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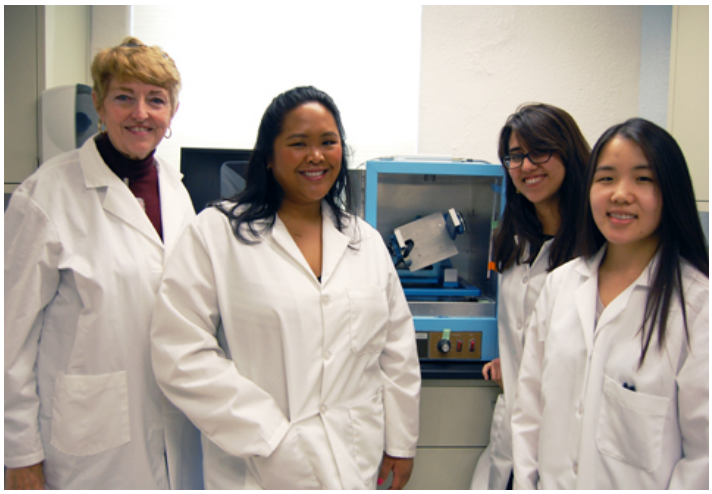
VA's First Astronaut: Millie Hughes-Fulford, PhD



Dr. Millie Hughes-Fulford and her team, from left: Tara Candelario, Emily Martinez, and Miya Yoshido. Their research on T-cells explores the genetic and molecular mechanisms that underlie diminished T-cell activation that occurs in the aging population and also in astronauts. T-cell activation is a critical event during which T-cells—specialized immune system cells—recognize infections within the body and initiate a defensive response.

By Kellie Burdette Mendonca, Public Affairs Specialist
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"It was a life's dream, and not many of us get our life's dream," says Millie Hughes-Fulford, PhD, VA's First Astronaut and Director/principal investigator for the Hughes-Fulford Laboratory at the San Francisco VA Medical Center (SFVAMC). Dr. Hughes-Fulford, who says she wanted to be an astronaut since the age of 5, professes (with a twinkle in her eye) to having watched "way too much science fiction as a child."

Dr. Hughes-Fulford, born and raised in Mineral Wells, Texas, explains: "I was watching Buck Rogers in 1950 when I was 5 years old, and their pilot was a woman named Wilma Deering. I wanted to be Wilma Deering because she could wear pants. At that time a little girl could not go around in pants. I would sneak off in my pair of Levi's and I would hear, 'Get out of those Levi's, put your dress on!' And so I wanted to be Wilma Deering because she could wear anything she wanted to, she flew a spaceship and was a professional woman. It was a dream and it turned into reality, which was awfully nice."

After graduating from Mineral Wells High, Dr. Hughes-Fulford entered college at age 16 and earned her Bachelor of Science degree in chemistry and biology from Tarleton State University. She then studied plasma chemistry and earned her PhD from Texas Woman's University. Her postdoctoral work included research focused on the regulation of cholesterol metabolism.

Not only has Dr. Hughes-Fulford contributed over 120 papers and abstracts on T-cell activation, bone and cancer growth regulation, this former U.S. Army Medical Corps Major was selected by NASA as a payload specialist. She

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VA's First Astronaut

became the first woman to venture into space in 1991 as a working scientist, flying aboard STS-40 Spacelab Life Sciences, the first Spacelab mission dedicated to biomedical studies. She was also principal investigator in 1996-1997 on a series of experiments which flew in space and examined the regulation of osteoblast (bone cell) growth and the root causes of osteoporosis that occurs in astronauts during space flight.

Most recently, Dr. Hughes-Fulford, her team, and her international colleagues published a featured article in the *Journal of Leukocyte Biology* showing—for the first time—that microgravity itself is the root cause of T-cell dysfunction. In July 2013, NASA awarded her work as a top discovery on the International Space Station.

Her current experiment, "T-Cell Activation in Aging," is scheduled to launch mid-March into space from Cape Canaveral. It will ride aboard the International Space Station for 30 days. "Our samples going up to the Space Station are for the incubator up there, which has a 1-gravity control," explains Dr. Hughes-Fulford. "On the ground we're doing yet another set of samples for ground control. "

After 30 days, SpaceX Dragon capsule containing the experiment will return to Earth and land in the ocean with three parachutes. Dragon is then retrieved from the ocean and taken to Long Beach, California, where Dr. Hughes-Fulford and her team will retrieve their samples and bring them back to the Hughes-Fulford Laboratory at the SFVAMC.

Whereas the last experiment involved T-cells and microgravity, revealing microgravity as the root cause of T-cell dysfunction, the current experiment is designed to discover the mechanism of the immune response. This study will examine the mechanism of action causing the decrease in T-cell activation in microgravity, a medical problem that was first found in returning Apollo astronauts.

"What we are looking for are new ways to regulate the immune system to help people on Earth," says Dr. Hughes-Fulford. "It's not just for the four people who may go to Mars in 2025 (although it will help them, too), it's about people on Earth, especially the elderly."

In the past, before the International Space Station (ISS) existed, Dr. Hughes-Fulford avidly lobbied Congress and gave presentations championing ISS. At the time, having an International Space Station was just a point of hope for the scientific community. And now? "Research is a treasure hunt in that you're looking for new ways to help people—especially our Veterans. And we're fortunate to have the International Space Station as a platform so that we can ask the questions and get the answers," she says.

Dr. Hughes-Fulford is proud of her 41 years employed at the SFVAMC. "We have some of the leading scientists of all the VAs because we're partnered with major universities. The VA helps support scientists doing the kind of work I'm doing (discovery). Because we're exposed to people clinically, we're able to take the knowledge and apply it to the basics; which is where we got penicillin, the polio vaccine, the statins—these came from people doing academic, theoretical work. And these discoveries directly help our Veterans."

At SFVAMC her laboratory researches cell growth and differentiation, studies the control of human prostate cancer growth and the regulation of bone and lymphocyte activation. For more information about the Hughes-Fulford Laboratory, click here. Dr. Hughes-Fulford is also a professor of biochemistry at the University of California Medical Center, San Francisco.

Dr. Hughes-Fulford is a member of the American Association for the Advancement of Science, American Society for Gravitational Science and Biology, American Society for Bone and Mineral Research, American Society for Cell Biology, and the Association of Space Explorers.

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