

Author's Accepted Manuscript

Influence of secondary aspiration on Human aspiration efficiency

K.R. Anderson, T. Renee Anthony



PII: S0021-8502(14)00064-0
DOI: <http://dx.doi.org/10.1016/j.jaerosci.2014.04.008>
Reference: AS4778

To appear in: *Journal of Aerosol Science*

Received date: 6 February 2014
Revised date: 18 April 2014
Accepted date: 18 April 2014

Cite this article as: K.R. Anderson, T. Renee Anthony, Influence of secondary aspiration on Human aspiration efficiency, *Journal of Aerosol Science*, <http://dx.doi.org/10.1016/j.jaerosci.2014.04.008>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Title: Influence of Secondary Aspiration on Human Aspiration Efficiency

Authors: KR Anderson^{1,2}, T. Renee Anthony¹

¹Department of Occupational and Environmental Health, University of Iowa, 105 River Street, Iowa City, IA, 52242

²Department of Environmental and Radiological Health, Colorado State University, Fort Collins CO (now at address)

Word Count: 6726

Keywords: Computational fluid dynamics; human aspiration efficiency; coefficient of restitution; particle bounce; inhalability

Abstract

Computational fluid dynamics (CFD) was used to evaluate the contribution of secondary aspiration to human aspiration efficiency estimates using a humanoid model with realistic facial features. This study applied coefficient of restitution (CoR) values for working-aged human facial skin to the facial regions on the humanoid CFD model. Aspiration efficiencies for particles ranging from 7-116 μm were estimated for bounce (allowing for secondary aspiration) and no-bounce (CoR=0) simulations. Fluid simulations used the standard k-epsilon turbulence model over a range of test conditions: three freestream velocities, two breathing modes (mouth and nose breathing, using constant inhalation), three breathing velocities, and five orientations relative to the oncoming wind. Laminar particle trajectory simulations were used to examine inhaled particle transport and estimate aspiration efficiencies. Aspiration efficiency for the realistic CoR simulations, for both mouth- and nose-breathing, decreased with increasing particle size, with aspiration around 50% for 116 μm particles. For the CoR=0 simulations, aspiration decreased more rapidly with increasing particle size and approached zero for 116 μm compared to realistic CoR models (differences ranged from 0 to 80% over the particle sizes and velocity conditions).

Download English Version:

<https://daneshyari.com/en/article/6344493>

Download Persian Version:

<https://daneshyari.com/article/6344493>

[Daneshyari.com](https://daneshyari.com)