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## HVAC & Infectious Diseases

By **Marlene Linders**

**W**hile the H1N1 virus is getting the headlines, other environmental pollutants such as *E. coli*, norovirus, staph infections (*Staphylococcus aureus*), and Methicillin Resistant *Staphylococcus Aureus* (MRSA) are increasingly encountered in our environment and cause significant health problems.

Norovirus, the bacteria identified as causing outbreaks on cruise ships, was to blame for the closing of the Hilton Hotel near Dulles International Airport. Taco John and Taco Bell franchises were closed in several cities around the country due to an outbreak of *E. coli*.

In Hong Kong in 2003, the Amoy Gardens apartment community was one of the most significant “owners” of a SARS outbreak. At least 321 cases were attributed to residents after an individual visited an apartment on March 14 and March 19 and used the toilet on the second visit.

Several scenarios were reviewed as to the cause of the outbreak; among them the dispersal of respiratory droplets, cross contamination, roof rats, toilets and bathroom hardware in need of repair, and improper HVAC equipment including poor air exchanges.

The Chinese University of Hong Kong and the University of Hong Kong investigated the incident by using a dynamic modeling and detailed epidemiological study of the location, time and distribution of people infected. The cause was an aerosolized plume arising from the toilet as a result of improper ventilation. The infected feces or urine, aerosolized by the toilet flushing spray, was drawn into the defective ventilation system, exposing all the residents of the apartment community.

No longer confined to hospital or health-care settings, airborne tuberculosis, chicken pox, and varicella are on the rise, and are now considered the new environmental toxins in public buildings. To lower risk, facilities of all occupancies need to

safeguard their patients, customers, and/or employees while minimizing their liability.

### **Burden of Proof**

To state a claim for negligence based upon the contraction of an illness or infection (caused by an environmental toxin), the plaintiff must prove that:

- The defendant was aware or should have been aware of the infectious source within the premises;
- The defendant committed a negligent act or omission, which exposed the plaintiff to the infection; and
- The plaintiff suffered an incident or illness due to the defendant’s negligence.

### **Exercising Due Diligence**

HVAC systems of commercial buildings are not typically engineered to effectively remove biological contaminants such as airborne bacteria and viruses. ASHRAE’s Standard 62.1 mandates use of an air filter with a minimum efficiency reporting value (MERV) not less than 6. This is primarily to enhance HVAC mechanical equipment performance, as well as protect it from contamination from dust particles, lint, etc.

Most commercial buildings and facility managers use filters ranging from MERV 5 to MERV 8. This provides building occupants minimal protection from biological contaminants as this level of filtration does not effectively remove smaller particles from the air. Only MERV ratings of 13 or higher remove contaminants such as airborne MRSA, TB, etc., with a layer of due diligence added. Enhancing filtration efficiency will improve filtration performance to increase removal of particulate matter from the air.

Baseline air quality sampling of high touch areas is a prudent measure to establish due diligence in the advent of a sentinel event. Sampling, using the new DNA panel for infectious diseases, provides a preliminary overview of susceptibility and creates a timestamp that can impact legal review.

### **Maintenance and Products**

Many problems relating to the spread of biological contaminants can be traced to building operation. Frequently, filters are improperly installed and maintained, which results in the all too common filter bypass. This in itself reduces filtration efficiency. Additionally, cleaning products should be pathogen specific, EPA registered for the desired outcome, and implemented into

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an aggressive risk management and high touch hygiene program that is exercised routinely.

Careful selection of products such as hardware with a silver-based finish and powder coated is a passive measure to increase facility cleanliness. Addressing dust collection points by using concealed door openers and low energy automatic openers hidden in the door or floor is another example of a passive measure, yet contributes significantly to the reduction of labor, as well as airborne particles.

### Design

Many commercial buildings have outdoor air intakes located at or near ground level. Because of the air intake's proximity to potential contamination sources such as streets, alleys, parking lots, loading docks, and retention ponds, and naturally occurring threats, the risk of occupant exposure is increased. All managers should construct a suspect footprint for their buildings and color code it red, green and yellow to ascertain areas of little to significant concern. Additional measures to consider:

- Commissioning: ensuring a building's ventilation system is operating in line with design intent; and
- Isolating high suspect spaces: Maintaining common areas considered vulnerable to internal releases such as lobbies and auditoriums, at a lower pressure relative to adjacent spaces to limit potential spread of a contaminant beyond the immediate release area.

Owners or managers should be mindful of the ways to limit liability on their premises for exposure to environmental toxins. Any time a possible threat exists, owners should act quickly to detect, identify, and remove the environmental toxin and its source. The owner also must inform building occupants of the toxin and provide any necessary warnings.

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