



Transport Minister and Minister-in-charge of Trade Relations S. Iswaran touring the exhibition at the Global Space and Technology Convention, held at Sheraton Towers Singapore hotel, on Wednesday. With him are (from left) Singapore Space and Technology (SSTL) executive chairman Jonathan Hung; Colonel Fredie Tan, director of the Changi Regional Humanitarian Assistance and Disaster Relief Coordination Centre; and SSTL CEO Lynette Tan. PHOTO: SINGAPORE SPACE AND TECHNOLOGY

# Researchers here embarking on 'space pregnancy' project

Simulation experiments on Earth to help explore how reproductive system will be affected in space

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As countries plan to send humans to the Moon again and on long missions to Mars, the National University of Singapore's (NUS) medical school and a local space organisation want to find out how babies and families will be made in outer space.

Will pregnancy take longer in space? How will reproductive organs and the foetus respond to the harsh space environment and radiation?

To address these unknowns, researchers from the NUS Yong Loo Lin School of Medicine (NUS Medicine) and space organisation Singapore Space and Technology (SSTL) are embarking on a "space pregnancy" research project. Through simulation experiments on Earth, they will explore how radiation and microgravity in the cosmos will affect the human re-

productive system.

"If we are going to be a space-faring society and if humans inhabiting other planets become a reality, having families and babies will be an important thing to consider," said Associate Professor Mahesh Choolani, head of the obstetrics and gynaecology department in NUS Medicine.

"For women, we have to think about the ovaries and the eggs and the foetus when pregnancy happens. Most important of all, we need to know the impact on the placenta, the master organ that helps the baby grow."

This life sciences experiment is one of several efforts under way to propel Singapore's small but budding space industry forward. The efforts were announced on Wednesday at the annual Global Space and Technology Convention.

At an NUS lab in 2022, Prof Mahesh and his team took human stem cells from the umbilical cord and exposed them to a lunar gravity environment using a small microgravity chamber. Microgravity is the condition of weightlessness in space, and the Moon's gravity is about a sixth of the Earth's.

Prof Mahesh said: "What we found, surprisingly, is that the growth of the stem cells slowed down dramatically, by up to 80 per cent, in lunar gravity."

"These are empirical findings and we need to do more experiments to find out what this means. Does it mean a longer gestation? Will the placenta look different? We don't know yet."

Over the next three years, the NUS Medicine team will work with SSTL to run similar experiments in varying microgravity and radiation conditions, to see how other cell types, organoids, and even non-human embryos behave in such conditions. Organoids refer to lab-made mini and simplified versions of an organ.

In five years, they are hoping to send such biological samples from reproductive organs to a space station, to see how they fare in the actual space environment.

SSTL executive chairman Jonathan Hung said: "Manned missions have rebounded as we target the Moon and beyond to discover new habitats, mine asteroids and establish colonies. Long missions in the harshest and unforgiving cold, hard space environment need

the best medical and biology expertise to support this."

The pregnancy project joins other ongoing space life sciences research, such as on astronaut health and growing food in space.

In 2021, institutions in Singapore sent coriander seeds up to the International Space Station for a month. Space radiation and microgravity transformed them into "superseeds", boasting more yield when brought back and grown on land.

At the conference on Wednesday organised by SSTL and held at Sheraton Towers Singapore hotel, Transport Minister and Minister-in-charge of Trade Relations S. Iswaran noted that the space sector here comprises about 2,000 professionals and researchers, and more than 60 local and international space-related companies.

Building on the Republic's decades-long niche in the areas of microelectronics, aerospace and advanced manufacturing, many companies here pivoted to the next frontier to develop high-tech satellite components and satellite communication systems.

Since 2011, Singapore has sent more than 20 satellites up to space,

most of which are used for research purposes.

In 2022, the Government announced a \$150 million investment in the research and development of space capabilities to support critical domains such as aviation, maritime and sustainability, and to create disruptive technologies.

SSTL and British firm In-Space Missions are working on creating a platform to help space start-ups and research institutes in the Asia-Pacific region send their satellite components and technologies up to space in a faster and affordable way, so that they can fly their technologies with fewer hoops to jump through. Such satellite components include propulsion engines, Earth observation cameras and new electronics.

Often, institutes and start-ups have to find launch missions on their own, which can be time-consuming and costly, said Mr Hung.

In-Space Missions was brought in because it makes satellite bodies that are also customisable, and young space-tech firms can attach their components to the vehicle, like ride-sharing.

This initiative is expected to start in 2025.

Welcoming the initiative, Mr Richard Lau, chief commercial officer of satellite communications company Addvalue Technologies, said: "Start-ups can fly their products in space in a cheaper and more efficient manner. It is important that new technologies demonstrate readiness in space so that their customers will have confidence to adopt the solutions."

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