Single-cell RNA Sequencing Analysis of Human Neural Grafts Revealed Unexpected Cell Type Underlying the Genetic Risk of Parkinson's Disease

Wang, Susan (Yingshan) (School: Episcopal High School)

Parkinson’s disease (PD) is the second most common neurodegenerative disorder, affecting more than 6 million patients globally. Though previous studies have proposed several disease-related molecular pathways, how cell-type-specific mechanisms contribute to the pathogenesis of PD is still mostly unknown. In this study, we hypothesized that in addition to dopaminergic neurons, non-neuronal cells may also be involved in PD pathology. We analyzed the single-cell RNA sequencing data of human neural grafts transplanted to the midbrains of rat PD models. Specifically, we performed cell-type identification, PD gene screening, co-activation analysis, and intercellular interaction analysis. The results revealed significant expressions of PD-related genes in oligodendrocytes, a type of non-neuronal cells, as well as potentially important cell-cell interactions between oligodendrocytes and dopaminergic neurons. We also proposed several ligand-receptor pairs as promising drug targets in the treatment of PD. Overall, the study provided an overarching framework for understanding the cell non-autonomous effects in PD, which may inspire new research hypotheses and therapeutic strategies.

Awards Won: