

Biofilms in Hospitals Prevalent, May Contribute to Infection

Nancy A. Melville | November 27, 2014

Biofilms harboring multi-antibiotic-resistant organisms are found at unexpected levels on dry hospital surfaces and could contribute to the risk of infection transmission, according to the results of a new study.

"This emphasizes how adaptable bacteria are," lead researcher Karen Vickery, PhD, from Macquarie University in Sydney, Australia, told *Medscape Medical News*.

"Biofilms are forming on many hospital surfaces because they aren't cleaned frequently enough. The bacteria have a chance to attach and excrete extracellular polymeric substances, or slime, which makes them more resistant to removal and tolerant to disinfectants," she explained.

The study results were presented at the Healthcare Infection Society 2014 Annual Meeting in Lyon, France.

Biofilms are commonly associated with wet or damp surfaces, such as plastic medical tubing. However, in a previous study Dr Vickery was involved in, biofilms were discovered on dry hospital surfaces, including a sterile supply bucket and a venetian blind cord (*J Hosp Infect.* 2012;80:52-55).

"The presence of multi-antibiotic-resistant organisms being protected within these biofilms may be the mechanism by which the organisms persist within the hospital environment," the researchers speculate.

In their study, Dr Vickery and her team aseptically obtained hard surface sections of additional furnishings and equipment from an intensive care unit after terminal cleaning.

They used aerobic culture and real-time quantitative polymerase chain reaction (PCR) to determine bacterial presence including the 16S rRNA gene and *Staphylococcus aureus*.

They found evidence of biofilm and bacteria embedded in thick extracellular polymeric substances on 41 of 44 items (93%), which was visually confirmed with scanning electron microscopy.

It was a surprise to see the high number of items with biofilm on them.

Half of the biofilms were culture-positive, and multi-antibiotic-resistant organisms were found on 52% of the samples. Eight of the samples were positive for methicillin-resistant *S aureus*, three were positive for vancomycin-resistant *Enterococcus*, and five were positive for extended-spectrum beta-lactamase *Sphingomonas paucimobilis*.

S aureus was detected with PCR in 72% of samples of patient bedding and 42% of samples from the patient environment and fixed furnishings.

The bacteria stayed viable for as long as 2 years while they were stored in a sterile environment at room temperature.

The biofilms were found to be polymicrobial, and the most common species detected were *Faecalibacterium prausnitzii*, *Massilia timonae*, *S aureus*, coagulase-negative *Staphylococcus*, *Pseudomonas* species, and *Propionibacterium acnes*.

"It was a surprise to see the high number of items with biofilm on them," Dr Vickery said, noting that these findings underscore the need for much more vigorous decontamination methods.

"I think we need a two-pronged attack," she said.

Preventing Contamination

"To prevent biofilm formation, the surfaces have to be cleaned more frequently so the current detergents and disinfectants can remove or kill the bacteria before they attach and become more resistant," Dr Vickery explained.

"For established biofilm, more elbow grease has to be used," she added. This is similar to brushing one's teeth: "you use a brush to remove the biofilm, allowing more friction to break the bonds between the bacteria and your teeth."

The implications of the prevalence of biofilms even on hard dry surfaces are "huge," said Jon Otter, PhD, from King's College London and Guy's and St Thomas' NHS Foundation Trust in London, United Kingdom.

"I think if you asked most professionals working in hospitals, they'd be surprised first and foremost, but I am not sure that most would be as alarmed as they should be. The implications may not be obvious to those who are not familiar with biofilm science," he told *Medscape Medical News*.

"Biofilms could explain why vegetative bacteria can survive on dry hospital surfaces for so long, and could be part of the reason they are so difficult to remove or inactivate using disinfectants," he explained. "Bacteria in biofilms can be 1000-times more difficult to kill than corresponding planktonic bacteria."

These findings could provide important insights that explain why some pathogens persist despite what should be effective disinfection measures, Dr Otter added.

"There's been a mystery around why disinfectants that achieve a 5- or 6-log reduction in vitro fail to eliminate pathogens on surfaces that are normally only present at 1 or 2 logs. I think biofilms probably explain this," he said.

Dr Otter said he agrees that these findings underscore the need to consider biofilms in developing decontamination approaches.

"Historically, we have not developed hospital decontamination protocols with biofilms in mind, so it's not really surprising that the measures fail to eliminate them," he said.

"We need to develop future hospital decontamination protocols with biofilms in mind," Dr Otter explained.

There was no commercial funding for this study. Dr Vickery has disclosed no relevant financial relationships. Dr Otter works part-time for Bioquell and has given paid lectures for 3M.

Healthcare Infection Society (HIS) 2014 Annual Meeting. Presented November 16, 2014.

Medscape Medical News © 2014 WebMD, LLC

Send comments and news tips to news@medscape.net.

Cite this article: Biofilms in Hospitals Prevalent, May Contribute to Infection. *Medscape*. Nov 27, 2014.