

Abstract Submitted
for the SES08 Meeting of
The American Physical Society

Novel Bioreactors to Study Forces on Bronchial Epithelial Cultures JEROME CARPENTER¹, MIKE MILLARD, MATTHEW COZON, RICHARD SUPERFINE², University of North Carolina at Chapel Hill, VIRTUAL LUNG GROUP TEAM — Studying cells in a physiologically relevant environment is an important tool in understanding cell signaling and gene expression. Human bronchial epithelial cells (HBECs) are responsible for mucociliary clearance, which removes pathogens from the air we breathe. Recreating the in vivo conditions of HBECs is difficult; they are polarized and undergo a variety of forces. Polarization is required for organ-specific systems such as cilia motility and mucus regulation. We achieve polarization by growing cells on an electrospun nanoporous scaffold which we attach to a silastic annulus. Using this geometry we apply vacuum to the annulus and stretch the cells. This bioreactor allows us to study polarized HBECs as they experience cyclic strain similar to breathing. We've grown polarized cultures on the scaffold and are evaluating the scaffold's mechanical properties. In a second bioreactor, we place the scaffold into a microfluidics channel to study the affect of shear stress on polarized cells. We also reproduce the branching structure found in the lungs to investigate the regulation of mucus as it ascends the airway tree.

¹Curriculum in Applied Science and Engineering

²Department of Physics and Astronomy

Jerome Carpenter
University of North Carolina at Chapel Hill

Date submitted: 19 Aug 2008

Electronic form version 1.4