Two experiments developed at the UPRM return successfully from space: “Science allows us to dream.” [1]

Submitted on 24 September 2025 - 6:04pm

Calificación:

The Professional is a member of CienciaPR

CienciaPR Contribution:

El Nuevo Día

Original Source:

Génesis Ibarra Vázquez

By:

In November 2024 and again in March of this year, two researchers from the University of Puerto Rico at Mayagüez (UPRM) witnessed the launch of their experiments to the International Space Station (ISS). Now, after the thrill of that milestone, they are celebrating a new wave of satisfaction with the successful return of both projects back to Earth.

“Certainly, science allows us to dream. And I think that is the message we want to share—that studying science drives us to pursue dreams, possibilities that can eventually become real. When we were there (at Kennedy Space Center in Cape Canaveral, Florida), I couldn’t believe we were watching that rocket take off, carrying our experiment into space, because at one time it was just a simple dream,” said Dr. **David Suleiman Rosado**, professor and chair of UPRM’s Department of Chemical Engineering.

Stem Cells in Microgravity

The first experiment to launch—in 2024—was that of Dr. **Maribella Domenech García**, also a professor in the Department of Chemical Engineering. Her research aims to study how

microgravity—the near absence of gravitational pull—affects the growth and anti-inflammatory properties of mesenchymal stem cells. The study could mark an important step for advancing space biomanufacturing and developing innovative medical treatments on Earth.

Water Purification in Space

Her work was followed in March by the experiment of Suleiman Rosado, which tested an advanced water purification system developed in his lab. The technology, designed to capture salts, inactivate microorganisms, and separate urea from water, could recycle this vital resource in space. It also holds potential applications on Earth, such as seawater desalination to produce drinking water.

Preliminary Results

Both researchers admitted feeling uncertainty about whether their projects might be damaged upon re-entry, but those fears did not materialize.

Domenech García's experiment returned in December 2024, though she opted not to receive it in her Mayagüez lab until January, fearing a power outage during the holiday break might harm the samples—an outage that, in fact, did occur. Suleiman Rosado's project, although it returned to Earth just 30 hours after being sent to the ISS, took several months before it was back in his hands at UPRM.

"Our objectives were to validate the cultivation technology and to conduct preliminary studies of the cells' production capacity. Technologically, regarding the microcarriers we designed, we can conclude the system works—it did its job. We were able to recover the cells once they returned to Earth, and they remained stable for the time spent in the microgravity environment. So we confirmed that the cultivation technology using microcarriers works both on Earth and in space," said Domenech García.

At the cellular level, she noted that the cells survived but showed behavioral changes, particularly in their ability to secrete therapeutic factors into the culture medium. *"We believe those cells exposed to microgravity have potential applications in biomanufacturing, especially when the product or therapeutic agent comes from what the cells secrete,"* she explained.

Meanwhile, Suleiman Rosado reported that his experiment validated expectations: *"The question was whether buoyant forces on Earth—caused by gravity—would influence transport and, therefore, membrane separation. The reality is that it had no effect. We thought it was a minimal factor and expected the separations using membranes in microgravity systems to behave exactly as they do on Earth, and that's what happened. Now the goal is to see if these membrane systems could be applied to other, perhaps more complex, systems."*

Next Steps

Both research teams are now preparing scientific publications based on their findings.

Domenech García also shared that she has received a $400,000 grant that will allow her to take the project to the next level. Specifically, the grant will fund a three-year study deepening into biomechanics and how cells perceive different gravitational environments, including a new mission to the ISS.

For his part, Suleiman Rosado submitted a proposal to NASA seeking to continue his research and is currently awaiting a response.

Both scientists expressed gratitude to the Puerto Rico Science, Technology and Research Trust, which supported the missions financially. They also highlighted the essential role of students—both graduate and undergraduate—in their projects.

“Students are the engine of the project and of my research group,” emphasized Suleiman Rosado.
“They are the ones executing, building, and carrying out the studies, particularly the graduate students. They are the driving force of any research lab,” Domenech García added.
