A System for Imaging Precision Cut Lung Slices

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Precision Cut Lung Slices (PCLS) are a reliable tool to model the biomechanical activity of lung tissue. Its numerous advantages include the retaining of nearly all resident cell types in the lung, preserving the native extracellular environment, and suitability for high resolution imaging. Recent developments of novel tissue stretchers which mimic physiological breathing patterns allow researchers to track lung pathology progression via the changing mechanical properties of the lung tissue. Tracking tissue deformation, however, is difficult due to the lack of high contrast areas within the tissue, which image processing software require for their correlation algorithms. Current solutions are constrained by a small field of view, or are limited to the imaging of a single sample. We propose the use of ink-filled beads to provide the contrast necessary for mapping areas of the tissue during stretch, and housing the camera below the sample in the indenter to avoid light scattering caused by imaging through the tissue. This technique is known as Absorption Contrast, enabling tracking of deformations via the movement of beads at resting state and stretching state. Methods used in previous studies have been employed to ensure bead homogeneity and proper binding to the tissue. The beads are illuminated through the tissue using six dimmable, white LEDs and two layers of a light diffuser to ensure even lighting. An endoscope is housed within the indenter in order to image the tissue from below, allowing us to image a large field of view of 12 samples simultaneously.