iPSC-Derived 3D Brain Organoids as Next-generation Platforms to Study Viral and Toxicant-associated Neurodegeneration

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Abstract

Neurodegenerative diseases (ND) are one of the most fatal diseases that affect the majority of individuals worldwide, among which Alzheimer's disease (AD) and Parkinson's disease (PD) are the most common. In vitro 2D monolayer cell cultures and in vivo transgenic animal models have been the primary tools for investigating mechanisms of neurodegenerative diseases. However, the ineffectiveness of these models in translating outcomes into human pathophysiology, necessitates innovative approaches to bridge the translational gap. In this review, we focus on the intricate pathogenic processes by which environmental toxicants and viral infections trigger neurodegeneration. The growing significance of three-dimensional (3D) brain organoids (BOs) derived from induced pluripotent stem cells (iPSCs) can be used as a groundbreaking platform for examining neurodegenerative pathways induced by exposure to environmental toxicants and viral infections. It also addressed how BO's overcomes the fundamental limitations of traditional models, such as 2D cultures and animal models, thereby creating novel

opportunities for the mechanistic study of multifactorial neurodegeneration and the development of therapeutic interventions.

Data Availability

No datasets were generated or analysed during the current study.

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