

News UK & Ireland



New discovery helps strengthen bonding of titanium implants to bone

BRISTOL, UK: Scientists at the University of the West of England (UWE) in Bristol have discovered a new way to improve the bond between titanium implants and bone. They found that a bioactive lipid called lysophosphatidic acid (LPA) interacts with vitamin D to enhance bone-forming cell function. Based on this finding, the researchers have developed an LPA coating for titanium implants to help strengthen the bonding properties of implants to bone.

“Many implants used in surgery are made out of titanium. These include joint replacements, screws and plates for fixing broken bones and dental implants,” said Dr Jason Mansell, a senior lecturer in Biomedical Sciences at UWE Bristol, who led the study.

“Implants work well when the patient’s own bone joins onto the titanium using the body’s own natural healing processes. When this join forms properly it is extremely strong, however in some cases, the patient’s bone fails to join strongly to the titanium and therefore the prosthesis works loose and ultimately fails,” Mansell explained.

Although the success rates of dental implants are high, ranging between 88 and 99 per cent in the literature, several factors, such as bone quality and quantity, as well as infection, can cause dental implants to fail, making reimplantation necessary. The new LPA coating, developed by the researchers could further improve the success rate of dental implant treatments.

LPA is a naturally occurring fatty molecule that acts with vitamin D to promote bone-forming cell function, the researchers discovered. “This is a very exciting discovery as few agents are known to enhance the actions of vitamin D on bone forming cells. Vitamin D is vital for bone health because it enhances bone forming cell function. Therefore, agents that can co-operate with vitamin D could find place as a coating on titanium to encourage better bonding to the patient’s bone,” Mansell said.

Based on this knowledge, the scientists developed an LPA coating for titanium implants. “We have found a way of joining LPA onto titanium using a simple process at room temperature. Recently we also discovered that our novel coating also deterred the attachment of bacteria, this is particularly exciting as it means we have a potential dual-action titanium implant material,” Mansell stated.

The next stage of the project, which is currently seeking further funding, will examine the robustness and stability of the coating, as it would need to withstand the rigors of storage, sterilisation and the physical forces it would be exposed to when implanted into the body.

The study, titled “Fluorophosphonate-functionalised titanium via a pre-adsorbed alkane phosphonic acid: A novel dual action surface finish for bone regenerative applications”, was published online ahead of print in the *Journal of Materials Science: Materials in Medicine* on 24 December.