**Heterogeneity of aerosol deposition in the mouse lung with respect to particle size, strain, respiratory rate and airway geometry**

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Understanding the effect on heterogeneity of aerosol deposition in the lung can help optimize aerosol inhalation drug delivery, which is a well-established procedure in the treatment of pulmonary diseases as it has potential advantages over oral and intravenous routes of delivery. As the most commonly used animal model for inhalation exposure and toxicology risk assessment research, mouse is used in this study. Preliminarily, R. R. Beichel et al. from University of Iowa exposed four most commonly studied strains of awake mice to fluorescent aerosol particles with diameters of 0.5, 1.0 or 2.0 µm and then acquired a high-resolution CT scan of their lungs. The dataset was then delivered to public with 3D lung geometries associated with their aerosol deposition profiles.

Statistical analysis on this dataset shows patterns on heterogeneity of aerosol deposition with respect to particle size, strain, respiratory rate and airway geometry. Lobe PV ratio () is denoted as the ratio of fraction of depositing particle count versus the fraction of corresponding lobe volume. We notice that the PV ratio has a bigger deviation from one in samples exposed to larger particles (, P = 0.03; , P ≈ 0) and the deviation, on the lobe level, is most pronounced by the over-depositing of aerosol in the cranial lobe. is positively correlated with particle size (p = 0.004) and is negatively correlated with particle size (p = 0.026). and also shows a negative trend with respect to particle size but the regressions are not significant. Besides, we also observed strain-related variations, showing specific strains with higher deviation, respiratory rate and lung volume. Moreover, airway geometry also plays a role in effecting aerosol deposition, but its effect needs to be determined with further analysis.

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