LARGE SCALE LABEL-FREE IMAGING OF THE HUMAN LUNG

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Respiratory diseases represent an immense worldwide health burden with more than one billion people suffering from either acute or chronic respiratory conditions [1]. Many of these diseases involve substantial changes in the extracellular matrix, but despite this very little is known about how these changes occur spatially on a large scale. To address this, we developed a method that allows for the clearing of large sections (~3x3x0.4 cm) of human lung tissue with excellent structural preservation and retention of both second harmonic generation for collagen, and endogenous fluorescence to visualize elastic fibers.

This has allowed us to image large sections from both healthy and diseased human lung tissue (Figure 1A), and we are able to clearly resolve individual elastic fibers and collagen fibrils at depths greater than 2.4 mm through dense collagen (Figure 1B-E). Using this optimized methodology, we have been identified important features in two common lung diseases that have not been previously reported in the literature.

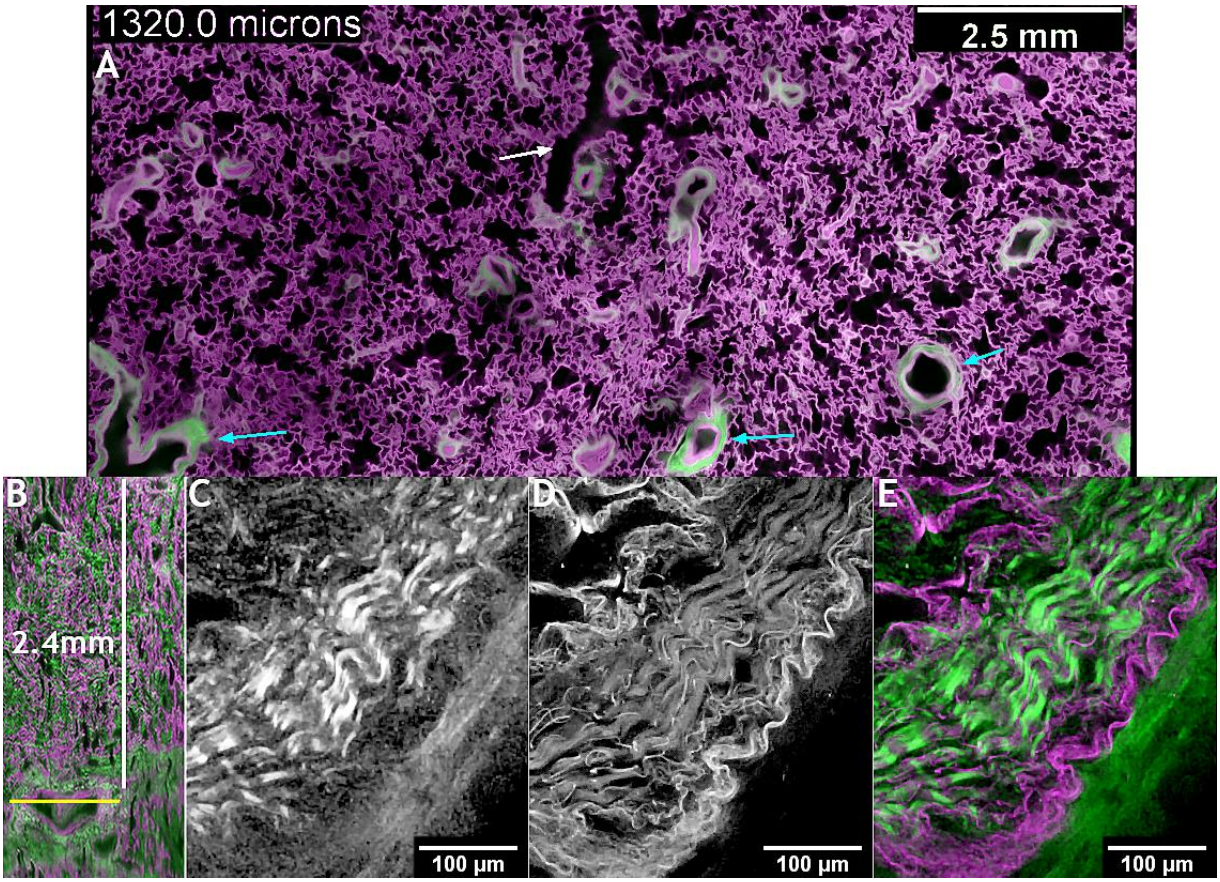

Figure 1: Imaging of human lung. A) Section of a large slice of healthy lung showing terminal airway (white arrow) and blood vessels (blue arrows). B) XZ projection of lung tissue from a patient with Idiopathic Pulmonary Fibrosis; yellow line shows the plane from which images C-E were taken. C) Collagen. D) Elastin. E) Merged image.

[1] Forum of International Respiratory Societies. The Global Impact of Respiratory Disease. 2nd Edn. Sheffield: European Respiratory Society, 2017.