

Abstract Submitted
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Particle Deposition During Airway Closure¹ CHENG-FENG TAI, University of Michigan, DAVID HALPERN, University of Alabama, JAMES B. GROTBORG, University of Michigan — Inhaled aerosol particles deposit in the lung and may be from environmental, toxic, or medical therapy sources. While much research focuses on inspiratory deposition, primarily at airway bifurcations due to inertial impaction, there are other mechanisms that allow the particles to reach the airway surface, such as gravitational settling and diffusion depending on particle size. We introduce a new mechanism not previously studied, i.e. aerosol deposition from airway closure. The airways are lined with a liquid layer. Due to the surface tension driven instability, a liquid plug can form from this layer which blocks the airway. This process of airway closure tends to occur toward the end of expiration. In this study, the efficiency of the impaction of the particles during airway closure will be investigated. The particles will be released from the upstream of the airway and convected by the air flow and deposited onto the closing liquid layer. We solve the governing equations using a finite volume approach in conjunction with a sharp interface method for the interfaces. Once the velocity field of the gas flow is obtained, the path of the particles will be calculated and the efficiency of the deposition can be estimated.

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