s13756-017-0210-3). Their paper is a valuable addition to the knowledge base in the battle against this pervasive pathogen. This review contains excerpts of the original article.

*C. difficile* is an important health threat associated with morbidity, mortality, and extra costs. The yearly national excess hospital cost associated with hospital-onset *C. difficile* is estimated to be €4 billion for Europe, \$1 billion in the United States of America and \$280 million in Canada. Spores of *C. difficile* can survive in hospitals for years, and the hospital environment is known to be a key pathway for patients to acquire *C. difficile* infections (CDI). Effective cleaning and disinfection is an essential prerequisite to prevent the spread of CDI within healthcare settings.

Presently, chlorine-based products are the mainstay with regard to environmental disinfection in the Netherlands, however, hypochlorite has to be used in excessive concentrations to be effective, thereby increasing its toxic and corrosive properties. Alternative, ready-to-use products are needed to ensure consistent cleaning and decontamination.

## Four disinfectants

The four different products that were tested are commonly found in the Netherlands; 1) regular hydrogen peroxide\*; 2) glucoprotamin; 3) a mixture of ethanol, propane and N-alkyl amino propyl glycine; and 4) a mixture of didecyldimonium chloride, benzalkonium chloride, polyaminopropyl, biguanide and dimenthicone as active ingredients. Tiles were contaminated with a test solution containing a concentration of 5x10<sup>6</sup>CFU/ml spores of *C. difficile* strains belonging to PCR ribotypes 010, 014 or 027. The tiles were left to dry for an hour and then wiped

or sprayed with one of the sprays or wipes as intended by the manufacturers. When products neutralized after 5 min, microbiological cultures and ATP measures were performed.

### Three PCR ribotypes

The study authors tested the effectiveness of these four, different cleaning/disinfecting wipes and sprays against spores of *C. difficile* PCR ribotypes 010, 014 and 027. These ribotypes were chosen because of their differences in virulence and transmission potential. *C. difficile* ribotype 010 does not produce toxins and therefore is unable to cause CDI in humans. In contrast, *C. difficile* PCR ribotype 027 is known for its “hypervirulence”, and is associated with increased morbidity and mortality, as well as its potential to cause large outbreaks.

The overall effectiveness of products measured by log<sub>10</sub> CFU reductions ranged from 3.09 (glucoprotamin) to 5.29 (hydrogen peroxide). When comparing the mean log<sub>10</sub> CFU reductions by application type (wipe versus spray), it became obvious that the ready-to-use wipes were outperforming the sprays using a paper towel by 0.81 to 1.60 log<sub>10</sub> CFU reductions. The differences in log<sub>10</sub> CFU reduction between the wipe and spray with the same active ingredient were consistently observed for all products tested in both application forms. This difference between wipes and sprays could possibly be explained by the “mechanical” effect involved with cleaning/disinfection. The authors point out that studies similar to this one, but using detergent wipes, achieved an average log<sub>10</sub> CFU reduction of 1.63, which is exactly within the range of difference they observed with wipes and sprays. Clearly, the application form is responsible for a significant part of the effect in addition or combination with the disinfecting active compound.

### Difference in wiping material

It could be argued that the difference in results is due to the difference in mechanical effect of the different materials used for wiping. However, based on a study by Diab-Elschahawi et al., who compared microfibers, cotton cloths, sponge cloths, and paper towels for their decontamination abilities, without finding a significant difference, it can be concluded that the difference between wipes and sprays in this study cannot be explained by the difference in wiping material.

Although sprays were used according to the suppliers' instructions, surface coverage as well as the actual contact time and number of wiping movements might be different to the use of impregnated wipes. The hydrogen peroxide product wipes and the ethanol product wipes were available as ready-to-use, but the glucoprotamin wipe needed to be prepared in a reusable container. The study authors highlight that ready-to-use wipes eliminate the possibility of human errors that could make the disinfectant less effective or make the wipes unnecessarily toxic.

### Not all ribotypes are alike

Interestingly, in addition to the application method and the compound used, the results derived from this study indicate that the individual *C. difficile* strain is of importance with regard to the effect of cleaners/disinfectants. While CFU reductions were highest for the non-toxin producing *C. difficile* ribotype 010 in a low organic contamination environment, they were lower for the clinically more important ribotypes 014 and 027. Interestingly, the differences in effectiveness were less pronounced and, in the case of the hydrogen peroxide wipe, even reversed in a high organic contamination environment. These results would seem to indicate the importance of including a variety of clinically relevant ribotypes when evaluating the effect of disinfectants against *C. difficile*.

