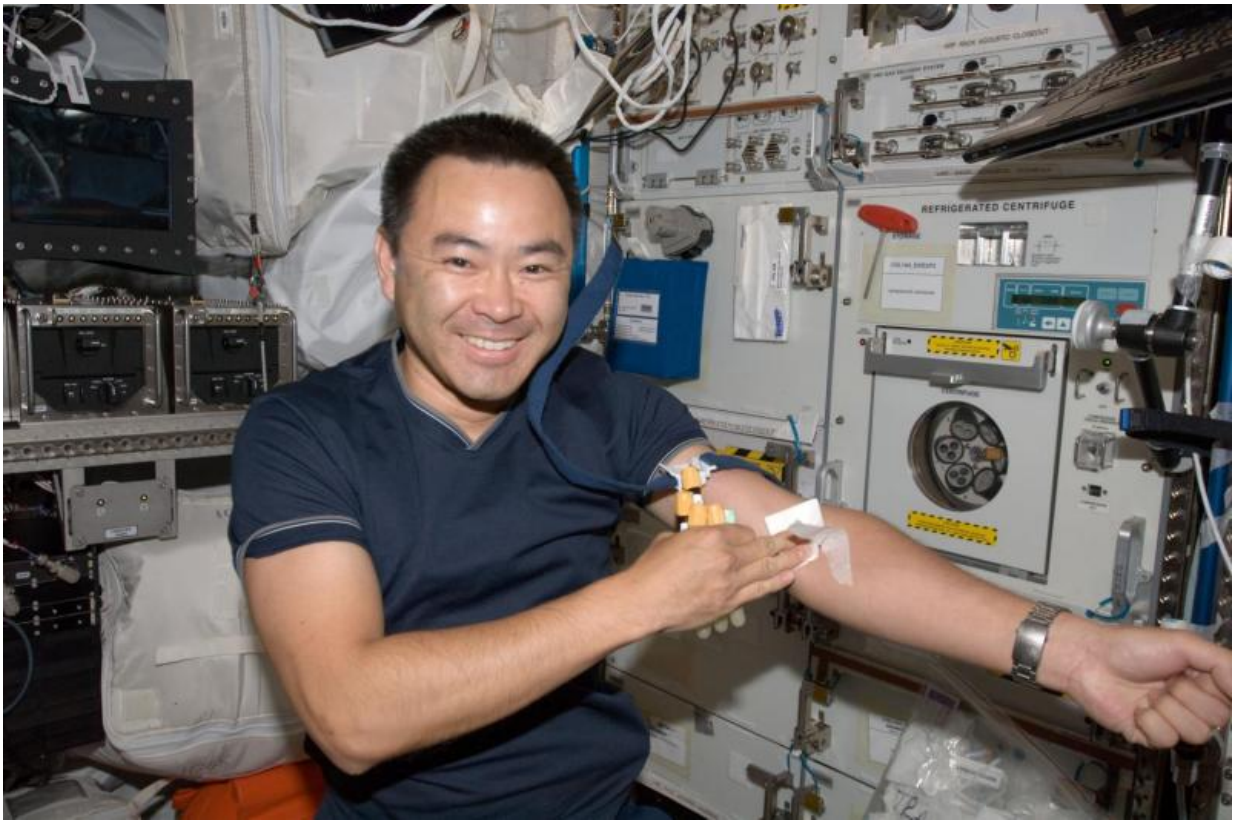
Boosting your body for lift off: NASA's One-Year Mission investigates the metabolism

August 25 2015, by Amy Blanchett



Expedition 32 Flight Engineer Akihiko Hoshide poses for a photo after undergoing a general blood draw in the European Laboratory/Columbus Orbital Facility. Credit: NASA

