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Geometrical influence of pulmonary acinar models on respiratory flows and particle deposition PHILIPP HOFEMEIER, JOSUE SZNITMAN, Technion - Israel Institute of Technology — Due to experimental challenges in assessing respiratory flows in the deep regions of the lungs, computational simulations are typically sought to quantify inhaled aerosol transport and deposition in the acinus. Most commonly, simulations are performed using generic geometries of alveoli, including spheres, toroids and polyhedra to mimic the acinar region. However, local respiratory flows and ensuing particle trajectories are anticipated to be highly influenced by the specific geometrical structures chosen. To date, geometrical influences have not yet been thoroughly quantified. Knowing beforehand how geometries affect acinar flows and particle transport is critical in translating simulated data to predictions of aerosol deposition in real lungs. Here, we conduct a systematic investigation on a number of generic acinar models. Simulations are conducted for simple alveolated airways featuring a selection of geometries. Deposition patterns and efficiencies are quantified both for massless particles, highlighting details of the local flow, and micron-scale aerosols. This latter group of particles represents an important class of inhaled aerosols known to reach and deposit in the acinus. Our work emphasizes the subtleties of acinar geometry in determining the fate of inhaled aerosols.

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