I really like and appreciate studies such as this one. The inclusion of the analysis of different strains of *C. difficile* show clear differences in resiliency. The study was very well assembled and well worth the read. Not all strains are equal, and not all disinfectants are up to the job of creating safe spaces in hospitals.

**\*Improved hydrogen peroxide formulations such as Accelerated Hydrogen Peroxide® were not included in this study**

### Community Environmental Contamination of *Clostridium difficile*

Historically, *Clostridium difficile* infection (CDI) has predominantly been thought to result from recent acquisition of a *C. difficile* isolate in a healthcare center. Efforts are primarily directed at prevention of the spread of *C. difficile* spores from symptomatic patients to prevent horizontal transmission of spores to other susceptible patients; however, early isolation of colonized patients has been shown to decrease CDI incidence. Case series have suggested a wider source of potential *C. difficile* contamination, including water, pets, foods, or farm animals. More recently, a large surveillance study in England demonstrated that a minimum of 45% of *C. difficile* strains associated with clinical disease were genetically distinct by whole genome sequencing. The authors concluded that there is a potentially large reservoir of *C. difficile* that was most likely environmental in origin. A group in Houston, Texas conducted a large environmental surveillance study (*Open Forum Infect Dis. 2017 Winter; 4(1): ofx018*) to assess rates of *C. difficile* contamination in homes and public areas within Houston. The objectives of the study were to assess environmental contamination of toxigenic *C. difficile* and to assess strain distribution and cytotoxicity of environmental compared with clinical strains obtained from hospitalized patients with CDI.

To assess *C. difficile* contamination in public areas, common areas of chain stores, fast food restaurants, public parks, and community homes were sampled using pre-sterilized gauze lightly soaked with 0.85% NaCl (sodium chloride). To assess *C. difficile* contamination in private homes, 3 to 5 household items were collected from a convenience sample of community homes located in various parts of Houston. No persons in the homes had CDI within the previous 12 months. To compare environmental contamination in hospital versus non-hospital settings, samples were obtained from bathrooms and patient table from hospital rooms with an admitted patient without CDI. For each batch of 10 swabs, a negative control of 1 swab that was not used but placed in with the rest of the swabs was used to assure no cross-contamination of swabs.

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reductions in colonization or infection with healthcare-associated pathogens. Second, adjunctive use of automated room disinfection devices has been shown to reduce contamination on surfaces and decrease acquisition of multidrug-resistant organisms. Finally, and for the purposes of our review, most critically,

ered. Although many programs may choose one primary method of monitoring, it should be appreciated that it may be beneficial to use multiple complementary monitoring methods. Education of EVS personnel should be an essential component of any intervention that includes monitoring and feedback. It should be clear that the monitoring is not punitive and the results will be used to improve performance.



multiple studies have shown that monitoring of cleaning with feedback to environmental services (EVS) personnel can increase thoroughness of cleaning and effectiveness of surface disinfection.

It is recommended that all infection control programs develop strategies to monitor cleaning to ensure the adequacy of their cleaning practices. Our review paper examined current methods used to provide monitoring and feedback on the effectiveness of manual cleaning and disinfection in healthcare facilities. We emphasize practical approaches to monitor and improve cleaning, including both daily disinfection of high-touch surfaces and post-discharge cleaning.

## Methods of Monitoring, Cleaning, and Disinfection

One of the guiding principles of infection prevention is that effective implementation of interventions requires objective monitoring of staff compliance with regular feedback on performance. Carling and Bartley suggested that the basic components of such “enhanced” monitoring programs should include (1) use of an objective, quantitative monitoring tool; (2) performance rather than deficiency orientation; (3) ongoing monitoring by trained, unbiased individuals; (4) objective performance feedback; and (5) goal-oriented structured process improvement model.

Several objective methods are available to monitor cleaning and disinfection. Each of these methods has advantages and disadvantages that must be consid-

## Fluorescent Markers

A nearly invisible transparent gel is applied covertly to multiple high-touch surfaces prior to cleaning and allowed to air-dry. After cleaning, a black light is used to assess the surfaces, with absence of marker indicating that a surface has been wiped. The method is often used to provide aggregate feedback on thoroughness of cleaning for EVS employees, and can also be used to provide immediate feedback to individual employees and to direct re-cleaning of rooms if pre-specified criteria on marker removal are not met. The ability to directly visualize sites that were not wiped provides a very useful and unambiguous teaching tool.

