

Interview with Dr. Brigitte Godard

Dr. Brigitte Godard is a doctor in medicine specialized in medical biology. She joined MEDES in 2005 where she studied bed rest experiments. A few years later she joined the European Astronaut Center in Germany and is currently an Astronaut Doctor.



1. How much insight do you have into the physiological effects of long-duration space travels on astronauts?

Nowadays space travels are at most 6 to 12 months long, which is not enough to identify physiological effects of microgravity. In space, human bodies can adapt quite easily, the main problem arises when returning to Earth. We know that the most important issues are bone loss due to microgravity even though astronauts are young and healthy. For longer space missions radiation will be the main problem. After microgravity and radiation the third aspect is the change in chronobiology. This is why exercise and nutrition in space are crucial.

The ISS continuously communicates with Earth, not only by exchanging messages with ground experts, but also by shipping food supplies by cargo. However, for interplanetary space travels, this will be impossible for obvious reasons.

2. Do astronauts have vitamin deficiencies?

ESA and NASA chose to systematically supplement vitamin D for all their astronauts. However, they don't supplement them with other vitamins. The reason is that nutritionists provide them with well-balanced meals, which shouldn't lead to any other deficiencies. But nutrition is difficult to manage, so we don't know for sure. Other space agencies, such as ROSCOSMOS, prefer to supplement their astronauts with all the vitamins because they assume there are deficiencies in space.

Radiations can modify food's nutritional value in space. To test this, expired food is tested when it's sent back to earth. But only few researches have been conducted so far on this topic.

3. On a long-duration space trip, what kind of deficiencies or other health problems can be expected?

In space, astronauts tend to eat a lot of meat and salt. We should maybe focus on providing them more vegetable proteins, as they are easier to digest and allow for less iron consumption.

To test the effects of microgravity on long-duration space travels, two ground modal studies have been developed : the bed rest modal and the dry immersion. The most frequently used model is the bed rest which closely simulates microgravity when the head is 6 degrees below the feet classically designed as head down tilt bed rest.

Of course in both models we are missing the radiations.

4. Do astronauts experience a loss or change in taste during space travels? What is the reason for this?

Change in taste is very variable from person to person, even though experts are trying to seek patterns and generalize. For example a French astronaut mentioned that he couldn't enjoy the gratin dauphinois as he did on the ground. And others never complain of any changes in palatability of the food. It does not necessarily mean that it does not happen, but meetings with doctors are usually short and it is not a usually asked question.

All the systems of our body are affected by microgravity, from the neurovestibular organ to bone-muscle system. This includes our microbiota, which is essential to a good function of our bodies. For instance, in space, astronauts tend to have more acne because of the effect of microgravity on their skin bacteria.

Microgravity causes physiological changes on cells, but the confined, aseptic and closed environment also causes modifications to our flora. This has many consequences, such as change in our immune system, but many remain unknown.

5. What are the health regulations governing the ingestion of modified microorganisms by astronauts?

Before sending anything to space we need to prove that it is safe for the astronauts. This is tested by doing bed rest experiments, where healthy patients stay in bed for different amounts of time and a number of specifications and rules regarding food and safety have to be followed.

6. Do astronauts' nutritional needs change during space travels?

When astronauts arrive in space, they are usually less hungry than usual. This is due to many factors like space sickness, an upset stomach or very limited time for eating during the day. Most astronauts lose weight while in space: some even

lost 10kg! To avoid this, nutritionists and doctors study the resting metabolic rate of astronauts and adapt their food to each individual.

Before a spacewalk, astronauts have bigger meals as they will use much more energy and won't be able to eat anything during a long period of time (8 to 10 hours).

7. Is there a noticeable change in the composition of urine during space travels?

Astronauts tend not to drink much water in space due to physiological response of the body because of the fluid shift in microgravity, which influences their urine. However, it has more impact on urine quantity than quality.

Another major side effect is kidney stones, no astronaut has suffered from it in space yet, but doctors and scientists from different space agencies designed a plan in case it happens.

8. How is astronauts' food intake planned: is their meal calculated to give them the exact nutritional intake per meal according to their stature and weight?

Doctors and nutritionists adapted WHO's recommendations to each of the astronauts' metabolism. To determine their metabolism, experts measure their resting metabolic rate a few months before their departure during a stress-free day. Unfortunately, this cannot be measured in space, because the device they have right now in space is not the gold standard one, the gold standard device is a device which is very heavy and there should be studies in between missions showing the one we have in space is compatible, but this is very time consuming for the astronauts in space.

9. What are the different medical specialties for monitoring astronauts?

A whole team is dedicated to help astronauts: doctors, engineers, psychologists, sport coaches... The doctor is their main contact person when they are on board the ISS. Each week, a private meeting is scheduled to discuss how the astronaut feels in space. And before the trip, their doctor makes sure astronauts are as healthy as they can be by performing a huge amount of tests.