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Environmental Health Committee (EHC) Emerging Issue Report:

Biological Agents in Context of Globalisation and Pandemic Influenza and Airborne Transmission

What is the issue?

Infections, such as influenza, SARS and M. tuberculosis (TB), have been clearly shown to have airborne disease transmission potential [1,2].Other infections, such as anthrax and smallpox, while not normally substantial airborne threats in nature, are potential biological weapons and could have devastating consequences in the workplace. A serious complication of the global *M. tuberculosis* (TB) problem has been the emergence of Multi-drug Resistant Tuberculosis (MDR-TB), and even Extensively Drug Resistant TB (XDR-TB). Although TB is an old disease and has been fairly extensively studied, MDR-TB is a fairly new phenomenon and less is understood about its infectiousness, transmission dynamics and appropriate infection control procedures for these organisms [3], particularly against the background of high HIV infection prevalence in most of the high-burden TB countries.

An important question that urgently requires answers is how effective are the various engineering interventions that may minimize the spread of airborne disease. Integral to rationale engineering control interventions is a clear understanding of the infectiousness of patients with infections that are can be spread by the airborne route, and an understanding of other types of controls, such as administrative or engineering controls, in hospitals that help to reduce exposure.

Air disinfection by means of UVGI could effectively reduce the amount of air changes required for infection control in a space provided by mechanical ventilation and save energy. Such air disinfection may be the single most cost-effective engineering intervention under circumstances where air circulation is an important transmission factor [4, 5]. Despite strong laboratory evidence demonstrating the efficacy of various engineering interventions against certain airborne disease[6], there have not yet been any clinical trials on preventing the transmission, Specifically, there have been no trials of ventilation, filtration, UV irradiation or respirator use for the control of any specific airborne infection. This is because infectious source patients, exposed hosts, organisms, and environments all vary greatly, making controlled trials extremely challenging.

Threshold Limit Values (TLV's) exist only for certain substances of biological origin, however there are no mandatory numerical limits against which investigators can compare measurements of air or source concentrations for any infectious agents. At present, air sampling methods for infectious agents (other than some opportunistic pathogens) are extremely limited, and suitable primarily for research endeavours. Moreover, the infectious dose for most airborne infections cannot be defined as it is dependent on host immunity, among other factors. Given the constraints, the usual approach of sampling indoor air and comparing measurements with TLV's can not be applied to bioaerosols[7].

What does it mean to ASHRAE?

There is great concern about the very real possibility of airborne transmission of various pathogens among institutional staff and administration in treatment facilities. Increasing international travel is providing new opportunities for airborne microbial spread.

What action should be considered?

This is the critical time for ASHRAE to be actively seeking solutions by supporting research on transmission and to develop tools for recommended environmental / infection control practice. It is suggested that:

1. ASHRAE, in recognising the devastating consequences of global pandemic viral or bacterial outbreaks, should be proactive in developing engineering guidelines for minimising the spread of these biological hazards in building systems.
2. The use and operation of interventions (engineering in particular) currently recommended for environmental infection control in facilities that provide health care, or serve the international travelling communities in particular, are not always understood in the context of the whole building design process. ASHRAE should consider implementing an investigation into current evidence based infection control practices to provide its membership a greater appreciation and understanding of such in order to support the necessary guidance required to prevent risk of infection from airborne transmission within these identified facilities.

Note: Emerging Issue Reports are developed and approved by the ASHRAE Environmental Health Committee (EHC). The Biological Agents in Context of Globalisation and Pandemic Influenza and Airborne Transmission Emerging Issue Report was approved by EHC in January 2011.

3. ASHRAE needs to liaison and work in collaboration with the various national and international medical research and public health advisory agencies to mutually seek environmental control solutions and assist in developing appropriate tools to eliminate, reduce or prevent biological hazards that cause the risk of airborne disease transmission in built environments.

References

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