1056-92-817 **Janine M. Haugh*** (janine_haugh@ncsu.edu), 1110-H Lupine Ct, Raleigh, NC 27606, and **Mansoor A. Haider**. *A Reaction-Diffusion Model of Cartilage Regeneration in Cell-Seeded Scaffolds.* Preliminary report.

Articular cartilage, a connective tissue lining the surfaces of bones in diarthrodial joints (hips, knees, shoulders), provides load support, energy distribution, and lubrication but is susceptible to damage from injuries and diseases like osteoarthritis. Cartilage has a limited capacity for repair and growth that is regulated by cells, called chondrocytes, in the tissue's extracellular matrix (ECM). In recent years, the use of nutrient-rich hydrogels and scaffolds seeded with chondrocytes as potential biomaterials for tissue regeneration and repair has seen wide interest. In this study, we develop mathematical models for cartilage regeneration in the local environment of a cell seeded in a hydrogel scaffold. Radially symmetric reaction-diffusion equations describe the coupling of nutrient and matrix concentrations. Several models describe the process by which matrix proteins form ECM within the scaffold, the gel-tissue interface movement, and scaffold degradation. Numerical solutions are based on finite difference and level set methods. The results are used to conduct a parametric analysis of regeneration times in terms of biophysical, physiological, and scaffold-design parameters and can provide a framework for characterization of scaffolds in tissue engineering applications. (Received September 17, 2009)