Docket #: S21-232

Generation of neural organizer organoids and midline assembloids from human pluripotent stem cells

Stanford inventors have developed a method of using human induced pluripotent stem (hiPS) cells to generate three-dimensional neural floorplate organizers that are functionally active and capable of choreographing midline brain development. These floorplate organoids can be fused with spinal cord organoids to form midline assemboids to induce specific cell fate and cell-cell interactions at the interface.

Organizer cell populations are crucial to neurodevelopment as they control spatial patterning and neural connectivity by establishing signaling gradients of guidance molecules. Disruptions in organizer cell type function can lead to neuropsychiatric disorders. Due to the lack of access to neural tissues, the investigation of human organizers is limited. Currently, there is no in vitro generated three-dimensional floorplate organoid described to date.

This first-time generation of functional neural organizers from hiPS cells brings new opportunities in biological investigation of human organizers and neurodevelopment. This powerful platform can be used to model human neurodevelopment, study human neurodevelopment related genetic disorders, identify toxic molecules that affect brain development, and screen for therapeutics for neural defects.

Stage of development
Proof of concept

Applications

- Model human neurodevelopment
- Study genetic disorders of neurodevelopment
- Identify toxic molecules that disrupt neurodevelopment

- Screen for therapeutics

Advantages

- Novel

Publications

- Onesto, Massimo M. et. al. Midline Assembloids Reveal Regulators of Human Axon Guidance. *bioRxiv Preprint* June 2024

Patents

- Published Application: WO2023137200
- Published Application: 20250076286

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