Abstract Submitted
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The influence of surfactant on the propagation of a semi-infinite bubble through a liquid- filled compliant channel[1] DAVID HALPERN, University of Alabama, DONALD GAVER, Tulane University — Pulmonary airway closure may occur as a result of fluid accumulation and surfactant insufficiency. This results in "compliant collapse" with the airway walls buckled and held in apposition by a liquid plug that blocks the passage of air. Airway reopening is vital to the recovery of adequate ventilation, but has been associated with ventilator- induced injury because of the exposure of airway epithelial cells to large pressure gradients. Surfactant replacement is helpful in modulating this harmful stimulus, but is limited in its effectiveness due to slow surfactant adsorption. We investigate the effect of surfactant on reopening by considering the steady two-dimensional motion of a semi-infinite bubble propagating through a liquid-filled compliant channel doped with soluble surfactant. Many parameters affect reopening, but we primarily investigate the capillary number Ca (the ratio of viscous to surface tension forces), the reopening (bubble) pressure p_b, the adsorption depth parameter λ (a bulk concentration parameter) and the bulk Peclet number Pe_b (the ratio of bulk convection to diffusion). The behavior of this system, and the impact of the flow field on surfactant transport and the applied stresses on the wall will be discussed.

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