**Lobar deposition of inhaled aerosol in the mouse lung: preliminary analysis of LAPD dataset**

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

Wanjun Gu1, C. Darquenne1\*,

1Department of Medicine, University of California, San Diego, USA

Understanding the spatial distribution of aerosol deposition in the lung can help optimize aerosol inhalation drug delivery. In a previous study, Beichel et al. have exposed four strains of awake mice (n = 34) 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 database with 3D lung geometries associated with their aerosol deposition profiles was made freely available(<https://doi.org/10.25820/9arg-9w56>).

We calculated the particle deposition to volume ratio for each lobe () in each animal in the database. When , particle deposition is proportional to lobar volume; when differs from one, lobar deposition is relatively greater () or smaller () than lobar volume.

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 show

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.

\*corresponding author: C. Darquenne. University of California, San Diego, 9500 Gilman Drive, mail code 0623A, La Jolla CA 92093-0623. Email: [cdarquenne@ucsd.edu](mailto:cdarquenne@ucsd.edu). Phone: 1-858-534-9171.

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