THE UNIVERSITY OF MEMPHIS | Office of Technology Transfer

University of Memphis Licensing Opportunity

Guided bone regeneration (GBR) for Dental/Craniofacial and Orthopedic Applications

Over 5 million dental implants are placed in the US annually and the number is expected to increase due both to the aging world population and the success of implant therapies. It is estimated that every second implant procedure requires bone augmentation, either prior to or concurrent with implant placement. Because soft tissue grows into spaces faster than bone does, guided bone regeneration (GBR) membranes are needed to stabilize the graft material in the defect site and to provide a barrier to prevent soft tissue infiltration to preserve the space for maximal regeneration of bone for implant placement. GBR refers to the procedures used to regenerate and restore bone volume, shape and function by use of barrier membranes.

GBRs currently on the market are made of expanded poly-tetrafluoroethylene (ePTFE) or collagen. These are known to have high complication rates. Also, and critically, ePTFE must be removed after bone formation has occurred, causing further trauma to the healing tissue and collagen may degrade prematurely reducing regenerated bone volume. A novel material from scientists at the University of Memphis provides a GBR with several clinically-relevant properties that would lead to better patient outcomes. This patent pending material is available for exclusive licensing.

Applications

- Barrier membranes for dental/craniofacial and orthopedic applications

Advantages

- Degradable membranes eliminate the need for removal surgery that is required for ePTFE membranes
- Studies predict complete degradation of implanted membranes in the 4-6 month time frame suggested by clinicians. This compares favorably to collagen membranes that degrade more unpredictably.
- Nanofiber structure allows for movement of fluids and nutrients but blocks movement of cells and tissues.

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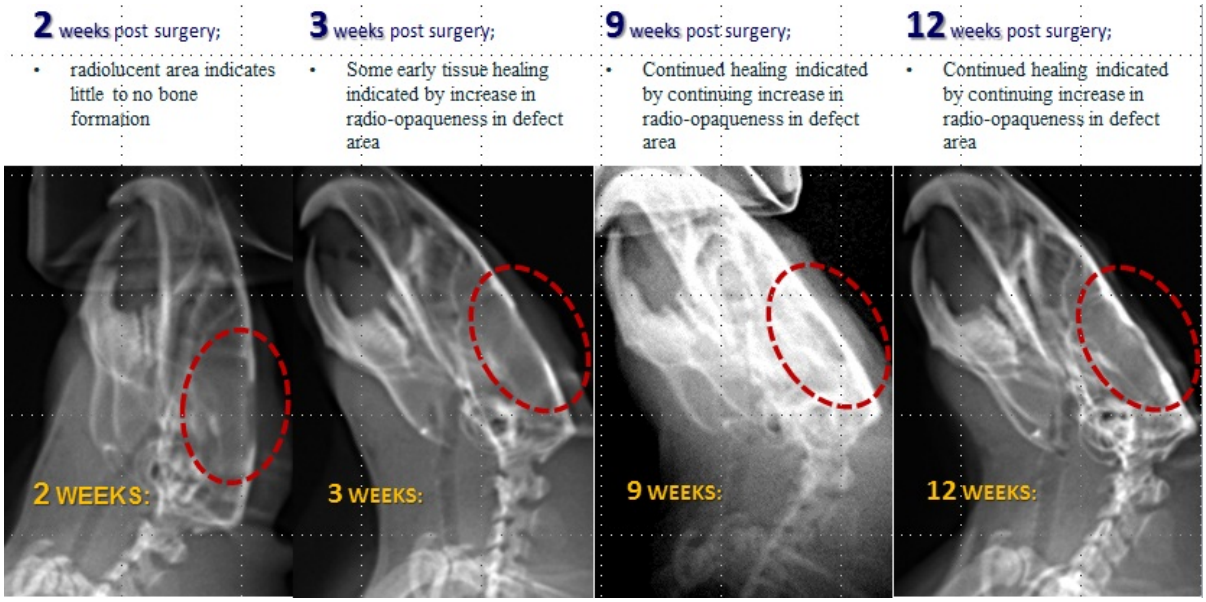
The Technology

Extensive scientific and clinical experience has shown chitosan to be biocompatible and osteoconductive. To take advantage of these properties as a guided bone regeneration membrane, however, requires longer degradation times and higher structural integrity than current chitosan formulations. U of M scientists have developed a novel approach to chemically modifying electrospun chitosan nanofibers that results in material that maintains the nano-structural integrity in an implant setting, has sufficient strength to act as a barrier of fast growing tissue but with degradation kinetics that predict complete degradation in 4-6 months. The figures below show this material supporting significant growth of bone in a standard bone defect model as early as 12 weeks after implantation. The nanofibers after treatment are smooth and uniform without swelling or deterioration in aqueous/physiological environments.



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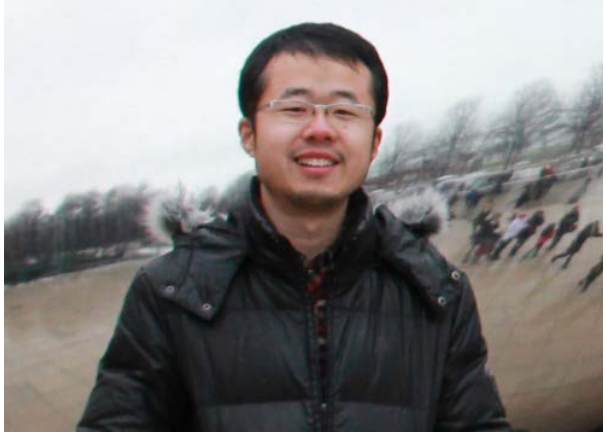
The Inventors

Joel Bumgardner, Ph.D. Professor of Biomedical Engineering at the University of Memphis. He holds joint appointments in the University of Tennessee Health Science Center. He has authored numerous papers and book chapters on chitosan based materials as well as a co-inventor of a patented and licensed chitosan-based sponge. He obtained his BS Degree in Biology from Florida State University, and his BS in Materials Science, and MS and PhD in Biomedical Engineering all from the University of Alabama at Birmingham. He was a Fulbright Scholar at the Umeå University School of Dentistry in Sweden. His research is focused on the bioactive degradable chitosan polymers and composites for implant, regenerative medicine, and wound infection prevention applications.



Chaoxi Wu, visiting scientist, is a Ph.D. candidate majoring in Biomedical engineering from Jinan University, China. His research interest is chemical modification of polysaccharides for biomedical applications. He joined the group of Dr. Joel D. Bumgardner in March 2013 to develop a chitosan-based barrier membrane for guided bone regeneration.