

Learning from nature

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Using lotus leaves and tea tree oil researchers at Swinburne University of Technology are working to prevent infection and improve outcomes for people requiring medical implants, such as hip replacements.

Led by Professor Elena Ivanova and Dean of the Faculty of Life and Social Sciences, Professor Russell Crawford, the goal of the research team, which includes Swinburne postgraduate students and collaborators from James Cook University in Townsville and Laser Zentrum in Germany, is to develop a product and process that can be readily used in implant surgery.

Working at the micro and nano-scale level with components of tea tree oil and by mimicking the characteristics of the surface of the [lotus leaf](#), the researchers are developing ground-breaking techniques to change the surface of [titanium implants](#) and develop bioactive coatings to reduce the risk of infection and rejection in implant patients.

"The problem is that because titanium is an attractive surface for growing human tissue, it is also attractive to bacteria, " said Professor Crawford.

"We want to find a way by which we can change surfaces so they are less attractive for the bacteria but still retain their biocompatibility."

Using imaging and analytical instruments in Swinburne's Advanced Technologies Centre, the team has developed new insights into how [bacterial cells](#) interact and attach to surfaces.

Professor Crawford said the bacteria attach to the surface by secreting an extracellular polymeric substance, which enables them to form layers as they multiply, creating a biofilm.

"Normal disinfection processes will often only kill the surface layer of bacteria in the biofilm," Professor Crawford said.

This is where the surface of the lotus leaf is proving to be an invaluable tool for the researchers.

"With a lotus leaf, a droplet of water will not attach, but roll off. If we can replicate this to create hydrophobic surfaces, any bacteria that might be present can't wet the [surface](#) and therefore can't attach," Professor Crawford said.

"If we are able to stop bacteria attaching on titanium surfaces, we know that these implants will be safer. "

Tea tree oil is another vital component of the research, due to its ability to kill [bacteria](#).

The researchers have taken a component of tea tree oil, and used it to create a coating for titanium implants in a process called plasma polymerisation.

"The vision is that we will one day have a device in hospitals that would allow surgeons to put this coating onto the titanium before it is surgically implanted, vastly reducing the risk of infection," Professor Crawford said.

"When people have to get hip implants replaced, it becomes a drain on the health-care system, and we hope our research can make a difference and reduce this pressure."

Provided by Swinburne University of Technology

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