

## **Imaging of Lung Function Using Synchrotron Radiation Computed Tomography: What's New?**

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There is a growing interest in imaging techniques as non-invasive means of quantitatively measuring regional lung structure and function. Abnormalities in lung ventilation due to alterations in airway function such as those observed in Asthma and COPD are highly heterogeneous, and experimental methods to study this heterogeneity are crucial for better understanding of disease mechanisms and drug targeting strategies. In severe obstructive diseases requiring mechanical ventilation, the optimal ventilatory strategy to achieve recruitment of poorly ventilated lung zones remains a matter of considerable debate. We have used Synchrotron Radiation Computed Tomography (SRCT) for the in vivo study of regional lung ventilation and airway function. This imaging technique allows direct quantification of stable Xenon (Xe) gas used as an inhaled contrast agent based on K-edge subtraction imaging. Dynamics of Xe wash-in can be used to calculate quantitative maps of regional specific lung ventilation. More recently, the development of Spiral-CT has allowed the acquisition of 3D images of the pulmonary bronchial tree and airspaces. This technique gives access to quantitative measurements of regional lung volume, ventilation, and mechanical properties. Examples of application in an experimental model of allergic asthma and in imaging lung recruitment as a function of mechanical ventilation parameters will be presented. Future orientations of this project as well as applications of other SRCT lung imaging techniques such as Diffraction-Enhanced Imaging will be discussed.

**KEYWORDS:** Synchrotron Radiation, Computed Tomography, Asthma, Regional lung ventilation