



UNIVERSITY OF NOTRE DAME

AEROSPACE AND MECHANICAL ENGINEERING

SEMINAR ANNOUNCEMENT

- SPEAKER:** Dr. Eric Darling
Orthopaedic Research Lab
Duke University Medical Center
Durham, North Carolina
- TOPIC:** Investigations of Single-Cell, Mechanical Biomarkers Via
Atomic Force Microscopy
- DATE:** Thursday, March 27, 2008
- TIME:** 3:30 p.m.
- PLACE:** 129 DeBartolo Hall

Abstract

Atomic force microscopy (AFM) provides a non-destructive means for quantifying and evaluating the viscoelastic mechanical properties of single cells. AFM provides an advantage over other techniques (micropipette aspiration, cytoindentation, magnetic bead rheometry, and optical traps) since adherent cells exhibiting a variety of morphologies can be tested under precise loading conditions. Data from single-cell studies assist in furthering our understanding of mechanotransduction: the process by which external loads that stress or deform a tissue are transmitted to cells. Orthopaedic tissues in particular rely heavily on mechanical stimuli to maintain their intrinsic functionality over decades of rigorous use. By investigating the mechanical properties of individual cells, we can more accurately model what loads are being seen at the cellular level. However, recent findings suggest that single-cell mechanical properties may also be useful for identifying problematic cell types. If true, “mechanical biomarkers” would be of great assistance when isolating adult stem cells from other cell types within heterogeneous harvest populations. Current, biochemically-based sorting techniques have had difficulties identifying mesenchymal stem cells, and the inclusion of mechanical biomarkers is a novel approach to solving this problem. The work described in this presentation focuses on the development of elastic and viscoelastic tests using AFM and their application to characterizing various cell populations, such as zonal chondrocytes, malignant chondrosarcoma cell lines, and primary, mesenchymal cell lineages.