Non-Invasive Pulmonary Airway Resistance Measurement System

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UVM innovations
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Overview

The assessment of lung mechanical function in small animals, particularly mice, is essential for many investigations into the pathophysiology of pulmonary disease. The forced oscillation technique applied in anesthetized tracheostomized animals provides the most accurate and specific assessment of lung function but is highly invasive.

Unrestrained plethysomography in conscious animals provides a parameter called PenH, but this quantity is actually a reflection of the control of breathing and not lung mechanics. Thus, there is currently no completely noninvasive method available for determining lung function in small animals, despite the continued erroneous use of PenH in this regard. However, Dr. Bates and his colleagues from the University of Vermont have a solution to this problem.

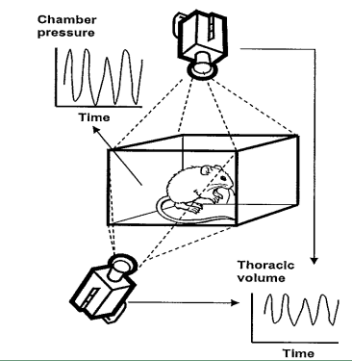

Figure 1: Schematic of the setup required for implementing the new invention, UVAP, in conscious mice.

Invention

Unrestrained plethysomography involves placing a conscious animal inside a closed chamber while the pressure in the chamber is measured. As the animal breathes, chamber pressure fluctuates due to compressive changes in thoracic gas volume as air flows along the resistive airways. However, the fluctuations in pressure also reflect humidification and healing of gas as it is inspired. We have shown the humidification and heating effects can be eliminated if the air in the chamber is saturated at body temperature. The remaining pressure fluctuations are then determined by airway resistance, tidal volume, and total lung volume according to the equation for the inspiratory plethysomographic pressure integral (IPPI).

Dr. Bates has shown that unrestrained plethysomography would provide a valid means for following changes in lung function if it could be coupled to independent measurements of changes in lung volume. This invention, Unrestrained Video-Assisted Plethysomography (UVAP), combines unrestrained plethysomography with the measurement of changes in lung volume using orthogonal video images of the thorax.

Advantages

- Provides researchers with the ability to follow changes in airway resistance in mice
- Greatly increases the throughput possible when screening large numbers of animals
- Allows non-destructive testing of valuable animal models of lung disease.

Applications

- University and Industry labs involved in this type of research
- Pediatric research studying lung function in infants
- Childhood asthma, Cystic Fibrosis, Infant Respiratory Distress Syndrome populations

Patent Status

Patent No. 7,945,303
Worldwide Rights Available

Learn more about Dr. Bates' research at:
http://bit.ly/17Hvc9j

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