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Selected Publication

Treutlein B, Brownfield DG, Wu AR, Neff NF, Mantalas GL, Espinoza FH, Desai TJ, Krasnow MA, Quake SR (2014) Reconstructing lineage hierarchies of the distal lung epithelium using single cell RNA-seq. *Nature* 509:371-375.

Research Aims and Interests

The goal of my group is developing and using novel genomics and microfluidic technologies to drive innovation in basic science and clinical research. Currently, my research interests are in the area of single cell genomics and transcriptomics. Human tissues and organs are inherently composed of diverse cell types, and single cell analysis allows us to study their genotype and corresponding transcriptomic phenotype, without being confounded by the population average. Of particular interest to me is the biology of the normal and diseased colon: investigating the cellular heterogeneity of the colon crypt and characterizing the various cell populations there, and comparing the normal colon to colon cancer in this context. I will also apply single cell studies to Parkinson's disease (PD) mouse models in order to dissect the cellular heterogeneities and differences in neuronal composition in a healthy brain, as compared to a PD afflicted one at different time points in the degeneration process and throughout development.

Another area of interest to me is circulating nucleic acids (cell-free DNA and RNA). These circulating nucleic acids arise mostly from cell death within the body, and thus it is hypothesized that they can be a reflection of the overall health state of an individual. Although there has been work to characterize them in the context of organ transplantation and immune health, there is a wide array of diseases associated with specific cell death, which can be studied non-invasively, or diagnosed and monitored, using circulating nucleic acids as a proxy. In the context of neurodegenerative disease, for example, there is evidence that measuring brain-specific cell-free RNA transcripts allows the correct separation of patients with Alzheimer's disease from control group patients. Given this evidence, I will investigate the applicability of this diagnostic and monitoring tool in the context of other diseases such as Parkinson's and ALS.