

Rapid generation of functional human astrocytes (iAstrocytes)

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BRIEF DESCRIPTION

Astrocytes are the most abundant central nervous system cell type and have been implicated in the pathobiology of many neurological diseases. The present invention describes a rapid and reproducible method to create functional human astrocytes (iAstrocytes) using induced pluripotent stem cells which can be used to study astrocyte biology and their role in neurological diseases.

SUGGESTED USES

·iAstrocytes can be used to study astrocyte involvement in neurological diseases, including but not limited to:

- » human astrocyte-human neuron co-cultures to study glutamate buffering/excitotoxicity
- » human astrocyte microvascular endothelial cells to study their role in blood-brain barrier
- » human astrocyte microglia-like cell co-cultures to study glia crosstalk.
- » organ on a chip, bioinformatics, and 3D culturing

·Transplanted iAstrocytes can be used for functional studies in xenotransplantation competent mice.

·Readily adaptable scale up for production for high content drug screening and other applications.

FEATURES/BENEFITS

·Reproducibility across multiple healthy and disease lines.

·Fully defined serum free methodology.

·More efficient and develops astrocytes faster than current methods. Mature functional astrocytes can be achieved in 45DIV.

·Incorporation of neurons in the initial steps of differentiation generate functionally mature astrocytes as validated by AQP4 expression by qPCR. This protocol has been further validated on the protein level by IHC and whole transcriptome level by RNAseq analysis.

·Validated to create astrocytes that are functionally more equivalent to human-brain derived astrocytes than previous approaches.

TECHNOLOGY DESCRIPTION

Currently, human astrocyte isolation is required from human primary tissue, which is labor and time intensive as well as highly variable due to the source material. This has hindered the identification of drug targets to modulate astrocyte function with current methodologies. In the present invention, induced pluripotent stem cells (iPSCs) are differentiated to neural stem cells (NSCs) which are then differentiated to iAstrocytes. This method is a serum free fully defined protocol utilizing growth factors which produces mature functional astrocytes in 45DIV. The resulting iAstrocytes have been validated to be functionally more equivalent to

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OTHER INFORMATION

CATEGORIZED AS

» **Medical**

» Diagnostics

» Disease: Central Nervous System

» Research Tools

» Stem Cell

» Therapeutics

» **Research Tools**

» Cell Lines

RELATED CASES

PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	WO 2024/006561	01/04/2024	2018-074

Additional Patent Pending

STATE OF DEVELOPMENT

This method for rapid astrocyte production has been validated and published. This invention could be developed into a commercial kit to facilitate astrocyte differentiation using any pluripotent stem cells.

OTHER INFORMATION

A non-provisional patent describing this method has been filed.