Stony Brook University | The State University of New York

Department of Biomedical Engineering

Regulation of Musculoskeletal Quantity and Quality
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Description

Research in the Integrative Skeletal Adaptation and Genetics Laboratory focuses on the identification of precise parameters that define skeletal tissue quantity and quality and their perturbation to applied physical stimuli. To this end, state of the art imaging techniques (e.g., microCT or synchrotron infrared spectroscopy) are combined with molecular (e.g., RT-PCR), genetic (e.g., QTL), and engineering techniques (e.g., finite element modeling) to determine genes, molecules, forces, as well as chemical and structural matrix properties. An example for a recent study includes the demonstration that extremely small amplitude oscillatory motions (~ 100µm), inducing negligible deformation in the matrix, can serve as an anabolic stimulus to osteoblasts in vivo, producing a structure that is mechanical stronger and more efficient to withstand forces. Recent results also indicate that there is not only a genetic basis for bone architecture, but also that the sensitivity of bone tissue to both anabolic and catabolic stimuli is influenced by subtle genetic variations. The identification of the specific chromosomal regions that modulate this differential sensitivity is in progress. Clinically, our studies may lead to the development of effective diagnostics, prophylaxes and interventions for osteoporosis, without side-effects and tailored towards the genetic make-up of an individual.