

The 2013 International Pulmonary Imaging Workshop

*Philadelphia, PA
May 16 - 18th*



Organized by:

- The Functional and Metabolic Imaging Group
- Department of Radiology

*The Deadline for Submitting Abstracts, Early Registration
and Request for Trainee Financial Support is
May 1st, 2013*

Organizing Committee

Rahim R. Rizi
Stephen J. Kadlecsek
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James C. Gee
John Hansen-Flaschen
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International Scientific Committee

John P. Mugler, III
Robert H. Brown
Eric A. Hoffman
James D. Crapo

**University of Pennsylvania
421 Curie Boulevard
Biomedical Research Building II/III
Philadelphia, PA 19104**

Foreword

On behalf of the organizing committee, I would like to welcome you to the 2013 International Pulmonary Imaging Workshop. In previous years' workshops, the focus was mainly on structural and functional imaging. This year, we have taken a new approach: we have allocated a significant portion of the upcoming meeting to metabolic pathways and to the development of probes for the assessment of pulmonary disorders. To this end, we have arranged for the coverage of a diverse array of topics by inviting specialists who can speak authoritatively on structural, functional, and metabolic pulmonary imaging; lung physiology; lung mechanics; lung image analysis and co-registration; and on the latest imaging and hyperpolarization techniques. Nevertheless, if our program seems at all incomplete or lacking in a well-balanced consideration of some topics, this is due to the unavoidable limitations of time.

The program is divided into fifteen sessions, consisting of:

- Fifty-six presentations from experts in the fields of pulmonary imaging, lung biology and physiology, metabolic pathways, and image analysis.
- Twelve 10-minute presentations by graduate students and postdoctoral fellows.
- Several short presentations from the workshop's abstracts.

In most cases, the presentations in each section are organized according to that session's underlying method or concept. While we believe that discussion is an important part of this meeting, we have only allotted a limited amount of time at the end of each session for dialogue. However, it is our hope that breaks given during each day's sessions will provide more time for informal conversations about the presentations.

The members of the 2013 Pulmonary Workshop's organizing committee extend our thanks to all of the meeting's speakers and participants. We are looking forward to seeing you at the University of Pennsylvania on May 16, 2013.

Rahim R. Rizi, Ph.D.
Professor of Radiology
University of Pennsylvania

Program Schedule

Thursday, May 16, 2013

7:00 – 7:50 AM

Continental Breakfast

7:50 – 8:05 AM

Introductory and Welcome Remarks

Rahim R. Rizi, Ph.D.

University of Pennsylvania

8:05 – 8:25 AM

Quantitative Molecular Imaging Biomarkers for Disease Management

David A. Mankoff, M.D., Ph.D.

University of Pennsylvania

Session I : Keynote Lectures - Part I **Moderator: Jerry D. Glickson, Ph.D.**

8:25 – 8:40 AM

Potential Contributions of Metabolic Imaging to Pulmonary Research

Thomas L. Croxton, M.D., Ph.D.

National Institutes of Health

8:40 – 9:10 AM

Potential of NIRS for Measuring Respiratory Muscle Blood Flow and Metabolism

Peter D. Wagner, M.D.

University of California, San Diego

9:10 – 9:40 AM

Imaging of Reactive Oxygen Species Production during Lung Ischemia

Aron B. Fisher, M.D.

University of Pennsylvania

9:40 – 9:55 AM

Discussion

9:55 – 10:10 AM

Break

Session II : Molecular Imaging of Pulmonary Disorders - Part I **Moderator: Rahim R. Rizi, Ph.D.**

10:10 – 10:35 AM

Challenges Associated with Molecular Imaging for Evaluating Molecular Pathways

Craig Malloy, M.D.

University of Texas, Southwestern

10:35 – 10:55 AM

Molecular Imaging of Pulmonary Fibrosis

Peter Caravan, Ph.D.

Harvard University

10:55 – 11:15 AM

Molecular Imaging of Inflammation in the Lungs

Timothy S. Blackwell, M.D.

University of Vanderbilt

11:15 – 11:35 AM

Imaging Lung Inflammation with Positron Emission Tomography

Delphine L. Chen, M.D.

Washington University

11:35 – 11:50 AM

Discussion

11:50 AM – 12:50 PM

Lunch

Session III : Graduate Student and Postdoctoral Presentations - Part I
Moderator: Kai Ruppert, Ph.D.

