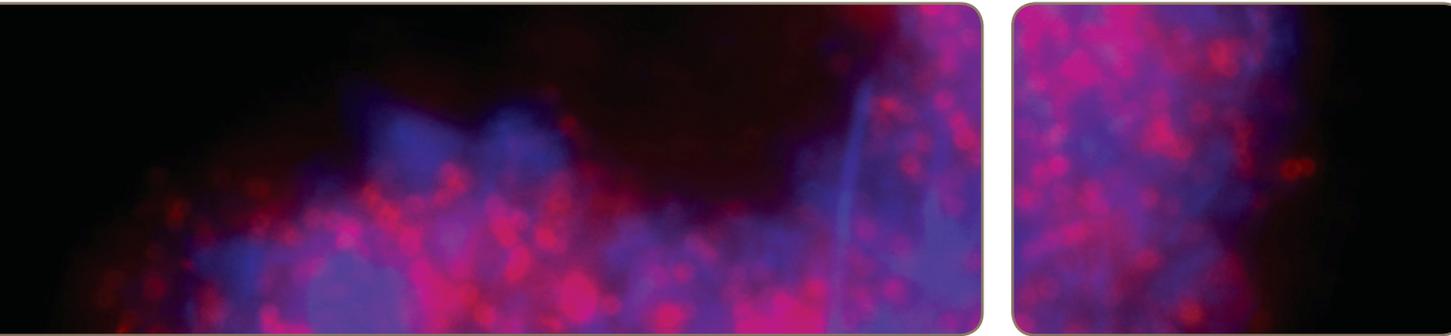


# Wound dressing provides glowing evidence of infection



**Image:** The polymers developed by the team incorporate a fluorescent dye and are engineered to recognise and attach to bacteria. The polymers grab the bacteria, shown here as pink fluorescent spots, clumping them together, and then glow blue.

**Credit:** University of Sheffield.

Fundamental research in polymer physics, jointly supported by the Engineering and Physical Sciences Research Council (EPSRC) and Ministry of Defence (MoD), led to the development of wound-healing technology and collaboration between researchers at the University of Sheffield and medical technology company Smith & Nephew Wound Management. Wound dressings which will accurately and quickly detect the presence of bacteria in wounds and help reduce the overuse of antibiotics are being developed.

## Bacteria detecting technology

When Professors Stephen Rimmer<sup>1</sup>, Sheila MacNeil<sup>2</sup> and Ian Douglas<sup>3</sup> presented the results of their EPSRC/MoD supported research into branched polymers to military scientists at Porton Down, it was clear the next stage would be to develop a fast, accurate and possibly life-saving technique for detecting the presence of bacteria in wounds.

Professor Rimmer, who heads an interdisciplinary team of polymer scientists, microbiologists and tissue engineers at the university, says: “The polymers we have developed incorporate a fluorescent dye and are engineered to recognise and attach to bacteria, collapsing around them as they do so. The level of fluorescence

detected will alert clinicians to the nature and the severity of infection. We were the first people to propose this theory.”

The team’s work also makes for a much more efficient use of antibiotics. “When the polymer collapses it traps the bacteria around it, allowing us to pull the whole thing out without releasing any antibiotics into the wound. This means the bacteria do not develop any antibiotic resistance – which is crucial for patients suffering from chronic wounds who need long-term care,” says Professor Douglas.

## From fundamental science to real application

Having published papers describing the research in prestigious journals, the team were looking for sponsorship to take the technology closer to real application when Professor MacNeil was invited to a national science conference and the team’s work started to gain wider public recognition.

Dr Mark Richardson, Vice President of Research and Technology at Smith & Nephew Wound Management<sup>4</sup>, had been following the team’s work. He says: “We knew the team’s research had been well funded; that it was innovative, of the highest quality and of global significance for the treatment of wounds. While we would not normally get involved at the applied research stage, because

of the EPSRC funding and the possibility of Technology Strategy Board<sup>5</sup> support, we could see the benefits of collaborating with the Sheffield research team to help develop and build their technologies into some of our existing products.”

With follow-on funding from the Technology Strategy Board, a joint University of Sheffield and Smith & Nephew team is now developing the technology that will provide enhanced care for patients suffering from chronic wounds such as diabetic foot ulcers and venous leg ulcers.

Dr Richardson adds: “Chronic wounds such as these are major health and economic burdens in most developed countries and are primarily wounds of the elderly. With the rise in the levels of obesity/diabetes this problem can only get worse. These are critical wounds. If they become infected they can be very problematic for the patient, in some cases leading to the amputation of digits or limbs. The early and accurate detection of infection is very important, but at the moment we have no point-of-care diagnosis for wounds. Clinicians can take swabs, but this can mean a delay of up to 48 hours to get a result, during which time the patient is potentially at risk.”

## Rapid response

The new wound dressings will look very much like conventional wound dressings, but will contain a hydrogel membrane. A handheld device will be able to detect changes in the colour of the dressing, indicating the presence of bacteria and how best to treat it.

Providing the clinician and the patient with a tool that alerts them early to a potential infection – and which also reassures them when there is no infection – could transform the care of wounds and reduce the unnecessary use of antibiotics. By highlighting the presence of an infection at an early stage, it could also help prevent wounds becoming colonised by an established layer of bacteria (biofilms) which are more resistant to normal antibiotic treatment and can lead to protracted care.

In the UK alone there are over 200,000 patients suffering from chronic foot ulcers, with up to 60 per cent of these being infected. By finding a way of detecting and treating these cases earlier, and more effectively, the team are confident their research will improve patient care and reduce the cost burden on the National Health Service. The aim is to have the new technology available commercially within the next four years.

## References

1. See [https://www.sheffield.ac.uk/chemistry/staff/profiles/stephen\\_rimmer](https://www.sheffield.ac.uk/chemistry/staff/profiles/stephen_rimmer)
2. See <https://www.sheffield.ac.uk/materials/staff/smacneil01>
3. See <https://www.sheffield.ac.uk/dentalschool/about/staff/douglas>
4. See <http://www.smith-nephew.com/about-us/what-we-do/advanced-wound-management/>
5. The Technology Strategy Board is now called Innovate UK.