

Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Xenon and Helium Gas Transport in the CT-based Human Lung Geometry¹ CHING-LONG LIN, Department of Mechanical and Industrial Engineering, The University of Iowa, ERIC HOFFMAN, Department of Radiology and Biomedical Engineering, The University of Iowa — Stable Xenon (Xe) gas has been used as an imaging agent for decades in its radioactive form, is chemically inert, and has been used as a ventilation tracer in its non radioactive form during computerized tomography (CT) imaging. Magnetic resonance imaging using hyperpolarized Helium (He) gas has also emerged as a powerful tool to study regional lung structure and function. However, the present state of knowledge regarding intra-bronchial Xe and He transport properties is incomplete. As the use of these gases rapidly advances, it has become critically important to understand the nature of their transport properties and to, in the process, better understand regional distribution of respiratory gases. In this study, we applied a custom-developed Characteristic-Galerkin finite element method to study transport of Xe and He in the CT-based human lung geometry, especially emulating the washin and washout processes. The realistic lung model is obtained from multidetector-row CT (MDCT) scanning of supine human subjects with lungs held at TLC and FRC. The simulation results show that the Xe/He washin and washout are governed by either flow instability or stable stratification, depending upon the relative density of resident gas versus inspired gas.

¹The work is sponsored by NIH HL-064368-06

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Date submitted: 10 Aug 2005

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