Millie Hughes-Fulford: Scientist in Space

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Millie Hughes-Fulford: Scientist in Space Educator Guide (pdf) *A resource for using QUEST video in the classroom.*

When SpaceX sends its next spacecraft to resupply the International Space Station on Dec. 16, along with M&M's and khaki pants for the six astronauts, the rocket will also carry some 40 experiments. Among them will be a cooler with several vials of human cells, sent up by University of California-San Francisco molecular biologist and former astronaut Millie Hughes-Fulford.

Millie Hughes-Fulford in her lab at the San Francisco VA Medical Center in March 2011. (Michael Goode/KQED)

Hughes-Fulford hopes to figure out why the human immune system takes a beating in space. Her research could help astronauts stay healthy during the months or years it might take to reach Mars. Her findings could also help aging people here on Earth stay healthy.

"Our hope is that we can apply the new knowledge across the board to anyone who has an immune problem," said Hughes-Fulford, whose lab is at the San Francisco VA Medical Center and who is employed by the Veterans Health Research Institute. The longtime Marin County resident recently moved to Hawaii.

Space is a useful place to study the human aging process, because in space the immune suppression process is sped up, said Camille Alleyne, assistant program scientist for the International Space Station (ISS).

In Hughes-Fulford's experiment, which is funded by the National Institutes of Health, human immune cells will remain at the ISS for one month, exposed to microgravity – the technical term used to describe the lack of gravity experienced in space. After 30 days, the cells will return to Earth on board the same SpaceX spacecraft.

In 1991, Millie Hughes-Fulford traveled to space on the shuttle Columbia as a payload specialist responsible for carrying out experiments for other scientists. She was the first woman to travel into space as a working scientist. (Courtesy of NASA)

In 1991, Hughes-Fulford was the first woman to travel to space as a working scientist, when she spent nine days on board the Space Shuttle Columbia during its first mission dedicated exclusively to the medical sciences.

During that mission, Hughes-Fulford conducted experiments for scientists from around the world, including one with rats that investigated why space travelers become sick. The study found that, in space, cells called T-cells, which regulate the entire immune system, don't send out the signals they're supposed to. As a result, space travelers can become sick.

“Now we believe it’s gravity that’s causing the changes, the T-cell needing gravity in order to function properly,” said Hughes-Fulford.

With her new experiment, and another one that went up on SpaceX in April, Hughes-Fulford’s goal is to understand which specific genes malfunction in space and what causes them to fail. The experiment will be one of the last things to be loaded onto the spacecraft, and one of the first to be unloaded once it docks with the ISS, said Alleyne. This is because the human cells need to be in a controlled temperature environment.

Tara Candelario held up a vial with human blood at Millie Hughes-Fulford’s lab at the San Francisco VA Medical Center, in March 2011. Candelario is currently extracting immune cells from human blood to send up to the International Space Station on Dec. 16, 2014. (Michael Goode/KQED)

Other experiments traveling to the ISS in December include NASA’s Cloud Aerosol Transport System (CATS), a device that will use lasers to identify sea salt, carbon, water vapor and particulates in the atmosphere. With CATS, scientists are trying to understand what’s happening in the Earth and atmosphere, to inform climate change models, said Alleyne.

The resupply mission will leave Cape Canaveral, Florida.

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