NIT-K team develops coating technology for orthopaedic implants

The bioactive, mechanically durable, and localised anti-microbial coating technology has particular application in joint replacements

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Sudhakar C. Jambagi, associate professor, Department of Mechanical Engineering, NIT-K, with his doctoral student Deep Shankar. SPECIAL ARRANGEMENT

Researchers at the National Institute of Technology - Karnataka (NIT-K), Surathkal, have developed an advanced bioactive, mechanically durable, and localised anti-microbial coating technology for orthopaedic implants, with particular application in hip and knee joint replacements.

The patented innovation marks a milestone in indigenous biomedical engineering and represents a major step forward in improving patient outcomes for millions of orthopaedic implant recipients across India and globally, the NIT-K said on Wednesday.

Addressing the growing challenges of implant-associated infections, implant loosening, and sub-optimal long-term performance of conventional implants, the research team has developed a composite coating that can be directly applied onto implant surfaces using an optimised High Velocity Oxy-Fuel thermal spray process, a release of the institute said.

The coating is engineered to deliver localised anti-microbial protection while simultaneously improving the mechanical durability, wear resistance, coating adhesion, and bone integration of the implant. The enhanced osseointegration enables stronger bonding between bone and implant, while the anti-microbial functionality combats bacterial growth at the implant site, thereby substantially reducing the risk of post-surgical infections.

Pre-clinical studies demonstrated promising performance. The technology has the potential to significantly reduce the need for revision surgeries and improve long-term patient outcomes – which carry profound implications for healthcare costs and patient quality of life.

The innovation has been published in multiple international research publications and the technology has been granted a patent. The research team is currently working towards clinical translation and commercialisation of the technology, with the patented technology having been translated into a deep-tech startup founded to bring this solution to market.

The technology was developed by Sudhakar C. Jambagi, associate professor, Department of Mechanical Engineering, and his doctoral student Deep Shankar, who completed his PhD under the supervision of Mr. Jambagi and has since gone on to found and lead the deep-tech start-up established to commercialise this breakthrough technology.

The innovation has been developed under the 'Make in India' initiative, and is fully aligned with the Union government's vision, promoting indigenous biomedical technology and delivering affordable, advanced healthcare solutions.

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