**Astronauts' fitness in space. How to strengthen astronauts' bodies?**

In addition to eating and sleeping, astronauts spend a lot of their time on physical exercise.

Without it, they wouldn't be able to function normally. Neither in space nor upon returning to Earth.

Exercise is the number one health priority in space. No other activity besides eating and

sleeping is as important. Astronauts spend an average of 2.5 hours a day on fitness. And we're talking

about conditions on the International Space Station (ISS). In the case of building a permanent base

on the Moon or Mars, the time spent on exercise will be even greater.

**Why do astronauts need to exercise?**

But if astronauts spend most of their time in microgravity conditions, why is it so important for them

to exercise during their time in space? The answer is simple. Without exercise, astronauts'

bodies lose bone and muscle mass. This, in turn, means a decrease in strength and can affect

astronauts' ability to perform their duties.

Muscles can be rebuilt, even after returning to Earth, but bones are much more difficult.

Weak bones mean a greater susceptibility to fractures and injuries.

Weakened astronauts are unable to perform their tasks in space. This is particularly important for

a crewed mission to Mars - due to the approximately 20-minute signal delay, NASA will not be able

to react immediately in the event of a malfunction or critical situation. Maintaining proper physical

condition by astronauts is crucial.

In microgravity conditions, there is a movement of body fluids, such as

plasma, which contains, among other things, red blood cells. Less plasma means less blood,

which carries oxygen to all parts of the body. It has been repeatedly shown that physical exercise

increases the amount of plasma in the body. Astronauts who exercise regularly produce more red blood cells.

Microgravity also causes so-called orthostatic hypotension, or low blood pressure

during a 3-minute orthostatic test. Under normal conditions, baroreceptors located in

the carotid sinus and aortic arch regulate fluctuations in blood pressure. As a result of changes in body position and

related decrease in blood pressure, the baroreceptor reflex increases heart rate

and blood pressure by increasing the tension of the vessel walls. In the case of a disturbance in the baroreceptor reflex,

orthostatic hypotension, hypertension in the lying position, and fluctuations in blood pressure may develop.

This can happen to astronauts.

With no gravity and less blood volume, astronauts are more prone to fainting.

Physical exercise helps them avoid this.

**Most common exercises for astronauts**

On the ISS, astronauts use three exercise devices. Each of them does something different. The exercise

equipment is placed on elevated platforms to reduce the noise generated by the machines:

• Ergometer bike: It's like a regular bike, and the main activity is pedaling. It is used to

measure physical fitness in space because it is easy to check

heart rate and lung capacity in this way.

• Treadmill: Walking or jogging on a treadmill is like walking on Earth. Walking is the most important

way to maintain healthy bones and muscles. Since lack of gravity causes people to

float in the air, astronauts wear harnesses that keep them on the surface

of the treadmill.

• Resistive Exercise Device (RED): RED looks like weightlifting machines. To

use it, astronauts pull and twist flexible rubber cords attached to weights. RED

can be used for whole-body training. From squats and leg curls to arm exercises

and heel lifts, astronauts can do them all on RED.

**Life on Mars won't be easy**

During a crewed mission to Mars, we can expect several health problems

for astronauts, not only those related to their muscle and bone mass. Lack of gravity can cause

movement of body fluids upwards, causing swelling and vision problems.

Living in isolation and confinement can also cause behavioral and psychological problems. Without

a natural biological clock, depression and sleep disturbances can occur. The space station

uses LED technology to mimic Earth's light to mimic circadian rhythms -

the same will be true at a Mars base.

The closed environment also means that microbes in the body can spread more easily. The immune system

is weakened, so urine, saliva, and blood samples are closely monitored to ensure that dormant viruses are not reactivated.

A serious problem is also exposure to radiation, which is much higher in

space than on Earth. Without our atmosphere, astronauts are more exposed to the risk

of cancer and damage to the nervous system. The ISS is close to Earth, which reduces

the risk, but missions further into space will have to overcome it.

And finally - it is also worth planning what supplies astronauts will need during their stay on

Mars. NASA aims for them to be as self-sufficient as possible during such a long mission.

The entire crew will be trained to monitor their bodies so as not to overlook

even the most trivial warning signal.

Surviving on Mars won't be easy, let alone maintaining proper fitness and physical fitness there.

This is difficult for every human being, as we were not created to live on the Red

Planet.