Docket #: S21-466

Methods for isolating neural stem and progenitor cells from the developing human brain

Researchers at Stanford have developed a novel method for the isolation of neural stem and progenitor cells (NSPCs). The ability to isolate and purify distinct NSPC types is crucial for scientific research studying neurodevelopment and developing therapeutics for neural regeneration. This novel method includes dissociation of brain tissue, staining with fluorescent antibodies, and isolation of cell types using fluorescence-activated cell sorting (FACS) based on the expression of various cell surface markers. Using different surface marker combinations, the method can isolate nine distinct NSPC types, including oligodendrocyte precursor cells (OPCs) and pre-OPCs, as well as excitatory and inhibitory neurons. The method purity for isolating NSPC types is superior to existing cell isolation methods and was verified using single-cell RNA sequencing and sorting. Isolated cells were functionally validated using in vitro and in vivo models. Successfully isolated NSPCs can be grown as neurospheres, used in preclinical and clinical applications such as disease modeling and drug screening, and/or banked for future use.

Stage of Development:
Prototype

Figure:

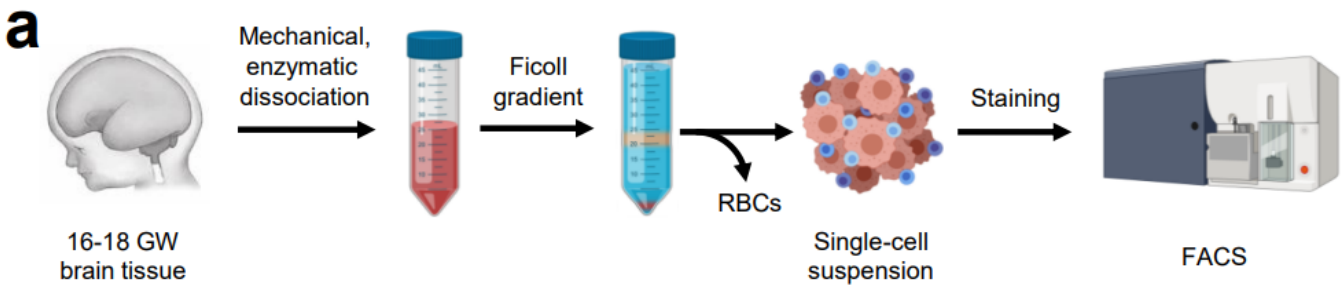


Figure Description: Tissue processing and experimental workflow for isolation and characterization of NSPCs via transcriptomic and functional methods (*Image credit: The Weissman Lab*).

Applications

- Can be used for the isolation of NSPCs
- Isolated NSPCs can be:
  - Grown as neurospheres
  - Used in preclinical and clinical applications such as disease modeling and drug screening
  - Banked for future use

Advantages

- Improved pure population yield of neural stem cells compared to previous methods
- Improved neurosphere growing proficiency from isolated NSPCs (1 in 5) compared to previous methods (1 in 23)
- Novel sorting method, with many of the markers used never previously described for this application

Publications

- Daniel Dan Liu, Joy Q. He, Rahul Sinha, Anna E. Eastman, Angus M. Toland, Maurizio Morri, Norma F. Neff, Hannes Vogel, Nobuko Uchida, Irving L. Weissman (2023). Purification and characterization of human neural stem and

progenitor cells. *Cell*, Volume 186, Issue 6, 2023, Pages 1179-1194.e15, ISSN 0092-8674.

Patents

- Published Application: WO2023225293
- Published Application: 20250297214

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