

What: Airway Physiology Core Website Content Review

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Who: De'Broski Herbert, Chris Pastore, Heather Rossi

Contact: Carole Cloud, cloud@vet.upenn.edu

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Penn Vet Airway Physiology Core

Our Mission

The mission of the PennVet Airway Physiology Core is to provide research investigators with the infrastructure and expertise to obtain data on pulmonary mechanics, airway cytology and lung architecture in mouse models of allergic disease and pathogen infection.

Created by research faculty at Penn Vet, the Penn Vet Airway Physiology Core provides investigators across the University of Pennsylvania and Children's Hospital of Philadelphia access to state-of-the-art equipment that can deliver inhaled substances to rodents and measure airway physiology either invasively or non-invasively.

This core offers comprehensive services beginning with study design and development, executing the studies, and providing assistance with data analysis and interpretation as needed.

Block links:

- Services
- Equipment
- Our Team
- Useful Links

Services

The Penn Vet airway physiology core features the [Buxco Fine-Pointe® resistance/compliance](#) instrument, the [flexiVent®](#) instrument, and the Buxco® Small Animal Whole Body Plethysmography instrument.

The devices allow simultaneous measurement of resistance, dynamic compliance, and tidal volume in either anesthetized mice (Buxco Fine-Pointe® resistance/compliance instrument and flexiVent® instrument) or non-anesthetized mice ([Buxco® Small Animal Whole Body Plethysmography](#)).

The systems deliver aerosolized methacholine, a synthetic agonist of the muscarinic receptor, which will cause airway constriction and is used clinically to diagnose asthma and other lung disorders associated with airway hypersensitivity.

What We Offer

- **Consultation**

Consultation for experimental design and animal protocol amendment, if needed. Client may opt to transfer their mice to the Core's existing protocol, or may need to add experimental drugs or treatments of interest to the existing protocol.

- Possible Experimental Paradigms we can perform

- Inhalation models of allergic and non-allergic environmental exposures

Click to see models included on the Core's IACUC
protocol:

- Allergens and irritants: ovalbumin, house dust mite, Papain, LPS, Fungal Antigen (*Alternaria alternata*, *Aspergillus fumigatus*)
- Parasitic and Chemical Injury: Helminths (*Nippostrongylus brasiliensis*, *Strongyloides ratti*), Bleomycin
 - Transgenic phenotyping
 - Therapeutic drug discovery
 - Metabolic Disease and Airway Health
 - Bacterial or Viral Infection and Airway Health
- Measurement & Assessment

Measurement and assessment of airway physiology and lung compliance in anesthetized mice:

- FlexiVent® system
- Buxco® FinePointe Resistance and Compliance system

Measurement and assessment of breathing patterns in awake mice:

- Buxco® Small Animal Whole Body Plethysmography system

Additional Services

The staff of the Airway Pathology Core will:

- Collect samples following invasive measurements (e.g., blood, bronchoalveolar lavage fluid (BALF), and lung)
- Prepare lung tissues for histopathology

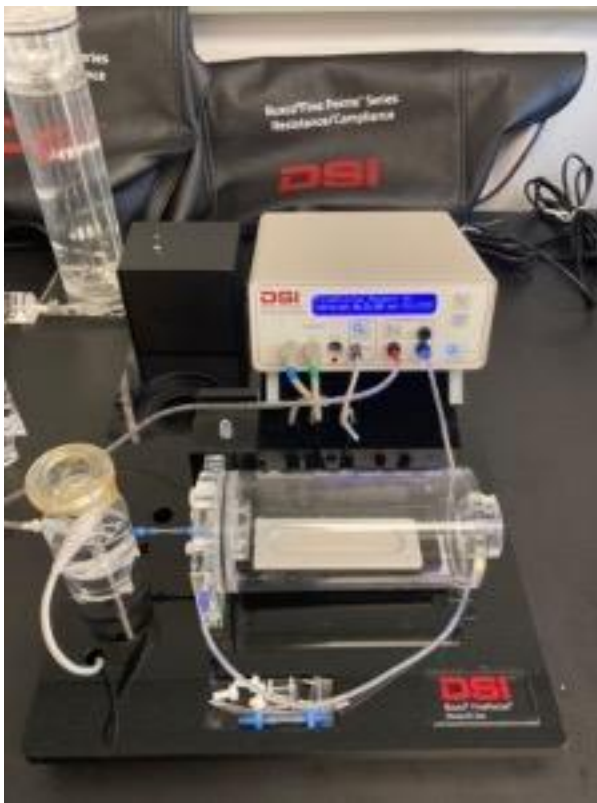
- Count total and differential cell populations in bronchoalveolar lavage
- Provide consultation for pulmonary data analysis and interpretation

Equipment

Airway Physiology Core Equipment

- **flexiVent®**
 - (Comparable system to the Buxco® FinePointe Resistance/Compliance system)
 - The **flexiVent®** provides the user with the ability to assess the mechanical properties of the respiratory system.
 - Using clinically relevant aerosolized methacholine doses, lung function can be analyzed in murine models of genetic knockdown, disease, or damage.
-
- **Buxco® FinePointe Resistance/Compliance system**
 - (Comparable system to the flexiVent®)
 - **The Buxco® FinePointe Resistance/Compliance system** provides the user with the ability to assess the mechanical properties of the respiratory system.

