



Early-stage brain cells from NCSF study of primary progressive MS on SpaceX CRS-30.

Nicolette Pirjanian, NCSF partner lab New York Stem Cell Foundation

## Space Could Unlock Cures for Neurodegenerative Diseases

By Anne Wainscott-Sargent, Contributing Author

**Millions of Americans live with Parkinson’s, multiple sclerosis (MS), and Alzheimer’s—neurodegenerative diseases with no cure and no significant biomarkers to enable early intervention. Fortunately, breakthrough research on the International Space Station (ISS) offers promising avenues to better understand and fight these devastating diseases.**

“Cells mature more rapidly in space, which means you can see what’s happening in an accelerated way. It would take you much longer to see those changes on the ground,” said Paula Grisanti, CEO of the National Stem Cell Foundation (NSCF).

Since 2019, NSCF has conducted six space station investigations using human brain organoids, tiny 3D replicas that mimic how cells behave in the brain. A \$3.1 million NASA award announced this spring will enable NSCF to continue its groundbreaking microgravity studies, funding three additional ISS projects through 2027.

In earlier investigations sponsored by the ISS National Laboratory®, the team examined brain organoids made from the cells of people with Parkinson’s disease and primary progressive MS. Together, these two conditions affect at least 2 million people in the U.S.

“These were the first 3D human patient-specific organoid models made from the cells of people with these diseases sent to the International Space Station,” Grisanti said. “In space, you can see cells talking to each other in a way that’s

not possible on Earth. It’s providing valuable new insight into how these disorders develop, accelerating biomarker discovery for early diagnosis and opening a whole new door to potential cell, gene, and drug therapies that don’t currently exist for these diseases.”

The upcoming flights will build on the team’s past research by adding organoids made from the cells of people with Alzheimer’s disease. Approximately 6.7 million Americans live with Alzheimer’s, resulting in an annual economic impact of more than \$321 billion.

### Brain Organoids in Space

NSCF scientists produce brain organoids from induced pluripotent stem cells (iPSCs) derived from human skin cells. “Stem cells mimic the very early stages of development in a mother’s womb and have the potential to become any cell type in the human body,” explained Pinar Mesci, NSCF space project advisor who serves as senior program manager for in-space biomanufacturing at Axiom Space.



Kentucky Senate President Stivers and Paula Grisanti, National Stem Cell Foundation CEO, announce a multimillion-dollar award from NASA for pioneering space-based research.

National Stem Cell Foundation