

Abstract Submitted  
for the DFD17 Meeting of  
The American Physical Society

**Respiratory Mechanics and Gas Exchange: The Effect of Surfactants.** ABDULRAHMAN JBAILY, University of California, Berkeley, ANDREW J. SZERI, University of British Columbia, Vancouver — The purpose of the lung is to exchange gases, primarily oxygen and carbon dioxide, between the atmosphere and the circulatory system. To enable this exchange, the airways in the lungs terminate in some 300 million alveoli that provide adequate surface area for transport. During breathing, work must be done to stretch various tissues to accommodate a greater volume of gas. Considerable work must also be done to expand the liquid lining (hypophase) that coats the interior surfaces of the alveoli. This is enabled by a surface active lipo-protein complex, known as pulmonary surfactant, that modifies the surface tension at the hypophase-air interface. Surfactants also serve as physical barriers that modify the rate of gas transfer across interfaces. We develop a mathematical model to study the action of pulmonary surfactant and its determinative contributions to breathing. The model is used to explore the influence of surfactants on alveolar mechanics and on gas exchange: it relates the work of respiration at the level of the alveolus to the gas exchange rate through the changing influence of pulmonary surfactant over the breathing cycle. This work is motivated by a need to develop improved surfactant replacement therapies to treat serious medical conditions.

Abdulrahman Jbaily  
University of California, Berkeley

Date submitted: 31 Jul 2017

Electronic form version 1.4