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Title: Comparison of aerosol deposition pattern in healthy vs. asthmatic subjects

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Body: Introduction A clinical study designed to validate computational models of aerosol deposition in healthy and asthmatic subjects has been completed. Objectives The objective here is to compare the aerosol deposition patterns between healthy and moderate asthmatic subjects inhaling identical aerosols under identical ventilatory parameters. Methods 6 healthy and 6 asthmatic subjects performed two inhalations each, which differed by a single controlled parameter: particle, ventilation, or carrier gas. The same parameters were used for a healthy subject (e.g. H01) and the corresponding asthmatic patient (e.g. A01). 3D-SPECT was performed to measure aerosol deposition location, and the 3D Central to Peripheral ratios, C/P, were calculated for right and left lungs. Results Almost all (11/12) the asthmatics had higher central deposition than the corresponding healthy subjects. Data on deposition per airway generation show that the asthmatics have a peak around the 5th generation, which is less marked for the healthy subjects (e.g. Figure 1 for H03 and A03). The mean right and left C/P ratios are 1.56±0.45 and 1.86±0.61 for healthy subjects, vs. 2.89±1.45 and 4.04±2.22 for the asthmatics. These differences between healthy and asthmatic subjects were statistically significant ($p<0.002$).

Conclusion The obstruction of the upper airways in asthma disease may induce the larger deposition of aerosol in central airways of asthmatics compared to healthy subjects.