12:50 – 1:50 PM

Who Moved My Perfusion? The Early and Late Phase Pulmonary Response to Whole Lung Allergen Challenge

Vanessa J. Kelly, Ph.D.
Massachusetts General Hospital

Reliability and Validity of Specific Ventilation Heterogeneity Estimation Obtained Using Specific Ventilation Imaging

Rui Carlos Sá, Ph.D.
University of California, San Diego

A Multiple-breath ^3He Wash-in Regimen to Reduce the Limitation of ^3He $p_A\text{O}_2$ -imaging Due to Delayed Ventilation and Slow Filling

Hooman Hamedani
University of Pennsylvania

Limitations and Pitfalls of HP Gas ADC Models of Alveolarization

Juan Parra-Robles, Ph.D.
University of Sheffield, United Kingdom

^{19}F Apparent Diffusion Coefficient MRI of Inert Fluorinated Gases in Human Lungs

Marcus Couch
Thunder Bay Regional Research Institute, Canada

Effects of Ventilator Induced Lung Injury on Airspace Distension and Regional Ventilation in Rats Using Hyperpolarized MRI

Yi Xin
University of Pennsylvania

1:50 – 2:05 PM

Discussion

Session IV : Molecular Imaging of Pulmonary Disorders - Part II
Moderator: Douglas L. Rothman Ph.D.

2:05 – 2:25 PM

Pyruvate Uptake and Metabolism in the Lung

Stephen J. Kadlecak, Ph.D.
University of Pennsylvania

2:25 – 2:45 PM

Anatomical, Functional and Metabolic MRI of Lung Injury Using Hyperpolarized Nuclei

Giles Santyr, Ph.D.
Robarts Research Institute, Canada

2:45 – 3:05 PM

Imaging of Lung Inflammation and Ventilation in Viral Induced Asthma Exacerbation

Sean B. Fain, Ph.D.
University of Wisconsin

3:05 – 3:20 PM

Discussion

3:20 – 3:35 PM

Break

Session V : Lung Structure and Disease Models - Part I
Moderators: Reynold A. Panettieri, Jr., M.D. and Jason Woods, Ph.D.

3:35 – 4:00 PM

Probing the Potential for Lung Growth in Adult Humans Using Hyperpolarized Noble Gas to Characterize Acinar Microstructure

James P. Butler, M.D.
Harvard University

4:00 – 4:20 PM	New Advances in Asthma Reynold A. Panettieri, Jr., M.D. University of Pennsylvania
4:20 – 4:40 PM	Intrapulmonary Aerosol Deposition with PET/CT: From Images to Tissue Dosing José G. Venegas, Ph.D. Harvard University
4:40 – 5:00 PM	Molecular Pathogenesis of COPD: A Guide to Functional Imaging Jeanine D'Armiento, M.D.,Ph.D. Columbia University
5:00 – 5:15 PM	Break
5:15 – 5:35 PM	CT of COPD: Beyond Emphysema and Airway Measurement Joon Beom Seo, M.D. University of Ulsan, South Korea
5:35 – 5:55 PM	Three-dimensional Structure of the Rat Acinus Johannes Schittny, Ph.D. University of Bern, Switzerland
5:55 – 6:15 PM	Products of Elastin Degradation as Biomarkers in COPD Gerard M. Turino, M.D. Columbia University
6:15 – 6:35 PM	Pulmonary Inflammation during Acute Lung Injury Measured with PET Marcos F. Vidal Melo, M.D.,Ph.D. Harvard University
6:35 – 6:50 PM	Discussion

Friday, May 17, 2013

7:00 – 7:40 AM **Continental Breakfast**

Session VI : Keynote Lectures - Part II **Moderator: Warren B. Gafter, M.D.**

7:40 – 8:10 AM	Emerging Functional Measures of the Lung with Dual Energy CT Eric A. Hoffman, Ph.D. University of Iowa
8:10 – 8:40 AM	Propulsion and Navigation within the Advancing Monolayer Sheet Jeffrey J. Fredberg, Ph.D. Harvard University
8:40 – 9:10 AM	Micro CT Studies of Lung Pathology and Their Relationship to Histology and Gene Expression Profiling James C. Hogg, M.D.,Ph.D. St. Paul's Hospital, Canada
9:10 – 9:25 AM	Discussion
9:25 – 9:40 AM	Break

Session VII : Lung Structure and Disease Models - Part II
Moderator: John D. Newell, Jr., M.D.

