Docket #: S24-345

Modular Human Brain Organoids for Neurological Disease Modeling

Stanford researchers have developed a fast and flexible platform for building human brain organoids that mimic the complexity of the brain's cellular makeup. This breakthrough enables faster research and better disease modeling for neurological conditions.

Traditional brain organoids take many months to mature and often lack key cell types like microglia (immune cells) and blood vessel-like cells. This invention overcomes those hurdles using a two-part system:

- ORChID technology uses CRISPR to precisely control the timing and type of brain cells generated from stem cells.
- INVIGOR allows researchers to mix and match those cell types to create customizable organoids, from simplified disease models to highly complex brain-like tissues, all within 33 - 45 days.

The result is a plug-and-play approach for generating brain organoids that can replicate healthy or disease-specific brain environments, accelerating research on Alzheimer's, Parkinson's, and more.

Stage of Development
Proof of concept - *in vitro* data

Applications

- Modeling of neurological and neurodegenerative diseases
- Drug screening and neurotoxicity testing
- Personalized medicine using patient-derived stem cells
- Research kits for brain organoid generation

Advantages

- Organoids mature in 1 month (vs. 3-6 months traditionally)
- Contains 5+ major brain cell types, including microglia and vasculature
- Fully modular: mix and match cell types as needed
- Tagging system allows easy tracking and isolation of individual cell types
- iPSCs can be frozen and thawed while retaining activity
- Cells are amenable to antibiotic selection

Patents

- Published Application: WO2026165106

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