

Repeated exposure to triclosan reduces virulence in *S. aureus*

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Repeated laboratory exposures to triclosan reduced susceptibility to antibiotics in *Staphylococcus aureus*, but probably not sufficiently to render commonly used antibiotics ineffective, according to a paper in the June 2012 issue of the journal *Antimicrobial Agents and Chemotherapy*. It also generated less virulent, less fit “small colony variants” of the pathogen.

The research is important, because concern has arisen that antiseptics and disinfectants might cause bacteria to develop reduced susceptibility to these compounds, as well as to [antibiotics](#), to the point where for some uses, in some countries, they have been strictly regulated, says principal investigator Andrew McBain, of the University of Manchester, UK. *S. aureus* is an important source of hospital- and community-acquired infections. Triclosan is a broad-spectrum antibacterial and antifungal compound often used in cleaning supplies, personal care products, toys, and other consumer products, as well as in clinical settings, for example, to reduce methicillin-resistant *S. aureus* infections.

The research began serendipitously when, during an unrelated study, Sarah Forbes, a PhD student in McBain’s lab, created a population of small colony variants by serially exposing *S. aureus* ten times on concentration gradients of triclosan. “This type of selection system we used represents a worst case scenario in terms of altering bacterial susceptibility because of the repeated and continuously elevating high level exposure,” says McBain. “We then grew this strain a further ten times on triclosan-free medium to see if it could recover.” The exposed

strain had reduced susceptibility to triclosan, and it was defective in its ability to form biofilms, as well as in a few other virulence-related functions. “We therefore hypothesized that if virulence had been altered at all in our strain, it had actually been reduced,” he says.

Forbes, and postdoctoral research associate Joe Latimer then grew the small colony variant, as well as the unexposed strain of *S. aureus*, in the wax moth larvae model, *Galleria mellonella*, “and found that our small colony variants were indeed less pathogenic in this test system than the unexposed strain,” says McBain. Even after it was grown another ten times in triclosan-free media, the small colony variant failed to fully regain its virulence, as well as its normal ability to form biofilms and to produce the enzyme, DNase.

“The work suggests that at least for small colony variants, long-term exposure can select for reduced susceptibility, but that the resulting organisms may also be reduced in their pathogenic capability, or fitness,” says McBain. He adds that “even though our small colony variants were less susceptible, their resistance levels remained markedly lower than commonly used concentrations so they were still probably effectively treatable.”

More information: J. Latimer, S. Forbes, and A.J. McBain, 2012. Attenuated virulence and biofilm formation in *Staphylococcus aureus* following sublethal exposure to triclosan. *Antim. Agents Chemother.* 56:3092-3100.

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