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# Implant Coating Fights Infection and Monitors Strain

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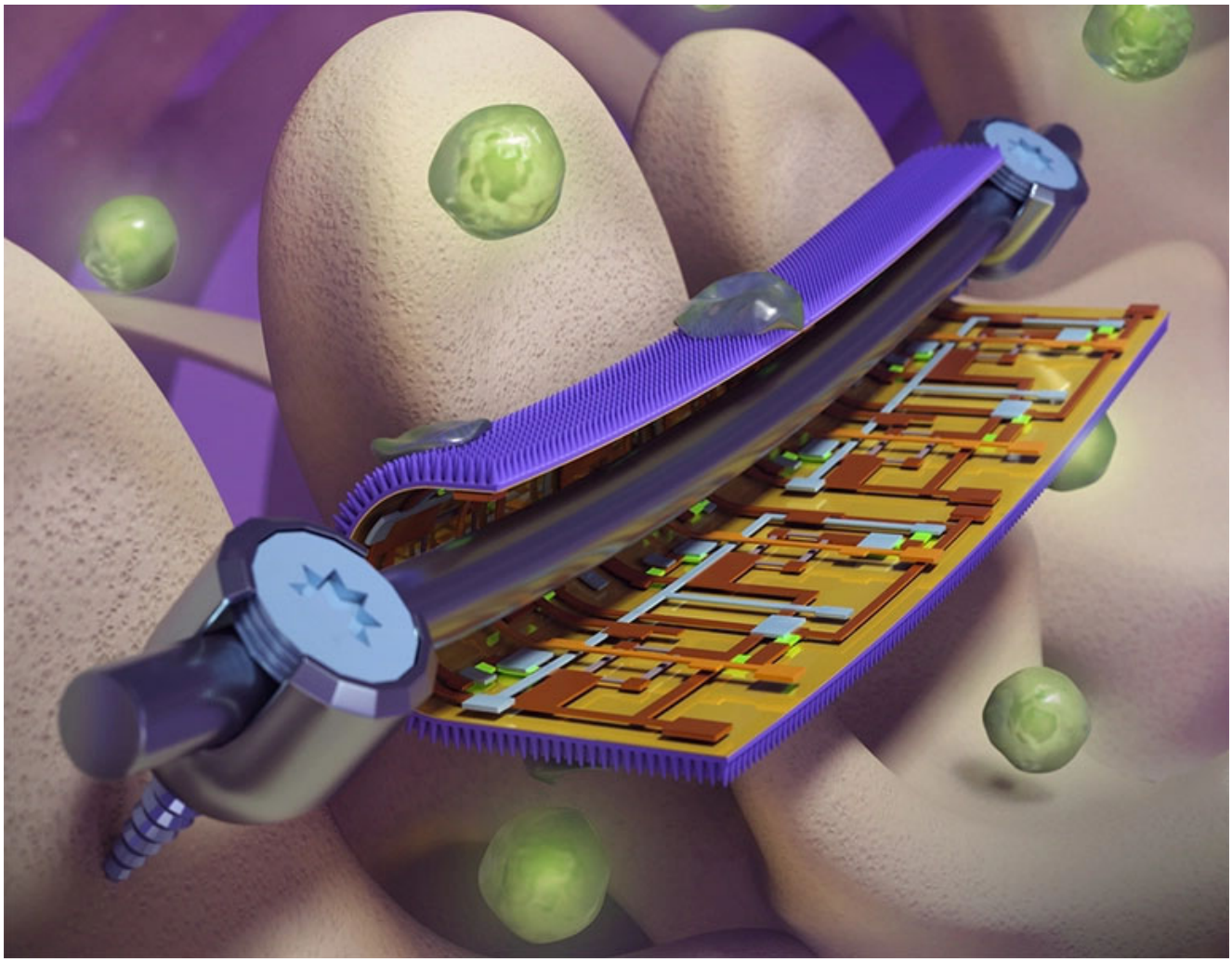

Researchers at the University of Illinois at Urbana-Champaign have developed a bioinspired implant coating that is designed to be implanted along with devices such as spinal implants. The technology has been inspired by dragonfly and cicada wings that contain tiny pillars that can skewer bacteria, providing mechanical anti-microbial action. Unlike current approaches that use antibiotics that are gradually released by the implant, the mechanical approach will not become depleted over time or cause side-effects in nearby tissues. It also avoids the manifestation of antimicrobial drug resistance and can also easily kill drug-resistant bacteria. The coating also contains flexible strain sensors that allow clinicians to monitor healing and device failure, providing dual functionality.

Orthopedic implants play a crucial role in stabilizing damaged bones within the body. However, such devices are often prone to failure and infection, requiring a follow-up surgery to replace the device in the case of outright failure, or drug treatment and potential device removal in the case of infection. This is inconvenient and unfortunate for patients and clinicians alike, and these phenomena can affect up to 10% of patients with such implants, highlighting the scale of the problem.

To address this, researchers have designed various technologies, including hydrophobic coatings designed to repel bacterial adhesion and drug release systems that can kill microbes in the immediate vicinity of the implant. However, bacterial biofilms can still form on such surfaces, and drug release will eventually peter out, leaving bacteria to infect the implant at a later date. Moreover, released antibiotics can potentially cause side-effects, while contributing to the ongoing superbug revolution and failing to kill drug-resistant organisms.

Clearly, a more reliable approach would be preferable. "This is a combination of bio-inspired nanomaterial design with flexible electronics to battle a complicated, long-term biomedical problem," said Qing Cao, a researcher involved in the project. "Using a mechanical approach to killing bacteria allowed us to bypass a lot of the problems with chemical approaches, while still giving us the flexibility needed to apply the coating to implant surfaces," added Gee Lau, another researcher who participated in the study.

The new coating is intended to be implanted along with an orthopedic implant and derives its anti-bacterial properties from the wings of cicadas and dragonflies, which include tiny 'pillars' that pierce the cell wall of bacteria, killing them. A series of stain sensors in the coating also allow clinicians to monitor device performance, potentially allowing them to replace an implant before it fails.

Study in journal *Science Advances*: A smart coating with integrated physical antimicrobial and strain-mapping functionalities for orthopedic implants

Via: University of Illinois at Urbana-Champaign

Antimicrobial Coating Prevents Infections Around Ortho Implants
Conn Hastings, Medgadget, 2021

Bacteria Forced to Mutate Into Oblivion
Editors, Medgadget, 2008

Dissolvable “Transient Electronics” Will Be Good For Your Body and the Environment
Scott Jung, Medgadget, 2012

Cheap Color Changing Sensor Smells Out Bacteria
Editors, Medgadget, 2011

How can physicians support patients with heart failure?
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What treatments are available for adults with heart failure?
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Guided by the principles of microbiome engineering: Accomplishments and perspectives for environmental use
Haiyang Hu et al., mLife, 2022

Effectiveness and safety of Danmu extract syrup for acute upper respiratory tract infection in children: A real-world, prospective cohort study

Linan Zeng et al., Journal of Evidence-Based Medicine, 2022



## Conn Hastings

Conn Hastings received a PhD from the Royal College of Surgeons in Ireland for his work in drug delivery, investigating the potential of injectable hydrogels to deliver cells, drugs and nanoparticles in the treatment of cancer and cardiovascular diseases. After achieving his PhD and completing a year of postdoctoral research, Conn pursued a career in academic publishing, before becoming a full-time science writer and editor, combining his experience within the biomedical sciences with his passion for written communication.