Mini-brains grown from stem cells don't think, but they do show 'complex' neural activity, researchers say

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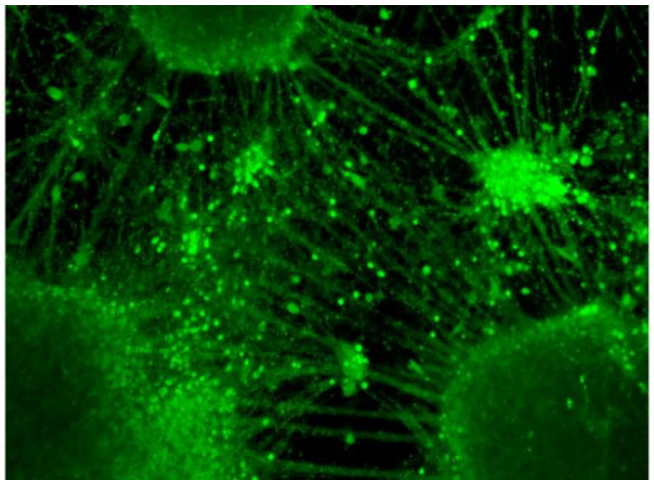
(CNN) — Floating disembodied conscious brains that issue commands to luckless human minions may be a cliché of science fiction, but they are a far cry from the primitive, lab-grown "cerebral organoids" that real scientists study today. New research suggests that contemporary mini-brains -- even if inferior to their fictional counterparts -- are still capable of a surprise or two.

Evidence of dynamic activity, in individual and synchronized neurons, was seen across a network of cerebral organoids grown from stem cells in a preliminary study published Thursday in the journal Stem Cell Reports.

Dr. Hideya Sakaguchi, study co-author and postdoctoral fellow at Kyoto University (currently at the Salk Institute), explained in an email that the important thing here is not just the creation of a mini-brain but that a tool was developed to detect nerve cell activity. Someday, this new calcium ion analysis tool may help researchers better understand complex brain functions and neurological disorders.

How do you make a cerebral organoid?

For the new study, the researchers began by creating a ball of pluripotent stem cells, which possess the ability to develop into any type of bodily cell and tissue. They placed this ball into a dish filled with a liquid medium that mimics the environment necessary to an actual developing brain. From here, the researchers studied the connections and activity between individual neurons.



A mini-brain neural network.

For those who worry that the mini-brains might possess human-like qualities (and so pose ethical dilemmas), there's no question that the organoids are incapable of sophisticated function, because they lack input from their surrounding environment, Sakaguchi said. Consciousness requires subjective experience, and that comes only when information is received from probing, sensory tissues -- those of the body.

Not ready for prime time

The new research is "not a big breakthrough," said Yi Zhou, an associate professor of biomedical sciences and neuroscience at Florida State University.

Zhou, who was not involved in the study, said the researchers focused on recording activity in isolated cells of the cerebral organoid instead of measuring activity in the organoid as a whole. Though they developed a new and interesting approach, their results do not add much to the field, he said.

Additionally, calcium ion activity is an indirect way to measure neuronal activity, whereas an examination of the firing of nerve cells is a more direct and ultimately accurate way to understand the functional ability of a model mini-brain.

Zhou said his own team mostly focuses on trying to make "more sophisticated" and "complex" mini-brains that are "able to mimic human brains." To that end, they add different neuron types and structures, such as a vascular system to supply oxygen and nutrients. Sometimes, his 3D cerebral organoid creations begin with cells from Alzheimer's patients "to see if it develops in a way that is different from a normal brain," he said. "Can we mimic pathologic conditions?"

"The mini-brain is still underdeveloped, but eventually, it will be a very useful approach to understand the development of our brain and to understand human diseases," Zhou said. "There is still a long way to go."