

Star Trek-style skin-healing technology could be the end of chronic wounds

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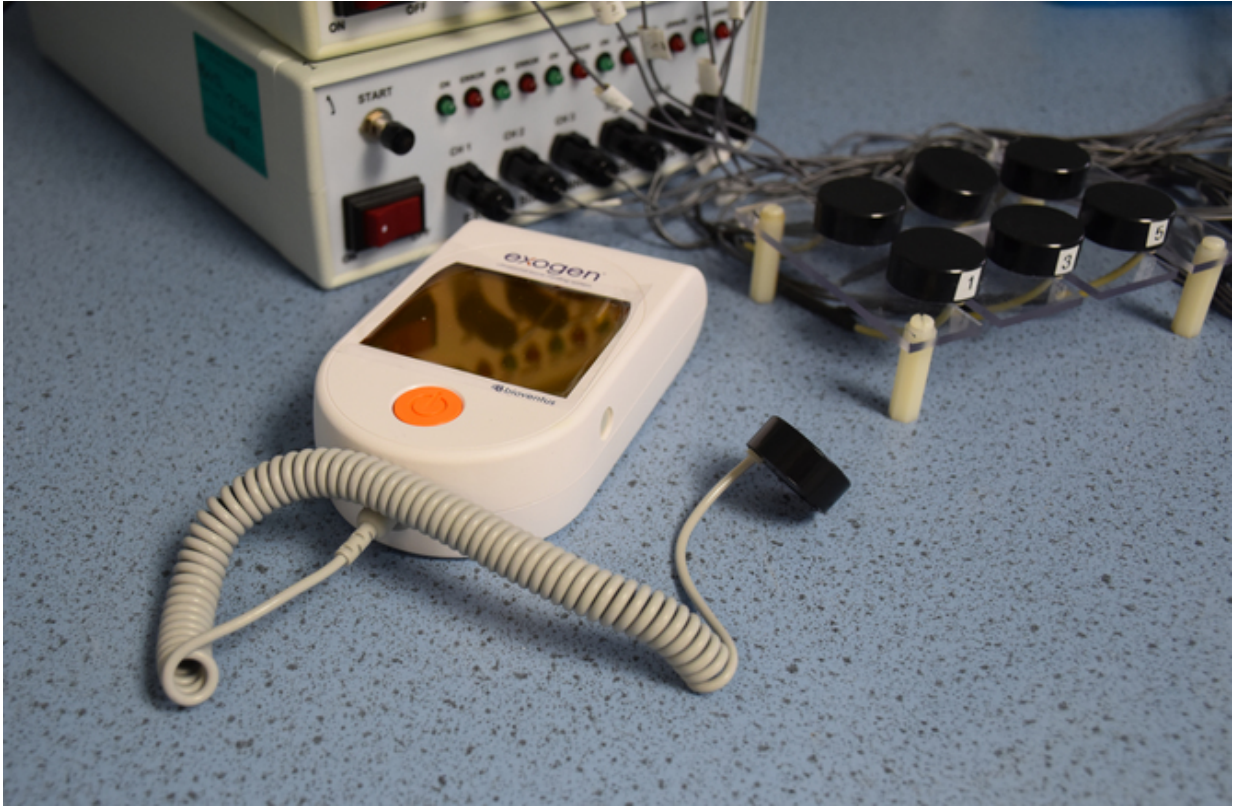
The ability to quickly heal wounds is among the most appealing of all technologies imagined by science fiction. Perhaps most famously, doctors in Star Trek are able to patch up cuts and burns by instantly

regenerating their patients' skin using a kind of [medical ray gun](#). The injured crew of the Enterprise can return to action almost immediately instead of spending months recovering.

Such technology might seem like pure fantasy (as well as a useful plot device) but it might now be closer to reality than you think. My research group has just [published work](#) on the use of a small handheld ultrasonic emitter that accelerates [tissue repair](#). This approach doesn't provide the instant fix of Star Trek, but we found that [healing](#) times could be reduced by 30%. This both increases comfort for the patient and shortens how long the wound is susceptible to infection.

Where such technology really comes into its own is in the treatment of individuals who don't heal well to start with. After the age of 30, our bodies' capacity to heal deteriorates – and by the time we are over 60 this deterioration [becomes a real problem](#). Other risk factors that contribute to poor healing include diabetes, obesity and smoking. This means a large proportion of the population suffer healing delays, and that susceptibility to healing defects is escalating.

As healing deteriorates, injuries can result in [chronic wounds](#) that never heal because the damaged skin cells become dormant. Such wounds include bed sores, venous leg ulcers, [diabetic foot ulcers](#) and pressure ulcers. Chronic wounds currently affect 200,000 UK patients and consume 2%-5% of [annual healthcare spending worldwide](#). They are also incredibly painful and, in many cases, can only be resolved by amputation of the limb.



Handheld healing. Credit: University of Sheffield, Author provided

We have discovered that ultrasound treatments can reactivate dormant cells and therefore jump-start the healing process. This is actually reminiscent of another [science fiction](#) archetype, the instant healing superpower seen in films and TV shows [such as X-Men](#) and Heroes.

It is [well established](#) that embryos in the womb are capable of perfect, scar-free healing. And even in adults, organs such as the liver will regenerate. However at the point of birth, we lose much of our capacity to heal and those capabilities continue to deteriorate throughout our lives.

What the ultrasound treatment does is effectively turn back the clock

and stimulate cells to perform the functions that they are capable of but have forgotten over time. Because it is jump-starting natural processes, such treatment is relatively risk-free – unlike many drug treatments that interfere with the chemical processes of the body and can lead to side effects.

The ultrasound device works by inducing nano-vibrations in the membranes and surrounding environments of [skin cells](#). Those vibrations cause channels to open on the surface of the cell that allow calcium to move across its membranes. Calcium is the signalling currency of the cell and the mineral's movements across membranes control many of the cell's functions.

In the case of ultrasound, the new position of the calcium within each cell gives it a defined front and back. This causes the cells to move towards the damage site, pulling the edges of the wound together and promoting healing.

We have demonstrated this effect in cells isolated from venous leg ulcer patients. More importantly, we have been able to reverse a number of healing defects caused by diabetes, age and congenital disorders, so that the treated wounds heal as quickly as young, healthy wounds. This means we will soon be in a position to prevent, and possibly reverse, the formation of chronic [wounds](#).

The future looks even brighter. Our research suggests ultrasound therapy is likely to benefit a very broad range of patients. Clinical trials are needed to determine the technique's limitations but could also reveal how the treatment could be improved further. One day – with a lot more investigation – it may even be possible to achieve the perfect, scar-free healing that we are capable of in the womb. So we cannot protect you from a Klingon attack but we might well be able to patch you up afterwards.

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