BIOTECHNOLOGY

Parkinson's Patients Say Their Symptoms Eased After Receiving Millions of New Brain Cells

Two studies found stem-cell therapies were safe and reduced symptoms, but bigger trials are still needed.

Shelly Fan Apr 17, 2025

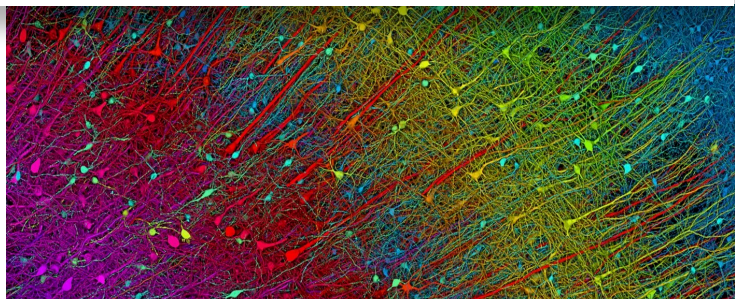

Image Credit: Digitally reconstructed neurons in map of human brain / Google Research and Lichtman Lab

Grabbing a coffee cup seems easy. But you need to be able to move your hand, stretch it out, and keep it steady.

These movements are difficult for people with Parkinson's disease. The disorder eats away at brain cells—called dopamine neurons—that control movement and emotion. Symptoms begin with tremors. Then muscles lock up. Eventually, the disease makes walking and sleeping difficult. Thinking gets harder, and as neurons die, people lose their concentration and memory.

Medications can keep some symptoms at bay, but eventually, their effects wear off. For nearly half a century, scientists have been exploring an alternative solution: Replacing dying dopamine neurons with new ones.

This month, two studies of nearly two dozen people with Parkinson's showed the strategy is safe. A single transplant boosted dopamine levels for 18 months without notable side effects. Patients had fewer motor symptoms even when they stopped taking their regular medications.

The work stands out because instead of being tailored to each patient, the cells were ready-made. The teams grew new dopamine neurons from donors in the lab. These cells can multiply easily in petri dishes, forming a large supply of replacement cells for patients.

Malin Parmar at Lund University, who was not involved in the study, told *Nature* the results are "a big leap in the field."

A Deteriorating Brain

Parkinson's is the world's second most common neurodegenerative disease.

and is critical for movement and emotions. Although the entire area eventually deteriorates, neurons that pump out dopamine—a chemical that fine-tunes neural networks and functions—are first to go. This means the brain gradually loses dopamine as the disease progresses.

There are treatments but no cures.

One common medication, Levodopa, tackles symptoms. Neurons slurp up the drug and transform it into dopamine. But as brain cells gradually die, the medication becomes less effective. Levodopa also has side effects. Because midbrain wiring influences both addictive behaviors and motor control, flooding it with dopamine can change how people act, like increasing the risk of gambling addiction and other obsessive behaviors. Long-term use can also trigger random movements of the face, arms, and legs—a symptom called dyskinesia.

Brain implants that bridge broken connections in the midbrain are another treatment. Deep brain stimulation, for example, mimics natural brain signals to ease motor symptoms. Some implants are already approved for use, but they require surgery and monitoring and aren't widely accessible.

Rather than patching a broken circuit with a temporary fix, what if we could replace broken dopamine neurons with fresh ones?

Stem-Cell Marathon

Stem cells offer a solution. These special cells can grow into any other type of cell under the right conditions, making them the perfect replacement for dying neurons.

Back in the 1980s, one team transplanted brain tissue rich in dopamine neurons into people with Parkinson's. These patients experienced a boost of dopamine and improved motor control for years after the surgery. But the source was highly controversial: fetal brain tissue.

Although a "first proof-of-concept for cell transplantation therapy," the trial raised "ethical concerns," according to Hideyuki Okano at the Keio University Regenerative Medicine Research Center in Japan, who was not involved in the new studies.

As an alternative, scientists have learned to create stem cells in the lab. One method produces stem cell lines that can grow almost forever under the right conditions. In another, scientists chemically transform adult cells, often taken from the skin, into a stem-cell-like state. These are called induced pluripotent stem cells (iPSCs). Five years ago, a team converted iPSCs into dopamine neurons and transplanted them into a patient, improving symptoms for up to two years.

Getting enough of the cells is difficult. Fetal brains are hard to come by and ethically problematic. And making iPSCs for each patient is time-consuming, potentially limiting widespread adoption.

Off-the-Shelf Treatment

The new studies took a different approach: They gathered two types of widely available stem cells, turned them into young dopamine neurons, and implanted them into the brain.

In one trial, researchers injected cells from a human embryonic-stem-cell line into the midbrains of 12 middle-aged people with Parkinson's. Once a line is established, these lab-grown cells can reproduce indefinitely, essentially making them an unlimited resource.

Participants received nearly three million cells spread across 18 areas in the midbrain. Some 300,000 of these—roughly the number of dopamine cells that naturally inhabit the region—survived transplantation. The patients took immunosuppressant drugs for a year to prevent rejection.

Follow-up brain scans found higher levels of dopamine, even after patients stopped medication 18 months later. No one showed signs of cancer—a serious risk associated with stem-cell therapy—wrote Okano. Symptoms improved 50 percent. Pain went down. And patients reported improved sleep, appetite, and daily movement.

In a second study, scientists created an iPSC cell line from a donor's skin cells and coaxed them into fresh dopamine neurons. Transplanted into seven Parkinson's patients, the cells were shown to be safe and in working order. They pumped out dopamine and eased motor symptoms for over two years.

These studies stand out because they used donor cells, as opposed to cells tailored to each patient. "The results are encouraging because they show that the use of allogeneic (non-self) transplants for the treatment of Parkinson's disease is likely to be safe," wrote Okano.

Long Road Ahead

Though promising, both studies have limitations, especially the large number of cells involved. It's possible to grow the cells in a normal lab setting, but quality control and other special measures are crucial. Scientists are still debating if off-the-shelf cell therapies—which require immunosuppressants—are better than personalized therapies.

The new approach also needs to undergo larger trials. Both studies were

"Transplanting dopamine-releasing neurons into the brain is a promising regenerative therapy for Parkinson's disease," wrote Okano. But "more evidence is needed to prove its effectiveness."

HEALTH, NEUROSCIENCE

Shelly Fan

Dr. Shelly Xuelai Fan is a neuroscientist-turned-science-writer. She's fascinated with research about the brain, AI, longevity, biotech, and especially their intersection. As a digital nomad, she enjoys exploring new cultures, local foods, and the great outdoors.

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