IKEUCHI LAB.

Modeling the Nervous System

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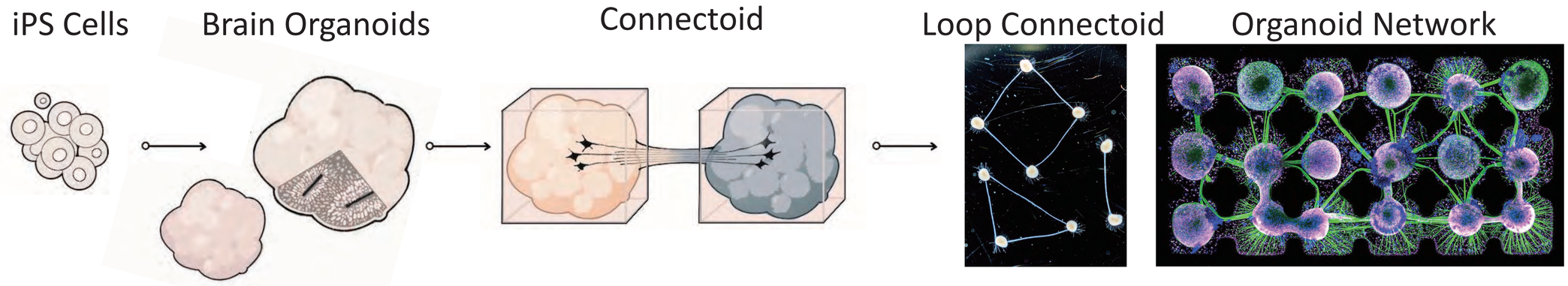
Reconstructing Human Neural Circuits in a Dish

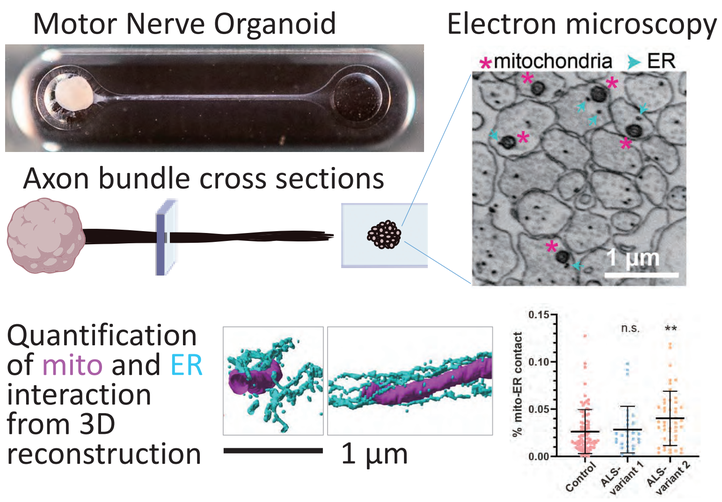
The human brain contains billions of neurons forming complex networks, yet many principles of brain function are difficult to study directly in humans and remain poorly understood. At Ikeuchi Laboratory, we build human neural circuits in vitro using various brain organoids derived from pluripotent stem cells (iPSCs), including cerebral, thalamic, midbrain, and nerve organoids. These systems allow us to study how neuronal network activity emerges, how circuits connect and adapt, and how dysfunction arises in disorders such as Alzheimer's disease, schizophrenia, and amyotrophic lateral sclerosis (ALS). They also provide a platform to explore interactions between biological neural networks and artificial systems, opening possibilities for future biocomputing applications.

