GOAL

The goal is to develop a comprehensive computational fluid dynamics (CFD) model for pulmonary flow, known as Digital Lung, that utilizes subject-specific airway geometries, spans spatial scales from the largest bronchial airways to alveolar sac, and employs a Computed Tomography (CT) data-driven, multistage approach to provide accurate predictions of regional ventilation and gas transport through the entire moving airway tree.

APPLICATIONS

- Drug delivery: improve pharmaceutical aerosol drug delivery.
- Biomedical imaging: advance Xenon or Helium CT/MRI.
- Life/health sciences: predict subject-specific regional ventilation for diagnosis of patterns related to pathologic changes in airway geometry and parenchyma.
- Cross-disciplinary research: Innovation.

SOME FACTS

- Early exposure to environmental pollutants has chronic, adverse effects on lung development in the children from the age of 10 to 18 years (Gauderman et al. 2004).
- Lung hot spots concentrate carcinogens that produce or incite lung cancer (Heistracher & Oldham 2003). Safe limits for pollutant concentration could be underestimated.
- The Iowa Radon Lung Cancer 5-year Study suggests that cumulative residential radon exposure is a significant risk factor for lung cancer in women. Iowa has the highest average radon concentrations in the US.

ACKNOWLEDGEMENTS

Sponsors: the National Institutes of Health (NIH) through grant #HL064368 (PI Hoffman) and #EB005823 (PI Lin) awarded through the National Institute for Biomedical and Bioengineering (NIBIB).

Contact: Prof. Lin, Phone 319-335-5673, Email ching-long-lin@uiowa.edu