NitroPep: preventing the spread of infection through contaminated surfaces

UNIVERSITY OF BIRMINGHAM

EXECUTIVE SUMMARY

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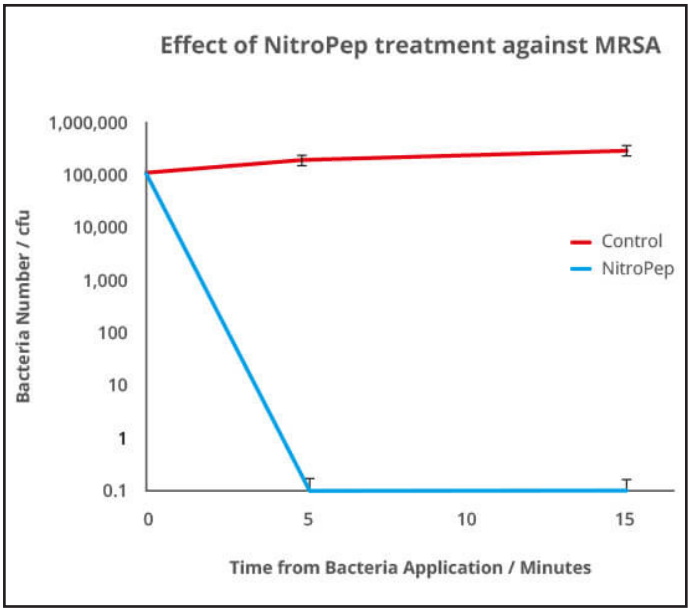
- NitroPep is a non-toxic antimicrobial surface coating that is clinically proven to kill bacteria such as MRSA and E. coli within minutes.
- It works by 'popping' bacteria when they land on a surface, just as a row of pins would pop a balloon. Since it provides a physical method of destroying pathogens, NitroPep could be a valuable tool in combatting antimicrobial resistance (AMR).
- Initial studies reveal NitroPep shows efficacy against the SARS-CoV-2 virus in under 5 minutes. Further research is planned to verify that the coating is effective against coronaviruses.

What is NitroPep?

NitroPep is a highly effective antimicrobial coating that can be applied to almost any surface, including metals, plastics and even touch-screen glass.

Developed by a team of chemists and microbiologists at the University of Birmingham, led by Dr Felicity de Cogan (Institute of Microbiology and Infection) and Dr Anna Peacock (School of Chemistry). It has since been patented and commercialised via a new University spinout company, also called NitroPep.



The coating is non-toxic and can last for up to ten years. It can also protect metals from the corrosion that results from bacteria colonising the surface.

It works by 'popping' bacteria when they land, like a row of pins would pop a balloon.

Historically, silver and copper have both been used to kill bacteria on surfaces. Silver, for example, has been used since Roman times to stop infections. Finally, we have something that is better - NitroPep is five times more efficient than traditional methods.

The coating is ideal for regularly handled and touched areas such as doorknobs, medical equipment, and handrails. It can be applied to surfaces in any environment, from hospitals to GP surgeries, trains, buses, homes, and offices.

It can also be applied to air conditioning units to filter pathogens from the air, making it an ideal solution for settings such as busy commuter trains.

Antimicrobial resistance (AMR) and hospital-acquired infections (HAIs)

It is predicted that by 2050, antibiotic-resistant bacteria could cost the global economy $100 trillion, with drug-resistant infections killing more than 10 million people a year worldwide - a ten-fold increase on current numbers. New technologies for combating infection are therefore critical if we are to reduce infection rates and tackle the ticking time bomb that is antimicrobial resistance.

Since NitroPep provides a physical method of destroying pathogens, it could be deployed as an effective tool for reducing the spread of infection.

Hospital-acquired infections, such as MRSA, cost the NHS over £1 billion per year. It is estimated that half of those infections result from contaminated surfaces.

Independent laboratory tests show that NitroPep kills

common hospital acquired infections, such as MRSA, in a matter of minutes.

The research evidence

Working with the Royal Centre for Defence Medicine and the Royal Navy, the researchers conducted a clinical trial which saw NitroPep coated onto surfaces - including door handles, an operating theatre and part of a communal toilet - on board a Royal Fleet Auxiliary ship.

Both the surfaces coated in NitroPep, and 'control' surfaces that were not treated with the coating, were subject to standard daily cleaning regimes while the ship was at sea for an 11 month period.

The surfaces were swabbed on a weekly basis and the results were then analysed in the laboratory at the University of Birmingham.

The results showed that the coating was effective against five different bacteria that are responsible

for hospital-acquired infections – Staphylococcus aureus, Staphylococcus epidermidis, Enterococcus, Pseudomonas aeruginosa and Escherichia coli.

The research also showed that the chlorhexidine NitroPep coating killed bacteria within 5 minutes – far more rapidly than currently commercially available technologies which do not have a significant effect on bacteria until up to 24 hours.

Published in Materials Science and Engineering C: Materials for Biological Applications, the research was carried out by scientists at the University of Birmingham's Institute of Microbiology and Infection and School of Chemistry; the Royal Centre for Defence Medicine; the University of Nottingham; and Queen Elizabeth Hospital Birmingham which is part of University Hospitals Birmingham NHS Foundation Trust.

Potential against coronaviruses

NitroPep uses chlorhexidine as a microbial agent, which according to the World Health Organization, exhibits some efficacy against SARS-CoV-2, the virus that causes COVID-19.

Initial proof-of-concept studies demonstrate that NitroPep shows efficacy against SARS-CoV-2 in under 5 minutes. Further laboratory tests are underway to verify these findings.

Policy recommendations

- Since hospital-acquired infections cost the NHS over £1 billion per year, the Government should facilitate a NitroPep trial deployment in key hospital settings to build up an evidence base for a wider deployment to safeguard patient health and protect the NHS.
- If laboratory tests confirm that NitroPep is effective at preventing the spread of coronaviruses, we would like Government support to conduct real-world trials on public transport and other areas of high footfall.

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£1bn current annual cost to the NHS for hospital-acquired infections

$100tn estimated annual cost of AMR to the global economy by 2050

<5 mins the time it takes for NitroPep to kill MRSA on a door handle