Building Circuits of the Nervous System



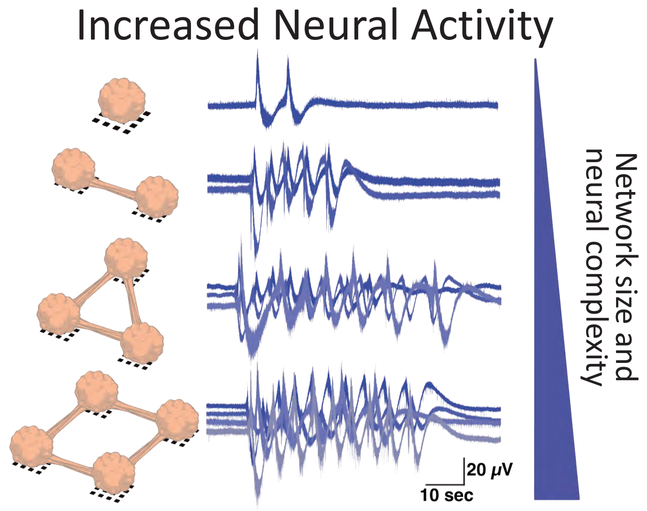
Disease Modelling

Amyotrophic Lateral Sclerosis



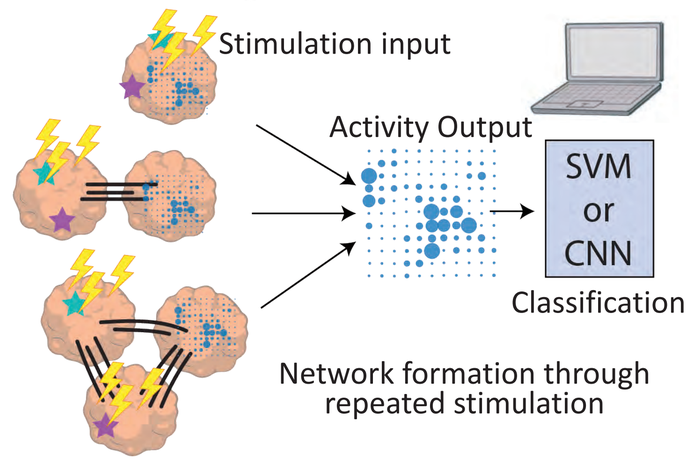
Neural Function

Increased Neural Activity

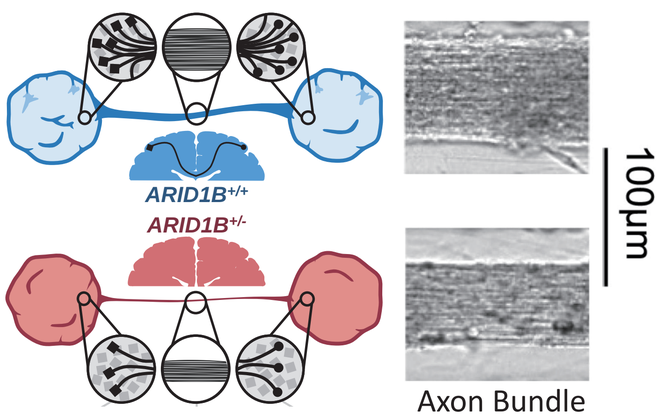


Computer Interface

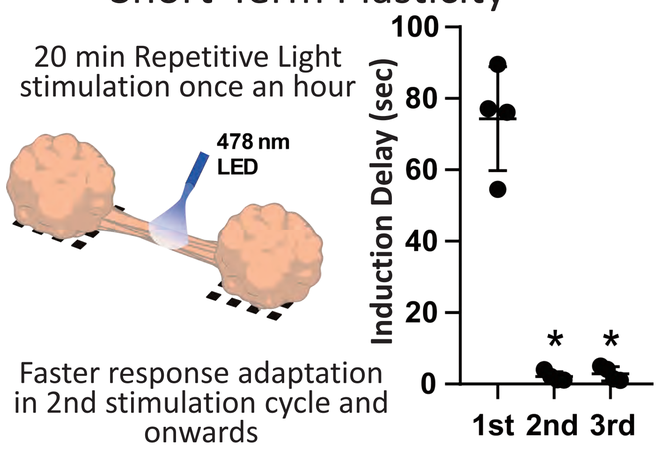
Source-Signal Discrimination



Agenesis of the Corpus Callosum



Short-Term Plasticity



Closed-Loop Interaction