The fluorescent marker method does have limitations. First, several studies have demonstrated that it is not uncommon for pathogens to be recovered from sites with complete marker removal. Such contamination despite marker removal could be related to factors such as incorrect application of product (e.g., insufficient contact time). Second, removal of marker from one site on a surface does not ensure complete removal from alternate sites on the same surface. For example, we found that marker was frequently removed from the top surface of bedside tables in our facility, but not from a frequently touched table hand grip on the undersurface. Finally, because the marks may not be completely invisible, some EVS personnel may focus efforts on removal of the marks rather than on improving cleaning practices. In that regard, EVS personnel occasionally have been reported to obtain their own black lights in an effort to search for and eliminate the marks.

## ATP

Adenosine triphosphate (ATP) bioluminescence assays provide a rapid assessment of cleaning effectiveness, because detection of ATP on surfaces indicates the presence of residual organic material (e.g., bacteria, human secretions or excretions, and food). A specialized swab is used to sample a standardized surface area and the swab is analyzed using a portable handheld luminometer. The amount of ATP is expressed as relative light units (RLUs). The method is easy to use and can provide rapid and objective feedback to EVS personnel regarding their performance. In several studies, providing monitoring and feedback based on ATP readings has been associated with improved environmental cleaning.

Use of ATP readings to monitor cleaning has some limitations. First, there is no established benchmark for the ATP readings that indicate that a surface is clean. Second, although some studies have demonstrated that ATP readings correlate with aerobic colony counts on surfaces, others have not. Notably, in a small study, we found that only 3% of sites with ATP readings of less than 250 RLU had positive cultures for *C. difficile* versus 19% of sites with higher ATP values, suggesting that low ATP values may be predictive of negative cultures for *C. difficile*. Third, the time requirement may be relatively high if multiple surfaces are assessed. Finally, the cost of routine monitoring with ATP can be significant if multiple surfaces are assessed in each room.

### **Direct Observation**

Although visual inspection of surfaces after cleaning is inferior to objective monitoring methods, intermittent direct observation of cleaning practices is an invaluable adjunct to routine monitoring. Variability in EVS personnel practices can adversely affect disinfection of surfaces. During our study period we found that some EVS workers in our facility used an insufficient number of wipes, resulting in inadequate application of disinfectant. Subsequently, we have demonstrated that such overuse of bleach wipes can result in transfer of *C. difficile* spores by the bleach wipes from contaminated to clean surfaces. Monitoring using fluorescent markers or ATP bioluminescence would not detect variations in cleaning practices. Thus, observations of practice are essential. Interviews of front-line staff are also very useful in order to identify knowledge deficits and appreciate issues that impact job performance. The findings of these observations and interviews can be used for development of educational materials and standard operating procedures for EVS personnel.

### **Microbiological Monitoring**

Cultures of the environment are not recommended for routine monitoring. A primary factor limiting the utility of cultures for routine monitoring is that the results are not available for 1 to 3 days and cannot be used to provide real-time feedback. Cultures are often performed using non-selective contact plates which provide information on total viable microbial counts on surfaces, often expressed as aerobic colony counts. There is no consensus on what threshold numbers of viable counts should be used as a cut-off to define a surface as "clean". Although not recommended for routine monitoring, cultures can be very useful in outbreak investigations and for research studies. Others have used cultures to identify specific reservoirs for transmission and to direct disinfection efforts.

### **Portable Equipment**

Equipment that is shared among patients (e.g., vital signs equipment, wheel chairs, electrocardiogram machines) can also be a potential source of pathogen transmission. Thus, current guidelines recommend that medical equipment that comes into contact with intact skin be cleaned and disinfected after each patient use. In a recent study, we demonstrated that hospitalized patients frequently have direct or indirect interactions with medical equipment and other fomites that are shared among patients. These items were often contaminated with healthcare-associated pathogens. In addition to monitoring cleaning of high-touch surfaces in patient rooms, healthcare facilities should develop protocols for cleaning of portable equipment and monitor practices. The protocols should define when and how equipment should be cleaned and identify the responsible personnel. Both fluorescent markers and ATP assays are likely to be effective methods to monitor cleaning of equipment. Further studies are needed to assess the effectiveness of cleaning and to identify effective methods to monitor cleaning.

### **Conclusion**

All healthcare facilities should have programs in place to monitor cleaning to ensure the adequacy of their cleaning practices. Such programs should include observation of EVS practices and education in conjunction with objective approaches to monitor cleaning with ongoing feedback to personnel. Ongoing commitment within institutions is needed to sustain successful cleaning and disinfection programs.

