Unveiling Protocadherin Expression in Non-Neural Developmental Contexts

Zhang, Emma (School: Jenks High School)

Protocadherins (pcdhs) are responsible for the formation of cell to cell adhesion proteins, which makes them crucial to neural development and function. Clustered protocadherins are a type of protocadherin located in a single genetic locus which is highly conserved between vertebrate species. While most literature focuses on protocadherin's role in the brain, some papers support the notion that pcdhs play a role in limb and fin development. Uncovering the functions of genes during vertebrate development is crucial for understanding human development and developmental disorders. Through single cell sequencing, gene pathways were captured in Danio rerio at six developmental time points. Scanpy, a single cell inferencing tool, was utilized to filter, process the data, and group the cells by similar gene expression. Principal Component Analysis and Uniform Manifold Approximation and Projection (UMAP), was used to generate figures for visualizing the data. Using Leiden clustering, cells were grouped based on similar gene expression profiles. From these clusters, a Wilcoxon rank sum test was used to identify which clusters demonstrated high protocadherin expression. Using Partition-based Graph Abstraction (PAGA), clusters with strong connections to one another were identified, some of them having high protocadherin expression. Using the ZFin and Daniocell databases, marker genes were identified and used to determine cell types within each cluster. Marker genes in the clusters of interest were found to be expressed in the spinal cord, epiderm, fin, and mesenchyme. This suggests a novel role for clustered protocadherins in epithelial development and pectoral fin development.

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