Studies in microgravity raising treatment potential

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Astronaut Piers Sellers, Mission Specialist on STS-132 activating "Micro-2" GAPs May 2010. This photo features BioServe's new, smaller and improved GAP that will be used in the Micro-6 experiment and will allow more to fit in the allotted space. Credit: NASA

(Phys.org)—Yeast. It's a good thing. It makes bread rise, turns grape juice into wine, and is essential in the production of beer. And in our bodies, yeast—specifically the yeast Candida albicans—helps us maintain a healthy personal ecosystem. However, when our immune systems are stressed, Candida albicans can grow out of control. When that happens, the yeast becomes so plentiful that infections can result in the mouth, throat, intestines, and genitourinary tract.

Studying how Candida albicans responds to the microgravity of space flight aboard the International Space Station is the subject of a new investigation destined to launch in early October 2012. Micro-6, NASA's yeast experiment, is included on the latest flight of the Space Exploration Technology Corp (SpaceX), Hawthorne, Calif., Falcon 9 vehicle scheduled for liftoff from NASA's Kennedy Space Center, Fla. The investigation is designed by principal investigator Sheila Nielsen-Preiss, Ph.D., Associate Research Professor, Montana State University, Bozeman, Mont. Macarena Parra Ph.D., project scientist for Lockheed Martin at NASA's Ames Research Center, Moffett Field, Calif., provides scientific guidance and direction for the study on the space station.

Researchers chose the yeast Candida albicans because there's already a great deal of scientific understanding of the organism. Thanks to the extensive studies of Candida, the researchers will have a broad set of benchmarks, including the sequence of the entire genome, with which they can compare their results.

Designed to examine how spaceflight affects potentially infectious organisms, the experiment will provide new insights into better management and treatment of Candida infections. By comparing cells grown in microgravity to cells grown in normal gravity, researchers will examine the susceptibility of the yeast to an antimicrobial agent.

Stronger and better treatments for astronauts are needed for long duration space flights. This experiment may yield results that help prevent and treat yeast infections in space. Eventually this research may lead to an understanding of why yeast infections become more virulent when the immune system is stressed, and potentially deliver more powerful antibacterial treatments here on Earth.

Unique Environments Demand Specialized Equipment

BioServe Space Technologies affiliated with the University of Colorado, Boulder provides critical technology for the experiment. The equipment consists of Group Activation Packs (GAP) stored in a flight-certified incubator at a temperature of four degrees centigrade. Each GAP contains eight Fluid Processing Apparatuses (FPA) shaped like test tubes, but designed to meet the unique requirement of mixing fluids in microgravity. Each FPA contains an isolated amount of the microbial culture of Candida, plus a growth medium and fixative.

During the three-week flight aboard the space station, a crew member will begin the experiment by increasing the incubator temperature to 86 degrees Fahrenheit (30 degrees Celsius), and then activate the FPAs by pushing the plunger to mix the Candida with a growth medium. After 24 or 50 hours, depending on the sample, researchers will push the plunger deeper into the FPA, which combines a fixative agent to effectively stop the growth of the yeast cultures and complete each experiment.

Protecting the health of astronauts in space

After the yeast return to Earth from space, Nielsen-Preiss will examine changes to the genetics within the organism. The investigation will help researchers understand if the yeast is more virulent after exposure to a microgravity environment and, most importantly for future treatment, how they have changed to become more infectious. Identifying this change potentially could lead to development of more effective treatments.

According to Parra, the experiment could be of vital importance in protecting the health of astronauts in space.

"On Earth, life has evolved over millions of years in a 1g environment," said Parra. "In space, living systems have to adjust to a different environment. Without gravity, microorganisms become more virulent, biofilms form more easily, and the immune system tends to get compromised. So, the more we know about the effects of living in microgravity, the better it is for humans in space."

Provided by NASA

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