

Development of Human-Derived Cerebral Organoids with Network Oscillations

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BACKGROUND

Historically, the understanding of the development and pathophysiology of the human brain has been studied by examination of post-mortem and diseased specimens in conjunction with non-human primates and mouse models. The understanding of complex biological mechanisms is driven by advancement of techniques and new model systems and recent advances in stem technologies have contributed to the advancement of our knowledge of human neural development. Moreover, the reprogramming of human somatic cells into induced pluripotent stem cells (iPSCs) which can be redirected to a specific cell fate has led to a breakthrough in neurobiology research. These findings have led to the generation of human brain organoids from iPSCs.

TECHNOLOGY DESCRIPTION

Researchers at UC San Diego have developed a method of making cortical/cerebral organoids from somatic cells and stem cells that have enabled them to explore the functional electrophysiological characterization of brain organoids neural networks. This has allowed them to develop a three-dimensional system of cortical organoids derived from human pluripotent stem cells. The model system was used to demonstrate reproducible oscillatory activity, in both population spiking and local field potential (LFP) recordings. This coordinated oscillatory electroencephalography (EEG)-like network activity became more sophisticated as the organoids matured and developed into cortical multi-layered structures.

APPLICATIONS

The reconstruction of human synchronized network activity in a dish allow for the understanding of how neural network oscillations might be disrupted in neurological disorders. The technology can be used to understand the impact of genetic variations in genes related to various diseases. It could also be used for drug screening.

ADVANTAGES

An *in vitro* brain organoid derived from human pluripotent stem cells capable of generating brain waves comparable to the human brain.

STATE OF DEVELOPMENT

A functional human brain organoid model platform has been developed using human derived pluripotent stem cells.

INTELLECTUAL PROPERTY INFO

A provisional patent has been submitted and the technology is available for licensing.

PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	2019023516	01/31/2019	2017-349

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OTHER INFORMATION

KEYWORDS

cerebral organoids, neural networks,
stem cells, brain oscillatory waves,
EEG-like

CATEGORIZED AS

- Medical
 - Stem Cell
- Research Tools
 - Animal Models

RELATED CASES

2017-349-0

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