How does space travel affect organ development?

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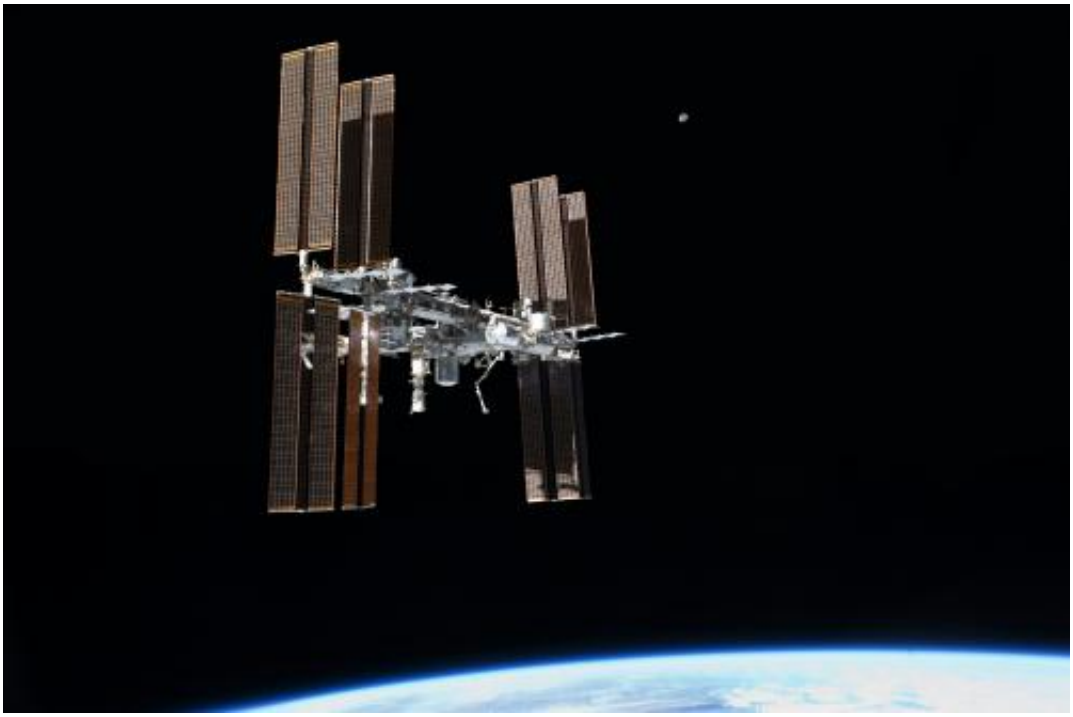

The Berkeley Lab experiment is slated to go aboard the International Space Station. Credit: NASA

The crew of the International Space Station will soon be joined by 180 mice from Berkeley Lab. Their mission: help scientists learn how space travel affects the immune system, organ development, and reproduction across generations.

The mice are part of a Berkeley Lab experiment, funded by NASA this summer, which will shed light on how biological systems respond to changes in gravity and radiation. NASA researchers can use this knowledge to understand how tissue development and reproductive ability respond to space travel.

"These studies are especially timely, as plans for commercial space travel are gaining popularity and appear likely in the near future. In addition, the number of women astronauts in the space program has been steadily increasing," says Janice Pluth of Berkeley Lab's Life Sciences Division. She leads the project with fellow Berkeley Lab scientists Antoine Snijders, Deepa Sridharan, and Jian-Hua Mao.

"Understanding how the space environment affects growth and development is key to adapting to the changing space travel landscape," Pluth adds.

Their experiment is one of 26 projects announced by NASA's Space Biology Program in August. The projects will be conducted aboard the International Space Station, and will investigate how microbes, cells, plants, and animals respond to changes in gravity and continuous exposure to low levels of radiation. In addition to addressing problems associated with human space travel, the research could lead to new biological tools for applications here on Earth.

Pluth has conducted ground-based NASA research for a decade, mostly exploring the effects of radiation on human cells. Now, in her first research slated to go into space, she's shifting to a mouse model system and investigating how very low levels of radiation and micro gravity influence development.

From left to right: Berkeley Lab's Deepa Sridharan, Janice Pluth, Antoine Snijders, and Jian-Hua Mao have developed an experiment to study the effects of space travel on organ development.

"We know that space travel affects the immune system of astronauts. But how changes to the immune system alter the growth and development of organs, and the reproduction of animals exposed during development, is still an unresolved question," says Pluth.

To explore this question, her team designed an experiment using two strains of mice: one that is sensitive to radiation and one that is resistant to radiation. This will allow the scientists to tease out the effects of individual sensitivity to radiation on the immune response and its long-term consequences. The scientists focused on the mammary gland as an elegant platform to more easily study development through time.

The mammary glands of the mice sent into space will be analyzed at various times during development. The scientists will study the immediate effects of adaptation to the space environment. They'll also study the long-term effects of re-adaption following the mice's return to earth, as well as how these changes might affect subsequent generations.

"Using the sensitive and resistant strains of mice will give a sense of the role genetic diversity plays in dealing with the consequences of the changing environmental conditions during space travel," says Pluth.

A launch date for the experiment has not yet been set.

Provided by Lawrence Berkeley National Laboratory