Weekly Colloquium
Tuesday, 2/14/2017, 12:30pm, Billings Building – Rosedale Conference Room

"Automating stem cell experimentation"

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Research Abstract:
Induced pluripotent stem cells (iPSCs) have become a useful tool for modeling how causal genetic variants impact cellular function in disease. Such disease models have proven useful to understand the functional consequences of strongly penetrant mutations. However, their use for understanding polygenetic traits remains largely unexplored. As it is now possible to derive stem cell lines from any individual, this opens the opportunity to interrogate genotype-phenotype associations through large-scale in vitro studies and in cell types relevant to human polygenic diseases. Current work at NYSCF is aimed at applying new advances in pluripotent stem cell biology and cell reprogramming to the creation of human models of diseases, such as Alzheimer's disease and Parkinson's disease, to discover new disease mechanisms and targets. However, the preparation of somatic cells, their reprogramming and differentiation are typically laborious, non-standardized manual processes that limit the scale and level of reproducibility at which this technology can be deployed. To overcome these problems, my lab has developed scalable high-throughput automated systems for deriving new stem cell lines and differentiated cells to study disease models from large numbers of patients in parallel. We have recently described a robotic platform for iPSC reprogramming, enabling high-throughput conversion of skin biopsies into iPSC lines with minimal human intervention and significantly reduced variation than their traditionally made counterparts. Methods for parallel differentiation of these lines will be necessary that maintain the fidelity of genotype-phenotype associations. We are developing techniques that enable exploration of a large space of experimental hypotheses necessary to create and analyze bona fide functional cell types and tissues from stem cell lines at scale. This automated high-throughput approach enables the scalability required for application of iPSCs to population-scale biomedical problems including the study of complex genetic disease and the development of personalized medicines.

Recent Publications:
