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A Path to Cure Neurological Disorders?

Using neuron development to unlock secrets about neuron-sourced diseases



by Alex Villano

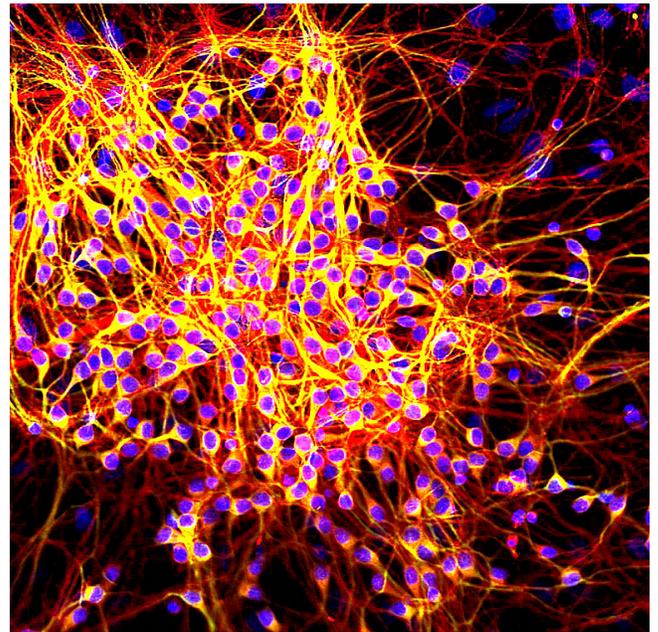
The importance we place on maintaining a healthy brain is no secret. So while you are anxiously finishing today's puzzle to maintain your brain health, look no further for the answers to the great mysteries of this vital organ than—a mini brain? It is accepted that healthy lifestyle choices prevent diseases such as Alzheimer's and Parkinson's, but we are still naïve to the biological processes occurring within

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the brain that lead to such neurological states. In a lab at the Institute of Molecular Biotechnology in Vienna, Austria, Madeline Lancaster and Jürgen Knoblich have paved the way for human pluripotent stem cells—cells that can become any cell in the body—to generate neuron clusters in a petri dish that closely resemble miniature human brains. Less than a year ago, the researchers published their findings of neuron clusters in *Nature Protocol* to demonstrate that with their small size and paralleled structure and function to neuronal networks within the brain, effects can be seen that are otherwise hidden in the skulls of patients with neurological disorders such as autism, Alzheimer's, and Parkinson's.

When grown under laboratory conditions, these mini brains arise from a single pluripotent stem cell that mitotically divides, creating numerous differentiated neurons. Collectively referred to as cerebral organoids, these masses of nerve cells mimic the structure of fetal brains during development within the womb, even creating fluid-filled cavities much like the brain's ventricles. Two months are required to grow the organoids to a size large enough to monitor, while these structures can be maintained for up to a year for results to be documented.

To navigate around controversial issues involving stem cells from embryos and fetuses, the researchers employ a process known as induced pluripotency. By taking adult skin cells, a readily available source, researchers reverse their maturity and lead them down the path to instead become nerves. Because these organoids closely mimic the structure and function of tissue within the human brain, they can now place them in manipulated environments similar to those of neurons within brains that produce Alzheimer's and Parkinson's diseases. Through this process, effects on organoid structure and function can be observed that mimic those in the collective neuronal networks of patients with respective neurological disorders.



So, while we applaud the completion of puzzles in the name of brain health, there is imminent information on the horizon bringing us closer to understanding and finding cures for diseases developed from neuron malfunction. This will close the gap on the great mysteries housed within the brain. 🐾