9:40 – 10:05 AM	Image-based Subtypes of COPD James D. Crapo, M.D. National Jewish Health
10:05 – 10:30 AM	CT Imaging of the Airways David P. Naidich, M.D. New York University
10:30 – 10:55 AM	Acute Exacerbations of COPD and Imaging as a Predictor/Marker of Disease Gerard Criner, M.D. Temple University
10:55 – 11:15 AM	Lung Inflation, Airway Dilation, and Obstructive Lung Disease Robert H. Brown, M.D.,M.P.H. Johns Hopkins University
11:15 – 11:35 AM	Pulmonary Microvascular Blood Flow in COPD and Emphysema R. Graham Barr, M.D.,Dr.P.H. Columbia University
11:35 – 11:55 AM	Radiographic Heterogeneity in COPD Meilan Han, M.D. University of Michigan
11:55 AM – 12:10 PM	Discussion
12:10 – 1:40 PM	Lunch and Poster Session

Session VIII : Lung Cancer
Moderator: Daniel H. Sterman, M.D.

1:40 – 2:10 PM	Update on CT Screening for Lung Cancer Claudia I. Henschke, M.D.,Ph.D. Mount Sinai Hospital
2:10 – 2:30 PM	Using Paired Tissue and Serum Samples to Characterize Human Lung Cancer Metabolomics with Ex Vivo ¹H HRMAS MRS Leo L. Cheng, Ph.D. Harvard University
2:30 – 2:50 PM	Imaging Proliferation in Non-small Cell Lung Cancer Sharyn I. Katz, M.D. University of Pennsylvania
2:50 – 3:00 PM	Discussion
3:00 – 3:15 PM	Break

Session IX : Lung Function and Structure Imaging - Part I
Moderator: Jim Wild, Ph.D.

3:15 – 3:40 PM	Advances in Regional Mapping of Gas Uptake in the Lung Using Hyperpolarized Xe-129 MRI John P. Mugler, III, Ph.D. University of Virginia
3:40 – 4:00 PM	In Vivo Lung Morphometry – Current Status and Future Perspectives Dmitriy Yablonskiy, Ph.D. Washington University

4:00 – 4:20 PM

Multi Nuclear MRI Measurements of Lung Function

Jim Wild, Ph.D.
University of Sheffield, United Kingdom

4:20 – 4:40 PM

New Advances in Pulmonary Functional MR Imaging Using Inert Gases

Mitchell Albert, Ph.D.
Thunder Bay Regional Research Institute, Canada

4:40 – 5:00 PM

Regional Reproducibility Study of Imaging of Alveolar Oxygen Tension

Masaru Ishii, M.D.,Ph.D.
Johns Hopkins University

5:00 – 5:10 PM

Discussion

5:10 – 5:25 PM

Break

**Session X : Technological Advances in Polarized Gas MRI
Moderator: Samuel Patz, Ph.D.**

5:25 – 5:45 PM

Design Considerations for a Portable MR Device to Measure Pulmonary Function

Samuel Patz, Ph.D.
Harvard University

5:45 – 6:05 PM

Further Increases in Production of Highly-polarized ^{129}Xe

F. William Hersman, Ph.D.
University of New Hampshire

6:05 – 6:25 PM

High (~25-90%) ^{129}Xe Hyperpolarization at High Xenon Densities Using an 'Open-Source' Clinical-scale Polarizer

Boyd Goodson, Ph.D.
Southern Illinois University

6:25 – 6:45 PM

Production and Use of Hyperpolarized Xenon for Lung Imaging: State of the Art and Future Directions

Nicholas N. Kuzma, Ph.D.
University of Pennsylvania

6:45 – 7:00 PM

Discussion

Saturday, May 18, 2013

7:00 – 7:40 AM

Continental Breakfast

**Session XI : New Techniques for Lung Imaging
Moderator: Stephen Kadlecsek, Ph.D.**

7:40 – 8:00 AM

Optical Coherence Tomography and the Lung: Recent Advances and Future Direction

Melissa J. Suter, Ph.D.
Harvard University

8:00 – 8:20 AM

High-resolution Imaging of Airway Using Endoscopic OCT

Xingde Li, Ph.D.
Johns Hopkins University

8:20 – 8:40 AM

Temporal Dynamics in the Lung

G. Kim Prisk, Ph.D.
University of California, San Diego

8:40 – 9:00 AM

Ultrashort Repetition Time (UTR) MR Imaging of the Human Lung

G. Wilson Miller, Ph.D.
University of Virginia

9:00 – 9:10 AM

Discussion

9:10 – 9:25 AM

Break

Session XII : Lung Function and Structure Imaging - Part II
Moderator: John P. Mugler, III, Ph.D.

