ATS 2026 Highlights

Respiratory Structure and Function Early Career Professionals



Han Kahvecioglu, BSc

(He/Him)

Postbaccalaureate Research Fellow
Dept. of Biomedical Engineering
Boston University

hanali@bu.edu

Get to know members of the RSF Assembly

Is your research clinical, basic science or translational?

Basic science.

Tell us about your research?

My research in the Nia Lab of Boston University focuses on developing new methods for studying the dynamic and cellular properties of the lungs. My primary project is on developing a multiscale imaging pipeline that integrates dynamic and cellular imaging to generate a functional atlas of the lung, enabling lung mechanics and tissue organization to be studied together.

Where do you see yourself in 5 years?

I am planning to continue my training in an MD-PhD program starting in 2027. Through this, I look forward to developing my expertise into a multidisciplinary basis between engineering and medicine, where my research questions are shaped directly by patient interactions and the most pressing needs in healthcare.

What do you find is the major benefit of RSF Assembly Membership?

The RSF Assembly has provided valuable exposure to exciting respiratory research and meaningful discussions with researchers who share similar interests. It has also been a great opportunity to connect with fellow trainees at similar stages of their careers. As someone just beginning my career in this field, these interactions have been incredibly helpful in shaping my growth and development.

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Multi-scale functional atlas of the lungs

Han A. Kahvecioglu, Gabrielle N. Grifno, Robert LeBourdais, Aman Shankardass, Hadi T. Nia

Objective: Current imaging approaches cannot simultaneously resolve whole-lung ventilation mechanics and cellular organization. We developed an integrated multiscale imaging pipeline that combines live µCT with whole-organ light-sheet microscopy to generate a functional atlas of the intact mouse lung.

Methods: Intact mouse lungs were maintained using the crystal ribcage system and imaged with µCT at multiple airway pressures to capture dynamic mechanical information. The same lungs were then fixed, cleared, immunolabeled, and imaged with light-sheet microscopy to obtain whole-organ cellular-resolution data. An airway tree landmark-based registration pipeline aligned the dynamic and static datasets into a common 3D space for integrated analysis.

Results: High-resolution µCT imaging (18 µm) enabled whole-lung displacement maps to be generated from scans acquired at multiple pressure points. Tissue clearing and light-sheet microscopy provided isotropic, cellular-resolution imaging of intact lungs with multiplex labeling. Airway tree landmark registration successfully aligned µCT and microscopy volumes, allowing dynamic mechanical maps to be overlaid with cellular and structural information in the same lung.

Conclusion: This multimodal pipeline bridges organ-scale lung mechanics with cellular-resolution imaging, creating a functional atlas that links regional biomechanics with tissue organization. The platform enables studies of lung mechanobiology and provides a foundation for future AI-assisted CT interpretation and investigations of lung health and disease.

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