A Novel Model for Dissolved Hyperpolarized Xenon 129 Dynamics in the Lung

**Background:**
The diffusion pathway of xenon through alveolar membranes correlates to that of oxygen and carbon dioxide. The dynamics of dissolved xenon in the lung can be observed and characterized using magnetic resonance methods. This technique can be used for global (spectroscopy) and localized (imaging) measurements of lung function, structure, and physiology.

**Technology Description:**
Researchers at Washington University have developed a simple model of gas exchange in the lung for hyperpolarized xenon-129, which treats individually the two peaks of dissolved xenon signal at different chemical shifts with shared pulmonary parameters. Rapid processing of the normalized dissolved-xenon signal amplitudes allows quantification of multiple pulmonary, structural, and physiological parameters including surface-area-to-volume ratio, ratio between air-blood barrier thickness and septal thickness, pulmonary capillary transit time, and gas-exchange time constant. The above parameters, as well as others capable of being determined using this system, are closely related to lung function and physiology, thus this new model can be used for screening or diagnosis of prevalent lung diseases such as chronic obstructive pulmonary disease (COPD) and fibrosis, as well as diseases that affect capillary blood flow in the lung, such as the sickle cell disease (SCD) and ventricular hypertrophy. This technique can also be used to monitor the progression and treatment of lung diseases.

**Key Advantages:**
- Non-invasive with limited radiation exposure
- Can simultaneously quantify structural, functional, and physiological information
- The first study of its kind to be completed in humans.

**Publications:**

**Patent Application Number:** 13/587,633

**Lead Inventor:**
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