9:25 – 9:50 AM

**Mesenchymal Stem(Stromal) Cells and Acute Lung Injury:
Biology and Potential Clinical Treatment**

Michael A. Matthay, M.D.
University of California, San Francisco

9:50 – 10:10 AM

Ventilator Induced Lung Injury – Insights from Hyperpolarized MRI

Maurizio F. Cereda, M.D.
University of Pennsylvania

10:10 – 10:30 AM

**Advances in the Assessment of Lung Function Using
Hyperpolarized Xenon-129**

Kai Ruppert, Ph.D.
University of Virginia

10:30 – 10:50 AM

**Using Hyper-CEST to Increase Hyperpolarized Xe-129 NMR
Detection Sensitivity in Complex Structures**

Ivan J. Dmochowski, Ph.D.
University of Pennsylvania

10:50 – 11:00 AM

Discussion

11:00 – 11:15 AM

Break

11:15 – 11:35 AM

**Multi-breath Hyperpolarized Gas Imaging Protocols – Advances and
New Possibilities**

Kiarash Emami, Ph.D.
Polarean, Inc.

11:35 – 11:55 AM

**Applications of ³He Lung Morphometry: Alveolar Recruitment and
Regeneration**

Jason Woods, Ph.D.
Cincinnati Children's Hospital

11:55 AM – 12:15 PM

Emerging Clinical Applications of Hyperpolarized-gas MRI

Juliana M. Bueno, M.D.
University of Virginia

12:15 – 12:35 PM

Ventilation-perfusion Matching Measured with Proton MRI

Susan R. Hopkins, M.D., Ph.D.
University of California, San Diego

12:35 – 12:45 PM

Discussion

12:45 – 1:45 PM

Lunch

Session XIII : Graduate Student and Postdoctoral Presentations - Part II
Moderators: G. Wilson Miller, Ph.D. and Kiarash Emami, Ph.D.

1:45 – 2:45 PM

Normalized T1 Relaxation Time Mapping for Early Detection of Cystic Fibrosis Lung Disease

Chris A. Flask, Ph.D.
Case Western Reserve University

High Resolution Imaging of Small Airway Lesions in the Early Stages of COPD in Paraffin Embedded Lung Tissue

Dragoş M. Vasilescu, Ph.D.
University of British Columbia, Canada

Hypoxic Vasoconstrictive Response in Advanced Heterogeneous Emphysema – the VENT Experience

Rahul G Argula, M.D.
University of South Carolina

Metabolic Spectroscopy and Imaging of Lung Inflammation Using Hyperpolarized 1-¹³C Pyruvate

Sarmad Siddiqui
University of Pennsylvania

A Portable Low-field System for Localized NMR Measurements

Mikayel Dabaghyan, Ph.D.
Mirtech, Inc.

Imaging Early Events in Experimental Acute Lung Injury

Rosana S. Rodrigues, M.D.,Ph.D.
Federal University of Rio de Janeiro, Brazil

2:45 – 3:00 PM

Discussion

Session XIV : Data Processing and Imaging Registration
Moderator: James C. Gee, Ph.D.

3:00 – 3:25 PM

Quantification of Changes in Lung Appearance and Configuration

James C. Gee, Ph.D.
University of Pennsylvania

3:25 – 3:45 PM

Anatomical Constraints for Segmenting Lungs with Severe Pathologies

S. Kevin Zhou, Ph.D.
Siemens Corporate Research

3:45 – 4:05 PM

Functional Chest CT Analysis

Eva van Rikxoort, Ph.D.
Radboud University Nijmegen, Netherland

4:05 – 4:25 PM

Advances in Pulmonary Image Registration

Nicholas J. Tustison, Ph.D.
University of Virginia

4:25 – 4:40 PM

Discussion

4:40 – 4:55 PM

Break

Session XV : Presentations from Submitted Abstracts
Moderator: Sean B. Fain, Ph.D.

4:55 – 5:10 PM

¹⁹F-Enhanced Magnetic Resonance Imaging of Pulmonary Function Using Perfluoropropane in Human Subjects at 3T

Ahmed F. Halaweish, Ph.D.
Duke University

5:10 – 5:25 PM

In Vivo ³He MRI and CFD Modeling of Respiratory Airflow Patterns

Kevin R. Minard, Ph.D.

Pacific Northwest National Laboratory

5:25 – 5:40 PM

In Vivo Measurement of Local Lung Ventilation in Healthy and Diseased Rats Using 4DCT

Richard E. Jacob, Ph.D.

Pacific Northwest National Laboratory

5:40 – 5:50 PM

Discussion

5:50 – 6:00 PM

Final Remarks

Rahim R. Rizzi, Ph.D.

University of Pennsylvania