



Eradicating wrinkles with space technology

► Plasma system for cosmetic surgery and other medical applications

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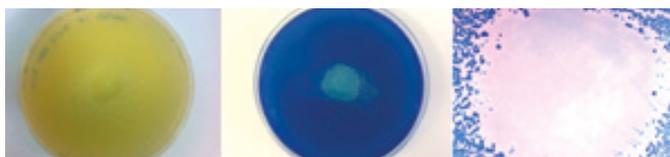
The plasma technology used to drive spacecraft has huge potential for medical applications. The development of a hand-held plasma device could transform the way cosmetic surgery procedures and wound treatment are delivered.

Plasma technology is capable of producing chemicals such as nitric oxide and other radicals that can sterilise and deactivate bacteria and help to heal wounds. The temperature and surface energy delivery of plasma technologies can also be controlled in order to reduce epidermal and superficial dermal thickness. A team of researchers from the Surrey Space Centre (SSC), in collaboration with spin-out company Fourth State Medicine (4SM), plastic surgeons and medical professionals, has succeeded in modifying this technology to enable it to operate at atmospheric pressures outside the vacuum environment of space, opening up a range of medical possibilities.

The main outcome of the IAA-funded project has been to take this laboratory concept and transform it into a working prototype: a portable medical plasma device suitable for clinical testing.

The hand-held device can both remove the upper layer of skin and sterilise the treatment area, enabling applications in common cosmetic procedures such as wrinkle removal and fine line reduction. With over four million cosmetic and aesthetic procedures conducted globally each year, there is clear potential for commercialisation, and the plasma system already has the support of a number of cosmetic-surgery organisations.

Since plasma kills bacteria, the technology also opens the way for applications such as the treatment of diabetic ulcers and open wounds, as well as trauma-related operations like managing acute bleeding. The portable prototype has generated a number of additional avenues of research, including a wound-care collaborative study with the University of Manchester, and a histology study on human tissue being undertaken with Broomfield and Springfield hospitals. The device has also been used to investigate application on fresh grains in collaboration with cereal manufacturer Weetabix Ltd.



The system sterilises wounds by killing bacteria such as MRSA

Dr Tom Frame, founder and CEO of 4SM and an SSC Research Fellow, comments: "We have had significant results across a range of histopathology studies and microbiology evaluation, which demonstrates a high level of efficacy across our commercial applications."

Dr Aaron Knoll, principal investigator for the IAA project, says: "The use of plasmas for medical treatment is an emerging field of research, with a significant potential benefit to humankind. We've barely scratched the surface of what this technology can do, and already we've seen very promising results."

Following the project, trials are underway to evaluate the clinical benefits and effectiveness of the technology on human skin samples and bacteria samples. In March 2015 the prototype device was named by the Royal Academy of Engineering as one of the seven most promising innovations to come from UK universities, bringing significant funding which will be used to commercialise the prototype over the next twelve months.

What is plasma? Plasma is the fourth fundamental state of matter (the others being solid, liquid and gas). Created when a gas is energised to the point that some of its electrons break free from its nucleus, plasma can be accelerated and steered by electric and magnetic fields, giving it practical applications in areas such as manufacturing, energy and lighting.