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Particle Deposition in Human Lungs due to Varying Cross-Sectional Ellipticity of Left and Right Main Bronchi STEVEN ROTH, JESSICA OAKES, SHAWN SHADDEN, University of California - Berkeley — Particle deposition in the human lungs can occur with every breathe. Airbourne particles can range from toxic constituents (e.g. tobacco smoke and air pollution) to aerosolized particles designed for drug treatment (e.g. insulin to treat diabetes). The effect of various realistic airway geometries on complex flow structures, and thus particle deposition sites, has yet to be extensively investigated using computational fluid dynamics (CFD). In this work, we created an image-based geometric airway model of the human lung and performed CFD simulations by employing multi-domain methods (Oakes et al. (2014), Annals of Biomedical Engineering, 42: 899-914). Following the flow simulations, Lagrangian particle tracking was used to study the effect of cross-sectional shape on deposition sites in the conducting airways. From a single human lung model, the cross-sectional ellipticity (the ratio of major and minor diameters) of the left and right main bronchi was varied systematically from 2:1 to 1:1. The influence of the airway ellipticity on the surrounding flow field and particle deposition was determined.

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