- Using clinically relevant aerosolized methacholine doses, lung function can be analyzed in murine models of genetic knockdown, disease, or damage.



- **Buxco® FinePointe Resistance/Compliance system-RC Compliance System (1/2)**
- The unit attached to the computer and FinePointe software delivers accurate doses of aerosolized methacholine via a nebulizer to an anesthetized mouse. The unit registers via forced inhalation any changes or obstructions to breathing as compared to baseline.

- The complete set up of the Buxco® FinePointe Resistance/Compliance

system (2 units connected to one computer)



- This screen shows an example dataset that was generated from an experiment. Key data include lung Resistance (top left graph) and Total Volume of lung (Top right graph). The former increases and the latter decreases as methacholine is administered in escalating doses.

- **Buxco® Small Animal Whole Body Plethysmography**

- **Buxco® Small Animal Whole Body Plethysmography:** Whole Body Plethysmography is a non-invasive way to measure total lung capacity and airway resistance. The system utilizes a chamber hooked up to a

nebulizer and can detect changes airflow in the chamber in response to methacholine doses. This method requires no sedation and can potentially integrate behavioral readouts

URL: <https://www.vet.upenn.edu/research/core-resources-facilities/airway-physiology-core/team/>

Team

De'Broski Herbert, PhD

- Director, Airway Physiology Core
- Associate Professor of Immunology
- Penn Presidential Associate Professor

Airway Physiology Core Location

University of Pennsylvania, Penn Vet
3800 Spruce Street, Rosenthal 216
Philadelphia, PA 19104

Li Yin Hung, PhD

- Technical Director, APC
- Research Associate

Chris Pastore

- Technical Director, APC
- Research Technician

Heather Rossi, PhD

- Laboratory Director, APC
- Senior Research Investigator

URL: <https://www.vet.upenn.edu/research/core-resources-facilities/airway-physiology-core/useful-links>

Resources & Links

Useful Resources and Links



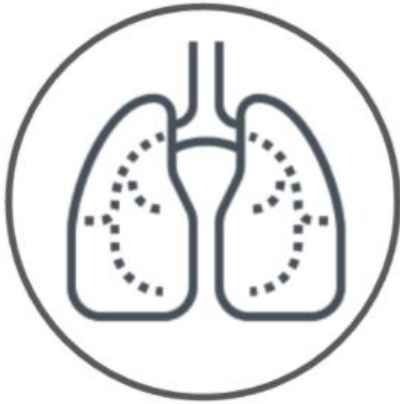
flexiVent

The flexiVent is widely regarded as the gold standard for in vivo lung function measurements. It goes beyond traditional resistance and compliance measurements, and captures crucial details about the mechanical properties of conducting airways, terminal airways and parenchyma. The flexiVent achieves the highest sensitivity and reproducibility by precisely controlling experimental conditions.



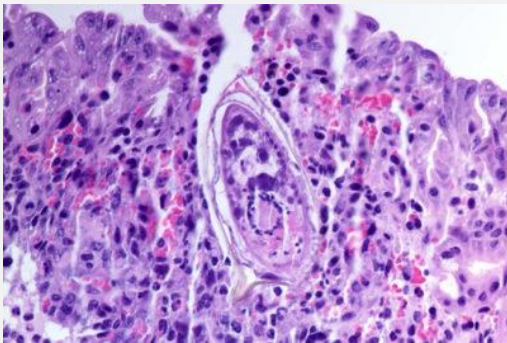
Buxco Fine-Pointe Resistance & Compliance

Buxco small animal WBP systems can be combined with other technologies to enable more data and holistic approaches to every study including optogenetics, electrical commutator, fluid swivel, and implantable telemetry.



Buxco Fine-Pointe Whole Body Plethysmography

Collect invasive resistance, dynamic compliance, and elastance data; evaluate spontaneously breathing, ventilated, aerosol challenged, and IV challenged animals; perform longer data collections with a heated bed; and reduce the risk of human error with automated diagnostics and calibration.



Herbert Laboratory of Mucosal Immunology

The Herbert lab is exploring the immunoregulatory and regenerative mechanisms operating at the mucosal interface. We have a keen interest in Trefoil factor proteins, which are a triad of mucus associated cytokines that currently lack bona-fide receptors. Our work employs a combination of molecular and biochemical approaches to interrogate cellular immunity under steady-state and infectious conditions.