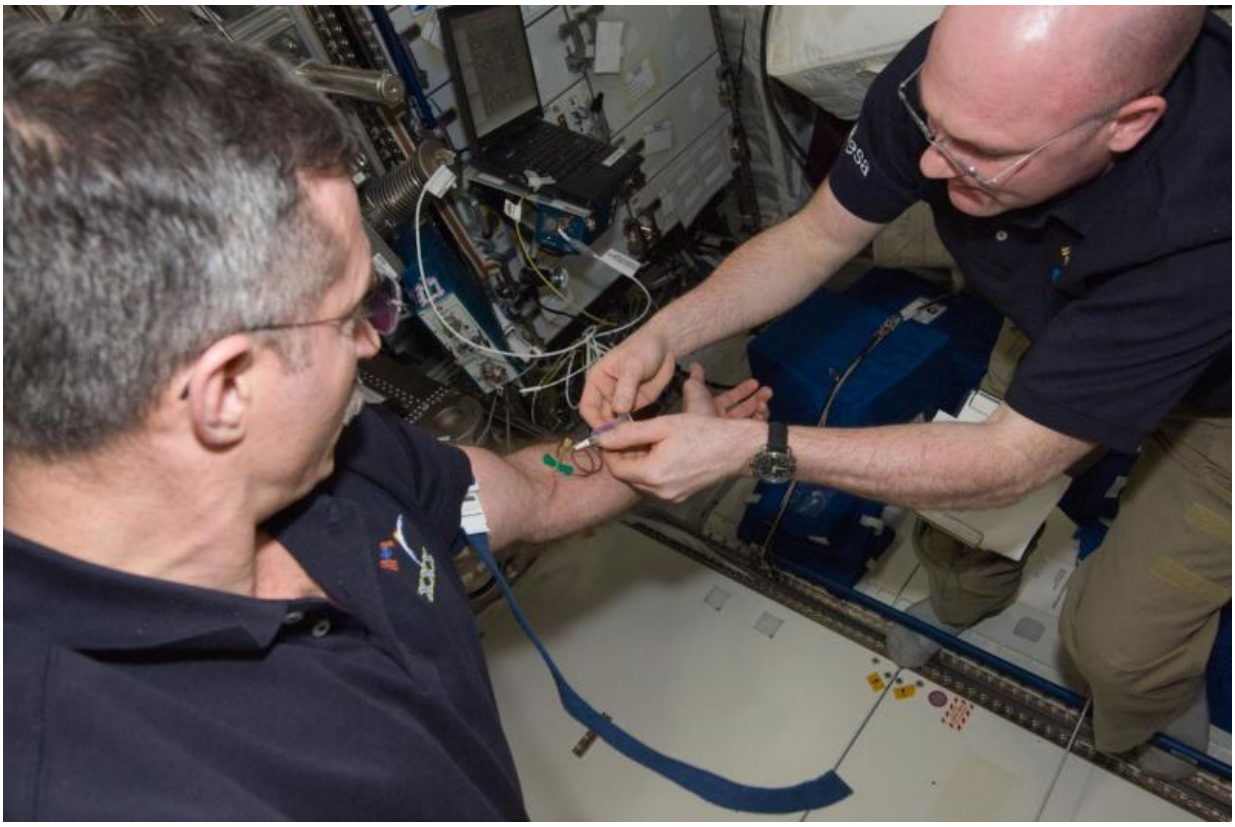
Everyone wants a metabolism boost, but understanding the processes that convert food to energy is challenging, and even more so in space.

Achieving optimal health requires a proactive approach and a holistic view of all the integrated functions of the body.

As part of NASA's One-Year Mission, researchers are conducting Human Research Program investigations aboard the International Space Station to learn more about biochemical processes, cardiovascular responses to oxidative stress and integrated immune function. To prepare for a journey to Mars, it is important to understand the effects of long-duration spaceflight on the human body and how to keep it healthy. Just like we are at risk for inflammatory damage on Earth due to stress and reduced physical activity, so are astronauts who work in a harsh environment.

Three metabolic investigations are geared to: 1) enhance an existing database of biological samples to identify key metabolic differences in specific populations, 2) examine how vascular changes accelerate atherosclerosis (artery wall thickening), and 3) validate a set of procedures to monitor immune function.

The Biochemical Profile investigation tests blood and urine samples obtained from a broad population of astronauts before, during and after spaceflight. Specific proteins and chemicals in samples are used as health indicators. The database of samples identifies commonalities in specific demographics such as males, females, repeat travelers and long-duration travelers. The test results establish a profile of the body's response to spaceflight, helping scientists understand how the body reacts in microgravity in different groups of people. This allows scientists to test the effectiveness of countermeasures, such as exercise and nutrition, and improve overall health for crew members on long duration missions.



Expedition 30 NASA Commander Dan Burbank and European Space Agency Flight Engineer Andre Kuipers are shown during an integrated immune blood sample draw in Human Research facility of the Columbus module. Credit: NASA

The Cardio Ox investigation examines blood and urine samples as well as carotid and brachial artery ultrasounds of crew members before, during and after spaceflight. The samples provide markers of oxidative and inflammatory stress. This helps determine an astronaut's risk level for atherosclerosis or plaque buildup. This is the first study to assess atherosclerotic risk using biochemical, structural and functional measures during, immediately after, and for up to five years after landing, to look at the long-term effects of spaceflight on vascular health.

On Earth, people who proactively seek to reduce elevated levels of oxidative and inflammatory stress may gain a greater understanding of how environmental factors can impact their cardiovascular health.

The Integrated Immune investigation assesses risks to the immune system by collecting health surveys, blood, urine and saliva samples before, during and after spaceflight. Ample post-flight evidence suggests that spaceflight has a negative effect on the immune system; however, little in-flight data has been collected. The in-flight samples allow investigators to assess differences and changes to the immune system. Validating a monitoring strategy enables development of countermeasures to reduce in-flight immune dysfunction. Researchers will use the data to monitor the effectiveness of countermeasures such as exercise, medication, immune modulators, etc.

On Earth, results from this investigation could help with development of new treatments and preventative measures for immune disorders. The techniques for monitoring the immune system could be applied to those in remote locations and those with altered immunity, such as infection epidemics.

Whether you're an astronaut or not, it's beneficial to take a proactive role in your health. Not only could you possibly reduce stress and environmental exposures, but you could also give a boost to your metabolism and immune system, leading to a longer, healthier, more productive life.

NASA's Human Research Program enables space exploration by reducing the risks to human health and performance through a focused program of basic, applied and operational research. This leads to the development and delivery of: human health, performance, and habitability standards; countermeasures and risk mitigation solutions; and advanced habitability and medical support technologies.

Provided by NASA