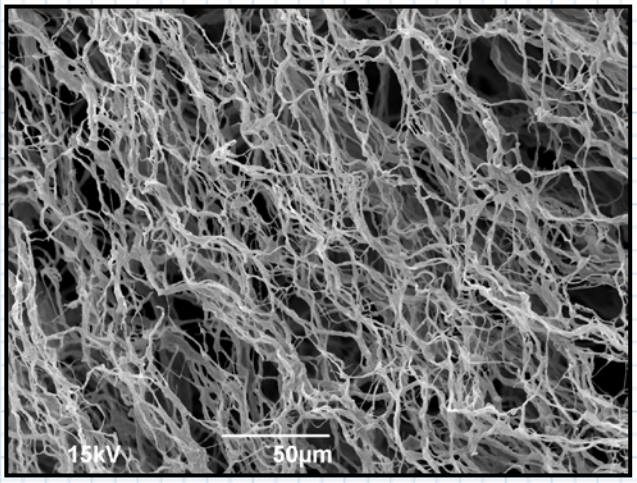
Non-Confidential Description

Novel Biocompatible Composite for Bone Tissue Engineering

Technology Case: RFT-200

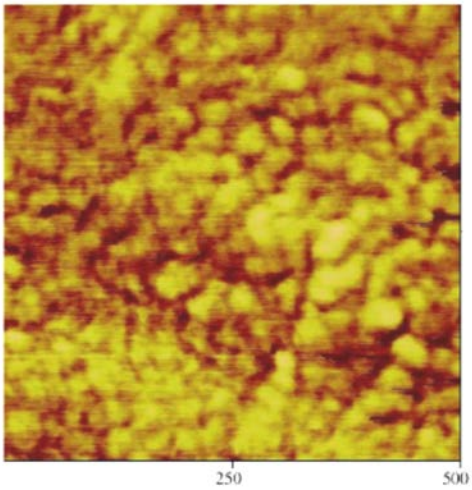


Above: *Image of chitosan–polygalacturonic acid–hydroxyapatite (ChiPgAHAP) composite showing fibrous scaffold*

Invention Summary

Bone tissue engineering represents an alternative approach to the replacement of diseased or damaged bone tissue.

Scientists at North Dakota State University have developed a novel biocompatible composite that may have applications as a bone replacement material. This tri-molecular composite incorporates two well characterized biopolymers known to promote cellular adhesion and colonization, and are slowly degraded to non-toxic products which are absorbed by the body. The composite material is particularly attractive for use as a bone replacement scaffold that allows portions of the scaffold matrix to be replaced with natural bone tissue while maintaining sufficient mechanical strength throughout the bone formation process.



Left: *Microstructure of composite material, showing uniform distribution of Hydroxyapetite/ Biopolymeric nanoparticles*

Benefits

- **GREEN TECHNOLOGY!**
- Established biocompatibility with normal proliferation, migration and differentiation of cells
- All components of the composite are currently approved by the U.S. FDA for a variety of medical applications
- Superior mechanical properties
- Improved structural integrity under wet conditions
- Uniform distribution of hydroxyapatite nanocrystals
- Highly amenable to tailoring composite properties

Invention Premise

The challenge of tissue engineering is to develop suitable bone replacement materials or scaffolds with desirable mechanical strength, porosity and bioactivity. In this invention, new nanocomposites of chitosan–polygalacturonic acid–hydroxyapatite (ChiPgAHAP) have been synthesized using biomimetic routes. Significant improvements in elastic modulus, strain to failure, and compressive strength have been achieved by incorporating polycationic and polyanionic biopolymers together with hydroxyapatite.

Atomic Force Microscopy (AFM) images of fracture and polished surfaces show that the nanocomposite consists of chitosan rich and polygalacturonic rich domains that are further made of smaller globular shaped particles with hydroxyapatite nano-particles embedded in biopolymer matrix. The enhancement in mechanical response of this nanocomposite has been attributed to strong interfacial interactions between the domains.

Patents

This technology is patent pending with fully preserved U.S. patent rights and available for licensing/partnering opportunities

The Lead Inventor

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Kalpana Katti received her undergraduate degree in Physics at the University of Delhi, India. She went on to get an M.S. in Solid State Physics in Kanpur, India, and received her Ph.D. in Material Science and Engineering at the University of Washington, Seattle. Her research areas include bone tissue engineering, biomimetics, nanotechnology, biomedical engineering, biomaterials, vibrational microspectroscopy, and multiscale modeling in bio-nano composite systems.

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