

# Sex and space? Houston, we have a problem

January 6 2011, By Alan Bavley

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Ever dream about a honeymoon in space? You may want to think twice after you hear about Joe Tash's research.

The near-zero gravity of Earth orbit may do serious harm to the male and female reproductive systems, the University of Kansas Medical Center biologist has discovered.

Sperm counts drop. Egg-producing ovary cells waste away.

At least that's been the case among the laboratory and space-traveling rodents that Tash has studied.

What prolonged exposure to microgravity does to an astronaut's fertility remains a big unknown. But Tash's hypothesis isn't reassuring: Long-term [spaceflight](#) renders people "reproductively compromised."

"We have a lot of tantalizing data that require more rigorous investigation," Tash said. "It's unfortunate that we're discovering this just as the shuttle program is winding down."

Tash will have an experiment with mice on board in February for one of the final space shuttle flights.

His work remains a NASA priority, but in the future he will rely on commercial and foreign spaceflights to get his animals into orbit.

"Right now, there isn't a lot (of [reproductive system](#) research) we're

looking at. Joe's got the most interesting finding," said Ken Souza, a space biologist working with NASA's Ames Research Center in California.

"We're very excited from the biological standpoint of pursuing this."

Scientists know plenty about how [weightlessness](#) impairs healing and weakens the immune system and how it causes muscles to atrophy and bones to lose calcium. And they've come up with some effective countermeasures like exercise for astronauts.

If exercise keeps muscles in shape, what countermeasure might astronauts use to maintain reproductive health?

Souza laughed.

"That's a good question," he said.

The human reproductive system remains the final frontier for biological research in space. And scientists haven't approached it boldly.

"There's a general unwillingness to go into that sensitive area of health," Tash said. "It's politically incorrect."

But it also has been relatively unimportant to the success of spaceflights, and that may be a reason for the meager amount of research, suggested Richard Jennings, a physician and aerospace medicine expert at the University of Texas Medical Branch.

"If you get sick in space, that's a safety of flight, life or death issue," Jennings said. "When you prioritize what you do in science, that's the first thing you look at. Reproduction was certainly way down the list."

Jennings has been involved in space medicine since 1987. He hasn't seen evidence that floating in a spacecraft affects astronauts' fertility, or their sex lives.

On the contrary.

"We've had astronauts - after a two-week flight, they were able to get their spouses pregnant a day or two after landing," Jennings said.

A 2005 study Jennings co-authored counted 17 babies born to female astronauts after they had been in space.

The astronauts had a high miscarriage rate, but women who've gained the seniority to go into space tend to be near the end of their child-bearing years, Jennings said.

"No matter what you do for a living, your fertility is dramatically reduced with age," he said.

Most of Jennings' experience has been with astronauts on short spaceflights. Longer missions may warrant more study of the reproductive system, he said.

"Maybe after 50 years it's time to do that," Jennings said.

Previous reproductive research done on animals in space has yielded mixed results.

Orbiting fish eggs have been successfully fertilized and hatched. Frog eggs also were fertilized in space, but the hatchlings never developed beyond the tadpole stage.

In 1979, a Russian satellite carried an experiment to see whether rats

could get pregnant in space.

Five females and two males were sent into orbit in a "mating chamber," separated by a partition.

Two days into the flight, the doors opened so that the rats could party.

The weightless rats were decidedly not party animals.

"We saw no signs of any pregnancies nor any signs the animals even copulated," Souza said.

Whether low gravity put a damper on rat physiology or on their mating behavior couldn't be determined.

"Unfortunately, the Russians didn't have cameras on board," Souza said.

Tash's research suggests that the reproductive system is at serious risk during spaceflight.

He has studied the effects of weightlessness on earthbound male rats by using a harness to keep their hind legs elevated above the cage floor.

Scientists consider this technique a valid simulation of microgravity.

Other researchers already had found that weightlessness compromises sperm development in animals. But none had studied the animals for more than a few weeks.

Tash kept his experiment going for six weeks, a duration more like the time astronauts spend on the International Space Station.

His results were more dramatic than anything found previously: The rats'

testes shrank and their sperm counts dropped so low the rats were infertile.

Tash's experiment with female mice that flew on the space shuttle Discovery in April showed effects that were equally devastating.

"Fifteen days of spaceflight shuts down the ovaries," Tash said.

Tash and his KU collaborators, Viju Gupta, Lesya Holets and Katherine Roby, examined the mice shortly after they landed.

They found that ovary cells called follicles that produce eggs were dying. And genes involved with the female hormone estrogen had switched off.

"The surprising thing for us was how dramatic it was," he said.

On the next Discovery mission, Tash will repeat the experiment. But this time, the mice will be kept alive for a week after landing to see if their reproductive systems show signs of recovering after spaceflight.

"These are exciting new findings that are really long overdue," said April Ronca, a developmental biologist at Wake Forest University medical school who has studied gravity's effects.

"So far, (the female reproductive system) has been an area that has been grossly understudied and needs to be looked at before we have more people spending prolonged periods in space."

Souza, the NASA biologist, thinks Tash's research may do more than help protect the health of astronauts; it may benefit Earthlings, as well.

Just as the rapid deterioration of bones and muscles in microgravity mimics the effects of years of aging on earth, Tash's research may

provide a model for studying how the reproductive system changes with age.

As scientists learn how reproductive hormones are affected and what genes are switched on or off, they may find ways to maintain sexual vitality or minimize the symptoms of menopause, Souza said.

Tash already is trying to extend his research to people. He's asked NASA for data on astronauts' sperm counts.

He's been turned down.

"They claim privacy rules," Tash said.

But Souza was optimistic that the [space](#) agency may change its policy:

"With animal data becoming more convincing, he may be able to get the human data."

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