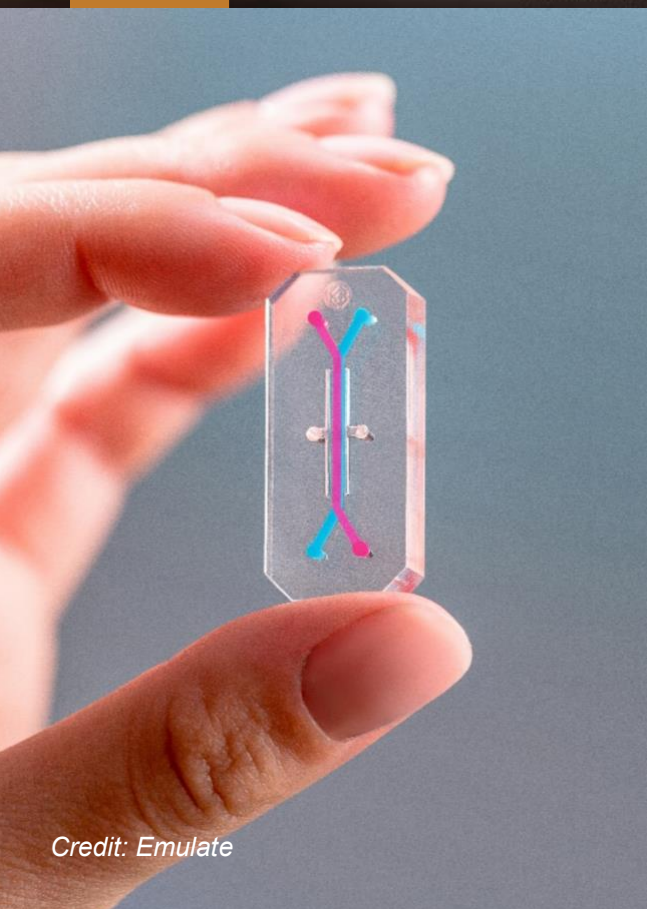


AVATAR

A Virtual Astronaut Tissue Analog Response

A small experiment flying aboard Artemis II could lead to big impacts in healthcare, both for astronauts in space and citizens on Earth.



The AVATAR (A Virtual Astronaut Tissue Analog Response) investigation will use organ-on-a-chip devices, or organ chips, to study the effects of increased radiation and microgravity on human health. Insights from this research could have far-reaching benefits that advance personalized medicine.

ENABLING SPACE EXPLORATION:

- Identify potential risks to human health prior to long-duration Moon and Mars missions
- Support the development of countermeasures and preventative measures
- Inform personalized medical kits, tailored to each astronaut

BENEFITTING HUMANITY:

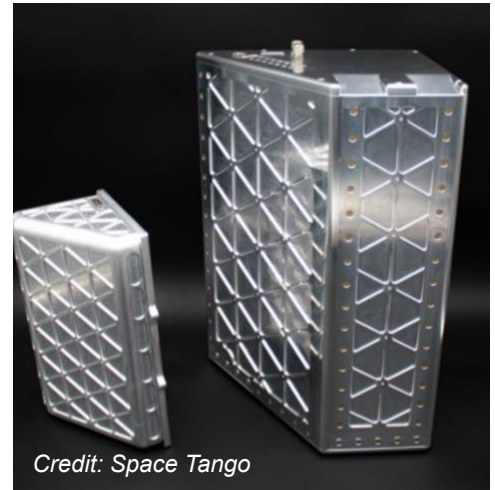
- Expand our scientific understanding of aging and disease
- Advance the use of biomedical technologies in research
- Contribute to healthcare improvements, such as cancer treatments

AVATAR

A Virtual Astronaut Tissue Analog Response

Artemis II Mission

AVATAR will use organ-on-a-chip devices, or organ chips, to study the effects of deep space stressors on human health. The chips will contain cells derived from Artemis II astronauts and accompany crew on their ten-day journey around the Moon. They will be placed in fully powered equipment that maintains environmental control of the experiment during the flight. Upon return, the samples will be analyzed and compared to data gathered during a simultaneous ground-control study. This will provide the most detailed look yet at the impact of spaceflight and deep-space radiation on developing blood cells.



What Are Organ Chips?

Organ chips are roughly the size of a USB drive and could be used to predict how an individual might respond to a variety of stressors, such as radiation or medical treatments, including pharmaceuticals. Made with human cells, the chips mimic how tissues, such as the brain, heart, liver, or dozens of other organs, work. NASA research will focus on validating and leveraging these models to assess the impacts of deep space stressors on human health.

Bone Marrow as Bellwethers

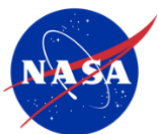
The AVATAR organ chips will contain bone marrow tissue developed from Artemis II crew cells. Bone marrow is responsible for producing red blood cells, white blood cells, and platelets. This makes marrow an ideal sample for diagnosing diseases and gauging how a person's immune system responds to treatments.

Know Before We Go

Before we send the first humans — Americans — to Mars, it is critical to first understand the potential health risks. NASA's organ chip research aims to do just that. This research could provide valuable information for developing measures to protect astronaut health on their missions, including personalized medical kits.

A Collaboration Between Government and Industry

AVATAR is led by NASA, in collaboration with other U.S. government agencies, including the Biomedical Advanced Research and Development Authority (BARDA) and the National Center for Advancing Translational Sciences (NCATS), which is part of the National Institutes of Health. Commercial partner Space Tango developed the innovative hardware to enable the automated experiment aboard Orion using Emulate organ-chips, with Emulate and the Wyss Institute scientists leading the research.



Probing biological and physical phenomena under extreme conditions advances the fundamental scientific knowledge required to go farther and stay longer in space, while also benefitting life on Earth.

SCIENCE.NASA.GOV/BIOLOGICAL-PHYSICAL/INVESTIGATIONS/AVATAR

