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Super biomaterials join the resistance against bacteria

A bacteria-resistant material that could help prevent hospital-acquired infections has been discovered by scientists at the University of Nottingham and is currently being used in clinical trials as a coating for urinary catheters. (see https://www.nottingham.ac.uk/research/groups/biomaterials-discovery/news/2019/university-of-nottingham-developed-material-in-clinical-trials.aspx)

Infections picked up in hospital cause 10,000 deaths per year in the UK with 1 in 10 patients getting an infection whilst receiving care. More than a third of such infections are catheter related.

But researchers at Nottingham University have identified a new group of structurally related polymers – recently named 'Bactigon', that dramatically reduce the attachment of pathogenic bacteria (including *Pseudomonas, Proteus, Staphylococcus* and *Escherichia coli*).

These 'SuperBiomaterials' and their fight against SuperBugs will form part of an exhibit at Royal Society Summer Science Exhibition, which opens today (Monday 1st July).

The research was led by Morgan Alexander, Professor of Biomedical Surfaces and Paul Williams, Professor of Molecular Microbiology and supported by Derek Irvine, Professor of Materials Chemistry. Together with commercial partners, Camstent, they have developed the coating for use on catheters. Professor Alexander said: "This has gone all the way from the discovery of a new class of materials that no one could have predicted all the way to clinical trials and that's a massive achievement.

"This is only the second medical product to ever come out of this type of high throughput materials discovery. We're excited to be bringing this research to the Summer Science exhibition with a range of hands-on activities that show how bacteria are transmitted and how materials can fight them off."

Many commonly used devices including urinary and central venous catheters are susceptible to biofilms that are essentially bacterial 'slime cities'. This protects bacteria from the body's natural defences and antibiotics. But super biomaterials prevent infection by stopping biofilm formation at the earliest possible stage — when the bacteria attempt to stick irreversibly to a medical device.

Interactive fun and games

The SuperBiomaterials exhibit will be full of colourful interactive activities to show how this non-sticky material works. 'Stick or Slide' will demonstrate how the presence of biofilms can make it more difficult to remove bacteria through regular means such as washing or antibiotics with a race to clear two tubes full of beads using air pumps– one tube with "biofilm obstructions" and one without.

The 'Stop Superbugs sticking' activity will feature real catheters with different strength magnets inserted inside. These will be dropped into a bowl of ball bearings (representing bacteria) to show how different materials end up with different amounts of bacteria attached.

The Great Greeting Experiment

The activity will also show how easily the bacteria that cause infections can be transferred via the hands with the 'Great Greeting Experiment'. This is a live research project aiming to find out which common greetings transfer the most bacteria. A university volunteer will have a set amount of iridescent powder on their hands and perform common greetings - handshake, high five etc, with a participant with clean hands. The participant will then place their hands into a UV light box to see how the powder has transferred.

The amount of powder transferred will be captured from photos of participants' hands using bespoke software.

After the greetings, participants will then observe how touching an object spreads the powder around their hand increasing the likelihood of transference, and will be shown how to wash their hands properly. They will then be able to put their hands back under the UV light to see how effective their technique was.

Dr Kim Hardie from the School of Life Sciences, who is leading the Great Greeting Experiment, said: "To fully understand the problem of bacterial infections, it's important to understand how bacteria reach us in the first place. Many infections get onto medical devices like urinary catheters via bacteria on the skin being left on the device after hand contact. Showing people how easily bacteria are transferred, and how ineffective we often are at getting them off, will show the start of the bacterium's journey: before it meets the SuperBiomaterials."

A colourful comic strip has been produced for children to take away showing how SuperBiomaterials work in the fight against bacteria and infection.

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NOTES TO EDITORS:

1. For more information please contact Professor Morgan Alexander at the University of Nottingham on 0115 9515 119, morgan.alexander@nottingham.ac.uk or Jane Icke Media Relations Manager for the Faculty of Science at the University of Nottingham, on +44 (0)115 951 5751 jane.icke@nottingham.ac.uk .
2. **The University of Nottingham** is a research-intensive university with a proud heritage, consistently ranked among the world's top 100. Studying at the University of Nottingham is a life-changing experience and we pride ourselves on unlocking the potential of our 44,000 students - Nottingham was named both Sports and International University of the Year in the 2019 Times and Sunday Times Good University Guide, was awarded gold in the TEF 2017 and features in the top 20 of all three major UK rankings. We have a pioneering spirit, expressed in the vision of our founder Sir Jesse Boot, which has seen us lead the way in establishing campuses in China and Malaysia - part of a globally connected network of education, research and industrial engagement. We are ranked eighth for research power in the UK according to REF 2014. We have six beacons of research excellence helping to transform lives and change the world; we are also a major employer and industry partner - locally and globally. For up to the minute media alerts, follow us on Twitter
3. The Summer Science Exhibition is located in the Royal Society, 6-9 Carlton House Terrace, London, SW1Y 5 AG and takes place from **Monday 1 July to Sunday 7 July 2019**. The event is **FREE** and open to the public.

4. More information can be found at: www.royalsociety.org/summer-science. Twitter Hashtag: #summerscience

5. A **preview for media** will be held the morning of Monday 1st July 2019 from 9.30am before the exhibition opens to the public. If you require earlier access please let us know. Journalists must **register their interest** in attending the event with the Royal Society press office. There will be ample opportunity to photograph, audio and video record the exhibits on show. Media are invited to come down to the exhibition throughout the week.

6. **The Royal Society** is a self-governing Fellowship of many of the world's most distinguished scientists drawn from all areas of science, engineering, and medicine. The Society's fundamental purpose, reflected in its founding Charters of the 1660s, is to recognise, promote, and support excellence in science and to encourage the development and use of science for the benefit of humanity.

7. The Royal Society has held a Summer Science Exhibition to showcase the best of UK science since its early days, when Fellows of the Society were invited to the President's home to view instruments and specimens from the latest research. Presidents have hosted displays and discussions of the latest scientific research since the early nineteenth century. Visitors in 1896 had their hands x-rayed while those in 1910 could view novel pictures of Halley's Comet. New technology such as Thomas Edison's incandescent lamps were exhibited in 1889 while Captain Scott's Terra Nova expedition to Antarctica 1914 showcased natural history specimens.