LIVING IN SPACE HARMS YOUR BODY

(7) The water loss decreases blood volume by about 20%. This means that there is less blood for the heart to pump and this causes the heart muscle to atrophy. Once astronauts return to Earth, their hearts are weaker and sometimes are unable to pump enough blood to the brain, so astronauts are prone to fainting. As well, fluid in the upper body causes it to build up in the face causing the face to become very puffy and giving astronauts a look that is termed "moon face". The fluid in the head also causes sinus and nasal congestion that give astronauts the symptoms of a head cold that can last the entire span of the mission. The increased fluid pressure in the head also exerts a lot of pressure on the back of the eyeballs. This affects their shape and causes damage to the optic nerve. This is of huge concern to space agencies as the vision damage is hard to reverse. Even if we find solutions to bone loss and muscle atrophy, there will be no use sending astronauts on long space missions to Mars, or anywhere else, if they become blind in the process.

(8) These are just some of the major problems caused by living in space. Other problems include a disruption to your sense of balance, immune system depression, sleep disturbance, loss of taste and smell and the last one is especially disturbing…excessive flatulence (farting)! This is especially horrible when living in a small and crowded space vessel without a window to crack open.

Article Questions

1) What do osteoclasts and osteoblasts do?
   Osteoclasts are cells that break down bone tissue and osteoblasts are cells that regenerate bone tissue. Both work in harmony to keep bone mass constant on Earth. (2)

2) What is spaceflight osteopenia and what causes it?
   Spaceflight osteopenia is the loss of bone mass during weightlessness. It is caused by the lack of gravity that promotes osteoclast activity and inhibits osteoblast activity. (2 & 3)

3) How does 6 months spent in the International Space Station affect an astronaut's bones?
   After 6 months in space, up to 10% of a person's bone mass can be lost, most of it in the vertebrae, pelvis and femur bones that support the body's weight on Earth. (3)

4) Why do muscles atrophy in space, how quickly does this happen and what can be done to slow this down?
   Muscles atrophy because of the absence of gravity. Without gravity, there is less need for back and leg muscles to hold up the body so the muscles shrink in size. 20% muscle loss can happen after 5-11 days if exercise is not used to slow this down. A minimum of 2 hours of daily exercise is required. (4 & 5)

5) In 2006, Heide Stefanyshyn-Piper, an astronaut who returned from a 12 day space mission, fainted twice during a welcome home ceremony. Explain what caused this to happen.
   During her space mission, she lost 20% of her blood volume due to water redistribution during weightlessness. This caused her heart muscle to atrophy and weaken. When back on Earth her blood volume immediately increased by 20% but her weakened heart was not strong enough to pump the blood throughout her body quickly. This deprived her brain of oxygen and caused her to faint. (6 & 7)

6) Describe the vision problems that can be caused by prolonged space missions.
   The increased fluid build up in the head causes pressure on the back of the eyeballs which can flatten the eyeball as well as damage the optic nerve leading to harm that is difficult to reverse. (7)

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