

# MULTIPHASE FLOW IN THE LUNG

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Our lab has been actively pursuing a number of problems involving multiphase flow in the lung. This talk will be a review of our efforts regarding airway closure and reopening, which is a sequence that leads to sound production in the lung called "crackles". The disease settings are acute respiratory distress syndrome, asthma, cystic fibrosis, surfactant deficiency, and congestive heart failure. CFD is used extensively with comparisons to our own experiments and available literature. Computations give us a way of understanding critical fluid mechanical phenomena for Newtonian and non-Newtonian fluids. For airway closure we study the stability of a lung airway model coated on its inner surface with a liquid film, or bilayer film, to model the serous and mucus layers. The relevant Rayleigh instability creates a liquid plug blocking the airway. Then it must be cleared by inspiratory airflow which forces the propagation of the liquid plug to their rupture and the crackle sound production. The investigations also gives us insight into the levels of stresses on the epithelial cells of airways and alveoli which may cause damage, provoke the release of bioactive molecules, and initiate and sustain inflammation.