University of Lethbridge

NEWS RELEASE

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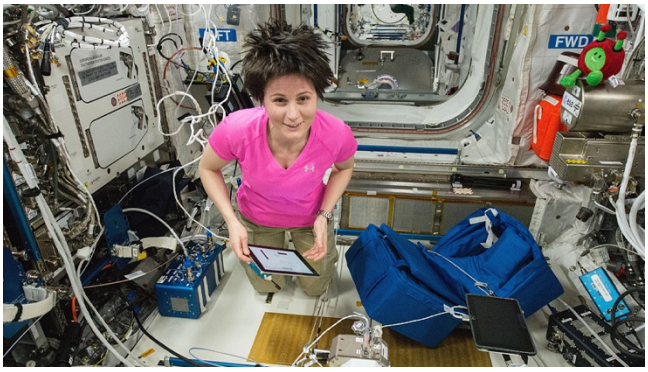
University of Lethbridge study investigates the effects of space travel on male and female astronauts

Astronauts blasting into space face a barrage of stressors — noise, vibration, G forces, loss of gravity, radiation, isolation and closed quarters, to name a few. A new study, led by a team around University of Lethbridge neuroscientist Dr. Gerlinde Metz, is examining what these stressors do to the human body in space and may in turn unlock clues to help mitigate the effects of similar stressors on everyday people.



Numerous studies have shown physical complications from space flight, including loss of bone and muscle, and impacts on cardiovascular health, vision and more. Female astronauts are more susceptible to radiation-induced cancer risk and, in the first days of flight, they seem to experience space motion sickness more often than their male counterparts.

To investigate how long-duration space travel affects metabolism, an international, interdisciplinary team of researchers analyzed 335 blood samples taken from astronauts before, during and after their space missions. Metz, from the Canadian Centre for Behavioural Neuroscience, in collaboration with Tony Montina from the Department of Chemistry & Biochemistry, partnered with scientists from the NASA Johnson Space Centre and the University of Bonn. The study was recently published in the journal *Cell and Molecular Life Sciences*.

NASA collected blood samples from 40 male and 11 female astronauts during four- to six-month missions to the International Space Station between 2006 and 2018. Samples were collected before launch, periodically throughout their missions and again upon their return to Earth. The samples were frozen for later analysis by NASA and shared with the University of Lethbridge for metabolomics analysis by nuclear magnetic resonance (NMR) spectroscopy. Metabolomics provides a highly accurate picture of the state of the body at the time the sample was taken.

“Using this approach, we saw that space travel resulted in sex-specific changes in metabolites involved in energy metabolism, which may be linked to bone loss, muscle regulation and immunity dysfunction,” says Metz. “Our results also show different metabolic responses, especially during the recovery period, with females needing more time to adjust to their return to Earth.”

The study builds on the understanding of the health effects of space travel and helps inform the development of measures to counteract these effects. Human missions to Mars are being planned for the late 2030s or early 2040s. With the round trip taking about two years, finding ways to mitigate potential health consequences has some urgency.

“We want to really understand well what space does to our body and how we can relieve those stressors to enable us to spend more time in space,” says Metz. “It’s important to understand what happens to the body during space flight and it will also help us understand a lot of the challenges we face on Earth.”

The study of stress and other spaceflight factors might also help us better understand the response to challenges on Earth. The environment aboard a spaceship has similarities to the lockdowns humans on Earth experienced during the COVID-19 pandemic, especially the isolation and distance from loved ones. Other situations on Earth, such as floods and hurricanes, also cause very high levels of stress, especially when people suffer long-term consequences like losing their homes and livelihoods and being forced to migrate.

“This type of analysis gives us really good clues about not only the effects of stress, but the origins of diseases and what can cause stress-related diseases,” says Metz.

This news release is available online at Space Travel Stress.

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