### **CONTINUED FROM PAGE 5**

In this large surveillance study, the authors found that between 6.5% and 24.6% of samples obtained from various environmental settings were positive for *C. difficile*. Prevalence of *C. difficile* was higher in parks and homes and lower in fast food restaurants and merchant stores. Ribotype distribution was similar between environmental and clinical isolates with the exception that the ribotype 027 strain was observed more commonly in hospital clinical and environmental isolates. Strengths of the study include a large sample of environmental samples and comparator clinical isolates obtained in the same geographic location from different hospital types during the same time period.



Of course, the obvious limitation of this study is that it was conducted in a single large, urban area in the southern United States. Future studies will need to test these results in different geographies.

Also, the authors did not use traditional random naturalistic home sampling in this study but rather a convenience sample of persons who answered an ad that they placed at randomly selected community and church group meetings.

### **CONCLUSIONS**

Previous case series have suggested a wider source of potential *C. difficile* contamination, including water, pets, foods, or farm animals. This study goes a long way to identifying a high prevalence of *C. difficile* from community environs that were similar ribotypes to isolates that caused clinical disease. These findings suggest that interventions beyond isolation of symptomatic patients should be targeted for prevention of CDI.

# Advancing Infection Control Education in Africa

## An Interview with Prof. Shaheen Mehtar

**Nicole Kenny: Why is infection control education in Africa so important?**

**Shaheen Mehtar:** On the African continent, there is skills shortage particularly in infection prevention and related subjects, like hospital engineering and infrastructure maintenance. Education and understanding of the local conditions are pivotal to good infection control practices in both healthcare facilities and in the communities. By using education systems like Webber Training's Teleclass Education we can take the messages into some of the more rural and remote parts of our continent.

### How has ICAN improved the lives of Africans?

The Infection Control Africa Network (ICAN) was established in 2012 and has membership in 34 countries across Africa with 500 members currently. It has an extensive education program, called "Cape To Cairo". Since 2005 ICAN, in partnership with Stellenbosch University, has trained over 120 people in a post-graduate diploma in IPC, 300 in fundamentals in IPC (6 months course), 1200 in the Basic course in IPC, 94 managers in cost effective IPC practices (5-day course in IPC for managers discussing finances and resources), and targeted courses on things like decontamination, to name a few of our education initia-

tives. There have been annual and now bi annual ICAN conferences where bursaries and scholarships (including a generous scholarship funded by Virox) are given to African scientists to present their research. ICAN has been a member of the WHO committees on IPC and related topics with a view to carry forward the view of low to middle income countries. If with all this extensive training, there has been an impact on African lives, we are pleased.

### How will the Teleclass Education Africa project be able to bring education to such a diverse and broad audience?

We are partnering with Webber Training to make the "Basics of Infection Control" course available to more people than just those who are able to travel to Stellenbosch University. All of the course lectures will be made available on [www.teleclassafrica.org](http://www.teleclassafrica.org) in English, and also, eventually, in French, Portuguese, Arabic, and Swahili as well. That will mean that virtually every healthcare worker on the continent will be taught in at least one language that is understandable to them. Further to that, we are hoping to partner with infection control agencies around the globe to fund and establish knowledge hubs in several university sites across Africa. Our intent is to ensure that good evidence-based training and education can be extended to not only clinical staff, but also to non-clinical staff, as well as community healthcare workers, and traditional birth attendants.

Shaheen Mehtar, is Emeritus Professor at Unit for Infection Prevention and Control, Tygerberg Academic Hospital and Faculty of Health Sciences, Stellenbosch University. An internationally recognized expert in IPC, Professor Mehtar and has been involved in setting up IPC programs in the UK, Europe, Far East, India, Asia and Latin America. She has been on the executive committees of several prestigious organizations such as the Hospital Infection Society, The British Society of Antimicrobial Chemotherapy, European Society of Microbiology and Infectious Disease, the International Society of Chemotherapy and International Society of Infectious Diseases. A founder member and Chair of the Infection Control Africa Network (ICAN), Prof Mehtar also serves on several WHO committees including those for global IPC policies, surgical site infection, WASH and safety injection global network (SIGN). Through ICAN she is extensively involved in establishing and promoting IPC training programs and structures across Africa. She supported the IPC programs during the Ebola outbreak in Sierra Leone. A highly respected and recognized world expert in Infection Control Professor Mehtar is frequently consulted by governments such as Egypt, Namibia, Swaziland and Zimbabwe.

[www.gofundme.com/teleclass-education-africa](http://www.gofundme.com/teleclass-education-africa)