Biomechanical Treatment for Degenerative Bone Diseases

“Research into the diagnosis and treatment of degenerative bone diseases at Stony Brook University has led to the development of a novel biophysical stimulation technology that offers hope to millions of individuals who suffer bone fractures from osteoporosis, osteogenesis imperfecta and other bone density depleting conditions.”
— Balaji Sitharaman, Ph. D., Assistant Professor, Department of Biomedical Engineering, Stony Brook University

Background:
Bone loss, due to trauma or disease, is an increasingly serious health problem. In just the United States, than 6.3 million fracture cases occur annually. Numerous patients with degenerative bone diseases face an increased risk of fracture — there are more than 10 million osteoporosis cases, about 50,000 cases of osteogenesis imperfecta and another 34 million individuals at risk due to degenerative bone disease or other conditions such as bone cancers (e.g., osteosarcoma) that are treated by tumor resection.

Technology Description:
SUNY Stony Brook faculty member, Dr. Balaji Sitharaman from the Department of Biomedical Engineering has developed a prototype for a portable, novel photoacoustic stimulation device that may be used for both prophylaxis and the targeted treatment of osteoporosis. Bone progenitor cells exhibit a unique sensitivity to acoustic or mechanical signals a phenomenon that provides the platform for safe and effective interventions in bone regeneration, accelerated osteo-integration, fracture healing and bone tissue engineering.

Advantages
This novel technology:
- Potentially eliminates the harmful side effects associated with existing FDA-approved pharmacological bone loss treatments
- Provides a targeted, focused method for treating bone loss
- Promotes development and stimulation of new bone tissue without external or weight bearing forces

Applications
- Therapeutic treatments
- Biomedical engineering
- Osteopathic medicine
- Stem cell research

Patents / Publications:
- Patent Pending
- Sitharaman B. et al. Tissue Eng Part A. 2011
- Sitharaman, B. & Green, D. PNAS., (2009)

Calcium levels of MSC samples stimulated with RF that are in direct and indirect contact with SWNTs.
* Significant difference between RF and non RF, p<0.05.
** Significant difference between SWNT and no SWNT cultures for the same medium condition, p<0.05.

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