Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

The surface properties of a lung mucus model system MARKUS WEYGAND, BEAUTIA DEW, STEPHEN GAROFF, MATHIAS LÖSCHE, TODD PRZYBYCIEN, ROBERT TILTON, Carnegie Mellon University — Adding surfactants to aerosol drug therapies may improve drug delivery by inducing surface tension gradient driven flows along the lung airway surfaces. Understanding the surface structure and properties of the mucus that lines the lung airways is crucial to the proper design of such formulations. In our studies, we use mucin solutions made from porcine gastric mucus as a model system. Surface tension measurements revealed a time and humidity dependence, which led us to investigate the structure of the air/solution interface using X-ray and neutron reflectivity. These studies reveal a compact adsorption layer at the air/liquid interface whose density distribution decays with a long tail extension into the bulk liquid. This structure showed only a minor dependence on the humidity above the mucus surface. To examine possible interaction between lipids present in the lung with the mucus, we deposited DPPC and DMPC onto the mucin solution surface and observed that the lipid layer remained on the solution surface for times long compared to the lifetime of mucus in the lung. The analysis of the reflectivity data impart a microscopic picture of the mucin solution surface and its alteration by lipid deposition.

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Date submitted: 21 Nov 2008 Electronic form version 1.4