Microscopic passengers to hitch ride on space shuttle

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When space shuttle Atlantis rockets into space later this week, it will take along three kinds of microbes so scientists can study how their genetic responses and their ability to cause disease change.

The 'Microbe' experiment, part of the STS-115 space shuttle mission scheduled for launch Aug. 27, will study three common microorganisms -- Salmonella typhimurium, Pseudomonas aeruginosa and Candida albicans -- that have been identified as potential threats to crew health. Sending these microbes into space will allow scientists to investigate the microbes' genetic adaptation and ability to cause infectious disease in microgravity, and to better understand the astronauts' space environment. The results of this experiment will help NASA scientists evaluate the risks to astronauts on future exploration missions planned to go to the moon and Mars.

"Spaceflight holds tremendous potential for the development of novel therapeutics, vaccines and diagnostics to treat, prevent and control infectious diseases," said Cheryl A. Nickerson, Ph.D., the experiment's principal investigator and a researcher at the Biodesign Institute at Arizona State University, Tempe. "Our Microbe experiment will be the first to investigate the effects of spaceflight on the disease-causing potential and gene expression profiles of disease-causing microbes." NASA Ames Research Center, Moffett Field, Calif., developed the Microbe payload for flight.

According to scientists, understanding human biological changes and

microbial responses while living in enclosed quarters in space is important to the health, safety and performance of crewmembers and requires further study. The flight microorganisms, which may be carried to spacecraft on the human body and in water or food, have been identified as potential threats to astronaut health based on previous spaceflight missions. Microorganisms also are major causes of human illness on Earth, according to Nickerson.

Prior studies have indicated that spaceflight weakens the human immune system and that some microbes become more virulent when grown under conditions that simulate spaceflight, thus increasing the risk of astronauts becoming sick during flight. Whatever the mission or its duration, microbes are present where there are human beings.

This experiment will focus on investigating the effects of spaceflight on three microorganisms commonly found where human beings live. The results will be used in the risk assessment of crew environmental conditions, including drinking water and breathable atmosphere, to help prevent contamination and contagious infection while in space. Scientists also believe this research some day may benefit people on Earth by leading to new therapies to treat infection.

"This experiment requires only the minimum of space shuttle resources, but it has the potential to greatly advance infectious disease research in space and on the ground," said Steven Hing, the experiment's project manager at NASA Ames, in California's Silicon Valley.

With these 'bugs' already present or with the potential to be present in human-occupied spacecraft, this research is applicable to both current and future long-duration flights, Hing noted. Because the microbes will be contained in Group Activation Pack (GAP) hardware that provides three levels of containment, they will pose no threat of exposure to the astronauts. A total of 12 GAPs will fly on the upcoming mission.

"Spaceflight has been shown to induce key changes in both human and microbial cells that are directly relevant to infectious disease, including changes in immune system function, microbial growth rates, antibiotic resistance, and cell surface properties," explained Nickerson. "It is exciting to think of the potential benefit that research in space holds for translation to the clinical bedside by providing a better understanding of how pathogens cause disease that will lead to new ways to treat, prevent and diagnose infectious disease."

Source: Arizona State University