

2004 BMEN Senior Research Projects
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1) Chitosan-based micro-encapsulation of cells: Tissue engineering for articular cartilage

In this project, a micro-encapsulation method of periosteal cells or bone marrow-derived stromal cells will be developed using chitosan beads. The cells harvested from rats will be seeded into chitosan beads and encapsulated with glycosaminoglycan molecules. The micro-encapsulated cell system will be then cultured in a chondrogenic culture medium for a certain period of time until the system forms an engineered tissue matrix. The cultured tissue matrix will be finally evaluated for its specificity of articular cartilage or bone.

2) Mechanical stimulation of periosteal osteogenesis

Our preliminary study shows that a mechanical load is critically important to maintain the periosteum as an osteogenic source for bone formation. This project will fine-tune our preliminary study to distinguish the osteogenesis and chondrogenesis of periosteum as a function of mechanical load.

3) 3-D finite element image reconstruction of human brain geometry from the NLM's Visible Human Project® data archive

In this project, a 3-D computer image of human brain geometry will be constructed from the Visible Human Project® data file of the National Library of Medicine. The VHP data archive consists of sequential two dimensional cross-sectional images of a female head. The size of each image is 2048 pixels by 1216 pixels, and each pixel is defined by 24 bits of color. The physical dimension of each pixel is 0.33 mm x 0.33 mm. Each image was taken at an interval of 0.33 mm in the third axis. This enables us to reconstruct a geometrically accurate 3-D brain structure using cubic voxels.