Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

**Liquid Therapy Delivery Models Using Microfluidic Airways**
MOLLY K. MULLIGAN, Technion - Israel Institute of Technology, Haifa, Israel, JAMES B. GROTBERG, University of Michigan, Ann Arbor MI, US, DAN WAISMAN, Technion - Israel Institute of Technology, Haifa, Israel, MARCEL FILOCHE, Ecole Polytechnique, Paris, France, JOSUÉ SZNITMAN, Technion - Israel Institute of Technology, Haifa, Israel — The propagation and break-up of viscous and surfactant-laden liquid plugs in the lungs is an active area of research in view of liquid plug installation in the lungs to treat a host of different pulmonary conditions. This includes Infant Respiratory Distress Syndrome (IRDS) the primary cause of neonatal death and disability. Until present, experimental studies of liquid plugs have generally been restricted to low-viscosity Newtonian fluids along a single bifurcation. However, these fluids reflect poorly the actual liquid medication therapies used to treat pulmonary conditions. The present work attempts to uncover the propagation, rupture and break-up of liquid plugs in the airway tree using microfluidic models spanning three or more generations of the bronchiole tree. Our approach allows the dynamics of plug propagation and break-up to be studied in real-time, in a one-to-one scale *in vitro* model, as a function of fluid rheology, trailing film dynamics and bronchial tree geometry. *Understanding these dynamics are a first and necessary step to deliver more effectively boluses of liquid medication to the lungs* while minimizing the injury caused to epithelial cells lining the lungs from the rupture of such liquid plugs.

Molly K. Mulligan
Technion

Date submitted: 02 Aug 2013 Electronic form version 1.4