Hospitals warned that wet breathing system filters transmit harmful bacteria and yeast

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Doctors have highlighted potential problems with the breathing system filters used in anaesthesia, including intensive care units, after demonstrating that they don't provide protection from harmful bacteria and yeast when they become wet.

Research in the July issue of *Anaesthesia* has shown that when they were wet, six commonly available filters allowed substantial passage of *Candida albicans* (a yeast infection linked to a range of chronic illnesses) and coagulase-negative staphylococci (a common hospital-acquired bacterial infection).

"Breathing systems filters are commonly used to reduce the passage of drug-resistant respiratory infections, but current international standards only require them to prevent bacterial transfer when dry" explains Dr David H T Scott, Consultant Cardiothoracic Anaesthetist and Intensive Care Specialist at the Royal Infirmary of Edinburgh, UK.

"The current ISO standard does not replicate the circumstances in clinical practice, where filters get wet with condensed water and airway secretions. We believe that our study shows that commonly available breathing filters cannot be relied upon to prevent bacterial transfer."

The researchers used six breathing system filters available in hospitals in Edinburgh:

- three hydrophobic pleated filters designed for use as heat and moisture exchanging filters (PhobA, PhobB and PhobC)
- one hydrophilic unpleated heat and moisture exchanging filter (PhilD)
- two simple filters (FilE and FilF).

These were tested using suspensions of two microbes:

- *Candida albicans*, because of its large cell unit size (12 micrometres)
- coagulase staphylococcus, because it is a common organism and its cell unit size (one micrometre) is representative of a large range of potential pathogens.

"All the filters tested permitted substantial passage of bacteria and yeast" says Dr Scott. "Even in a one microlitre loop of filtered solution, the number of colony-forming units transmitted through the filters was too large to quantify.

"In most cases the bacterial cultures from filters could not be distinguished from the samples created using unfiltered bacteria."

The authors conclude that their study shows that viable organisms pass across all types of breathing systems filters tested under conditions that may occur in clinical practice.

"In particular, simple filters required very little pressure to permit passage of microorganisms" says Dr Scott. "Although our experiment involved saturating the filters with test fluid, it provides important proof

of the principle: organisms may traverse some filters very easily and even large yeasts like *Candida albicans* survive the passage."

The authors are keen to point out that, although they tested six commonly available filters, the structure of gas filters suggest that products made by other manufacturers are just as likely to show the problem.

"It is important that clinicians are aware of the potential for microorganisms to pass through wet filters" says Dr Scott.

"Further studies are also required to investigate the potential for cross-contamination between patients if filters are used as the sole method of infection control in breathing systems for anaesthesia and intensive care.

"It should be pointed out that a microbe would have to make a long journey to infect a new patient by this route. Although a search of previous studies has revealed no evidence of cross-contamination relating to filter use, it could be theoretically possible in certain conditions."

More information: Passage of pathogenic microorganisms through breathing system filters used in anaesthesia and intensive care. Scott et al. Anaesthesia. 65, pp 670-673. (July 2010). DOI: 10.1111/j.1365-2044.2010.06327.x

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