Title of the project:

Surface-engineered Dental/Orthopedic Implants

Category (translational/bioengineering/biodesign): Bioengineering

Investigators (IISc and clinical institutions)

Kaushik Chatterjee, IISc

Dr Jayanth Kesave, Narayana Multispeciality Hospital

Statement of research

Some of the common clinical problems associated with implanting orthopedic biomedical prosthetics/ devices are poor osseointegration and bacterial infections. There is growing interest in the field of biomaterials research to develop nanoscale topography based strategies that offer alternatives to conventional biochemical approaches involving drugs and biomolecular factors. Inspired by nanostructures present on insect wings, we have recently developed anistropic nanostructures on the surface of Ti. We found that these nanostructures impart excellent bactericidal activity against several strains in vitro through mechanical rupture. Remarkably, the surfaces are cytocompatible and promote osteogenic differentiation. We propose to mimic these nanostructured surfaces on screws and bone plates for use in dental and orthopedic applications. Specifically, we will test the performance in vivo using animal models. Ti screws with and without the nanostructures will be prepared and implanted in the animals. The effect on bone formation, inflammation and bacterial infection will be evaluated.

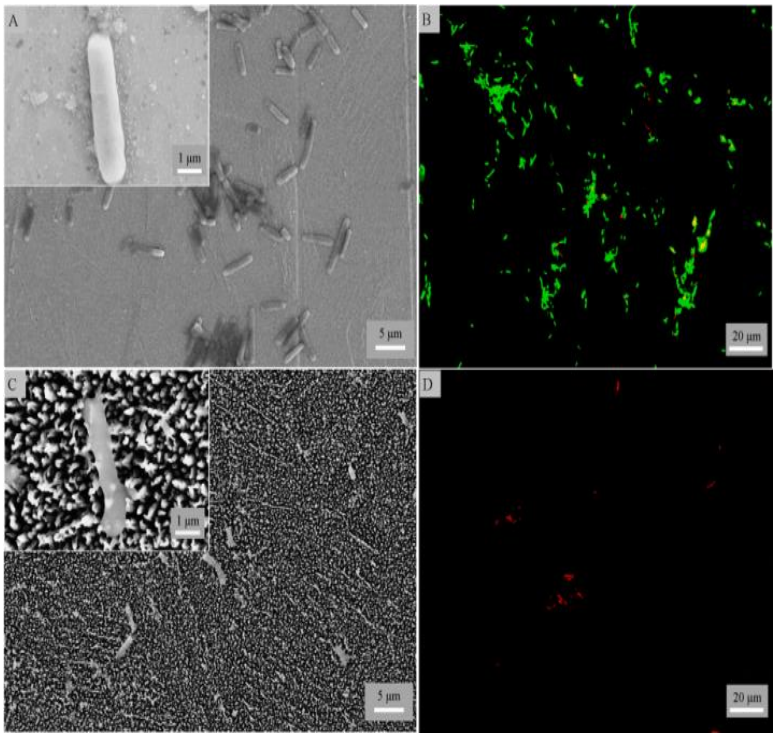

Figure above shows (A, C) SEM and (B, D) fluorescent microscographs of *P. aeruginosa* attached for 4 hours on the smooth control (top) and nanostructured black titanium (bottom) surfaces.