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Insights: Publications

Illuminating Dynamic Neutrophil Trans-Epithelial Migration with Micro-Optical Coherence Tomography

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A model of neutrophil migration across epithelia is desirable to interrogate the underlying mechanisms of neutrophilic breach of mucosal barriers. A co-culture system consisting of a polarized mucosal epithelium and human neutrophils can provide a versatile model of trans-epithelial migration *in vitro*, but observations are typically limited to quantification of migrated neutrophils by myeloperoxidase correlation, a destructive assay that precludes direct longitudinal study. Our laboratory has recently developed a new isotropic 1-μm resolution optical imaging technique termed micro-optical coherence tomography (μOCT) that enables 4D (x,y,z,t) visualization of neutrophils in the co-culture environment. By applying μOCT to the trans-epithelial migration model, we can robustly monitor the spatial distribution as well as the quantity of neutrophils chemotactically crossing the epithelial boundary over time. Here, we demonstrate the imaging and quantitative migration results of our system as applied to neutrophils migrating across intestinal epithelia in response to a chemoattractant. We also demonstrate that perturbation of a key molecular event known to be critical for effective neutrophil trans-epithelial migration (CD18 engagement) substantially impacts this process both qualitatively and quantitatively.