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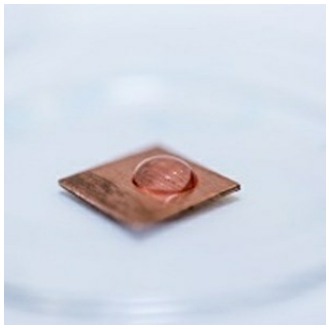
Copper Destroys MRSA in Touch Contamination



New research from the University of Southampton shows that copper can destroy MRSA spread by touching and fingertip contamination of surfaces, setting it apart from other antimicrobial surfaces and shedding new light on how it works.

Frequently-touched surfaces in busy areas – such as hospitals – are at high risk of community-acquired and healthcare-associated infections (HCAIs) caused by methicillin-resistant *Staphylococcus aureus* (MRSA) and methicillin-sensitive *Staphylococcus aureus* (MSSA). Bacteria deposited on a surface by one person touching it, or via contaminated body fluids, can be picked up by subsequent users and spread to other surfaces, potentially causing thousands of infections worldwide. There were over 800 cases of MRSA and almost 10,000 cases of MSSA bacteraemia reported by English NHS acute Trusts between 1 April 2014 and 31 March 2015[1].

In previous Southampton studies, simulated 'droplet contamination' of MRSA – representing a sneeze or a splash – showed it was rapidly killed on copper and copper alloy surfaces. However, contamination of surfaces often occurs via fingertips, drying rapidly and potentially being overlooked by cleaning regimes, unlike visible droplets.

Dr Sarah Warnes, lead author of the new research [2], explains: 'Our latest research shows that in simulated fingertip contamination of surfaces with millions of MRSA, the cells can remain alive for long periods on non-antimicrobial surfaces – such as stainless steel – but are killed even more rapidly than droplet contamination on copper and copper alloys. Exposure to copper damages the bacterial respiration and DNA, resulting in irreversible cell breakdown and death.'

While the efficacy of copper – and a family of copper alloys collectively called antimicrobial copper – has been well-established through laboratory and clinical trials, the mechanism by which solid antimicrobial copper surfaces destroy bacteria and viruses is still being studied.

This new paper, published in the journal *Applied and Environmental Microbiology*, demonstrates that MRSA die on copper surfaces by a multifaceted attack from copper ions and reactive oxygen species (ROS), but the mechanism is slightly different than previous results for Gram-negative bacteria, such as *E. coli*, where the ROS can convert to even more reactive, fast acting oxygen radicals.

Professor Bill Keevil, Chair in Environmental Healthcare at the University of Southampton and the paper's co-author, explains the significance of these findings: 'It's important to understand the mechanism of copper's antimicrobial efficacy because microorganisms have evolved various mechanisms to convey resistance to disinfectants and antibiotics.

'Our work shows that copper targets various cellular sites, not only killing bacterial and viral pathogens, but also rapidly destroying their nucleic acid genetic material so there is no chance of mutation occurring and nothing to pass on to other microbes, a process called horizontal gene transfer. Consequently, this helps prevent breeding the next generation of superbug.

'By contrast, our work with silver suggests that this metal does not work as an antimicrobial to kill MRSA on dry touch surfaces, emphasising the unique antimicrobial properties of copper.'

Touch surfaces made from solid antimicrobial copper are already used by hospitals around the world to reduce the spread of infections, supporting key infection control measures such as good hand hygiene and regular surface cleaning and disinfection.

References

1. *Staphylococcus aureus (MRSA and MSSA) bacteraemia mandatory reports. Summary of the Mandatory Surveillance Annual Epidemiological Commentary, 2014/15* Public Health England, July 2015

2. *Death and genome destruction of methicillin-resistant and methicillin-sensitive strains of Staphylococcus aureus on wet or dry copper alloy surfaces does not involve Fenton chemistry* S. L. Warnes and C. W. Keevil. Applied and Environmental Microbiology 2016 10.1128/AEM.03861-15

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