

Infection outbreaks at hospitals could be reduced by copper-coated uniforms

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Escherichia coli. Credit: Rocky Mountain Laboratories, NIAID, NIH

Doctors, nurses and healthcare professionals could soon be wearing uniforms brushed with tiny copper nanoparticles to reduce the spread of bacterial infections and viruses, such as Escherichia coli (E. coli), at

hospitals.

Material scientists at The University of Manchester, working in collaboration with universities in China, have created a 'durable and washable, concrete-like' composite material made from antibacterial [copper nanoparticles](#). They have also developed a way of binding the composite to wearable [materials](#) such as cotton and polyester, which has proved a stumbling block for scientists in the past.

Bacterial infection is a major issue in hospitals across the UK and has been rising due to its spread on surfaces and clothing. E. coli infections alone killed more than 5,500 NHS patients in 2015 and Government estimates put the cost of such infections to the NHS at £2.3 billion this year alone.

Precious metals, such as gold and silver, have excellent antibacterial and antimicrobial properties, but their commercial use in textiles is prohibitive due to extremely high costs. That means [copper](#) is the material of choice for researchers as it has very similar antibacterial properties to gold and silver but is much cheaper. That's why material chemists are focussing their attentions on exploring the possibility of using copper as the ultimate antimicrobial agent.

However, prior to this breakthrough, techniques for binding copper to materials like cotton for medical and antimicrobial textile production had limitations. Now, using a process called 'Polymer Surface Grafting', the research team has tethered copper nanoparticles to cotton and polyester using a polymer brush, creating a strong chemical bond. The researchers say it is this bond which has led to excellent washable properties and durability. These developments could finally see copper-covered uniforms and textiles commercialised in the future.

Lead author, Dr. Xuqing Liu, from the School of Materials, said: "Now

that our composite materials present excellent antibacterial properties and durability, it has huge potential for modern medical and healthcare applications."

The researchers tested their copper nanoparticles on cotton as it is used more widely than any other natural fibre and polyester as it is a typical polymeric, manmade material. Each material was brushed with the tiny copper nanoparticles which measure between 1-100 nanometres (nm). 100nm is the equivalent to just 0.0001 millimetres (mm).

The team found their cotton and polyester coated-copper fabrics showed excellent antibacterial resistance against *Staphylococcus aureus* (S. aureus) and *E. coli*, even after being washed 30 times. When compared with the traditional process of copper coating the polymer brush technique developed at the University is far more effective.

Dr. Liu said: "These results are very positive and some companies are already showing interest in developing this technology. We hope we can commercialise the advanced technology within the next few years. We have now started to work on reducing cost and making the process even simpler."

Provided by University of Manchester

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