

Unit 8

Track 13

As we inch closer to the reality of sending astronauts to more remote areas of our universe, with the proposed Mars mission receiving particular attention, I'd like today to look at some (1) problems we may face living and travelling in deep space.

Now, you've probably all heard of the ISS, the International Space Station, but you may not know exactly what goes on there. The ISS is the world's first permanent (2) research facility, and its main purpose is to perform the sort of scientific research that can only be carried out in space. Among other tests, the astronauts and scientists on board take part in (3) experiments on themselves to determine how human bone and tissue is affected by living in a low or zero gravity atmosphere for long periods of time. And this raises one of the biggest problems of space travel – its (4) on the human body. And you probably won't be surprised to hear they've found out that space travel can affect us in several ways (5), especially over extended time periods.

Let's start with its effect on the cardiovascular system. Now, living on Earth, we are affected by gravity because for two-thirds of the day we are standing or sitting. Because of this, body fluids such as (6) pool in the lower part of the body. The human body is equipped with various mechanisms to (7) gravity to maintain sufficient blood flow to the brain. However, in an environment where there is minimal gravity, often called a micro-gravity environment, the quantity and distribution of body fluid (8), since it is free of the gravitational effect. This is known as 'fluid shift'. Its symptoms include a blocked nose, headache and a puffy face often known as 'moon face'. Similar to what you might experience during a heavy cold, in fact. This can also lead to space (9). If you've ever been on a ship in stormy weather, you've probably experienced something similar. A few minutes or a few hours after entering weightlessness, astronauts experience headaches, nausea and a strong feeling of lethargy. About a half of all astronauts experience these symptoms, but they're (10), and usually wear off after a few days.

This, unfortunately, is more than can be said for the effects that space travel has on the (11) structure. Bones, of course, contain calcium and phosphorous, er, there are about 1,200 grams of calcium and 450 grams of phosphorous in the average human body. The problem with space travel is that once gravitational stress is removed, the body starts (12) calcium at an alarming rate. In fact, after (13) of weightlessness, the body loses about 3.2% of its bone content, and then about 2% for every subsequent month spent in zero gravity. This weakens bones, which greatly increases the risk of fractures. The good news, however, is that it's possible to take (14) to minimise calcium loss. Basically, this involves getting plenty of exercise, which is why space stations are equipped with things like treadmills and exercise (15). Incidentally, this also helps retain muscle strength. You don't use your muscles much in space, so they tend to (16) rapidly.

The biggest problem, though, is that of cosmic radiation, and this is the one that scientists are really struggling to mitigate. Cosmic radiation consists of fast-moving elementary (17) er, protons, electrons and stripped-down atomic nuclei. Nobody is certain where many of these come from, but there are theories that they (18) in black holes or quasars, that is, distant galaxies producing large amounts of energy. When these particles hit human beings, they pass right through them, seriously damaging their DNA as they do so. On Earth, a magnetic field (19) humans, deflecting the radiation before it can penetrate to the Earth's surface. However, without this shield, astronauts are exposed to dangerous levels of these high-velocity particles, and the further they go, the more they are (20) to them. The symptoms would be particularly unpleasant, with cancers, cataracts and brain damage heading the list of a whole range of medical conditions caused by radiation poisoning.

OK, so much for health. Now, let's consider the logistical problems of ...