

SPACE EXPLORATION

# LIVING IN SPACE

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# AT A GLANCE

- Astronauts live onboard the International Space Station (ISS). The ISS is made of many modules that have been added over time.
- Cargo missions carry supplies to the ISS. Supplies include water, air, food, and equipment.
- Future space stations will make use of expandable modules. This will reduce the number of missions needed to build space stations.
- Scientists hope to create rotating space stations in the future. Rotational forces can mimic the effects of gravity.
- Living in space affects the human body. It can damage bones, muscles, and other body parts. It can also affect mental health.
- Scientists work to help astronauts stay healthy while living in space. This will allow astronauts to go on longer missions in the future.

# 3

## BODY AND MIND IN SPACE

**M**uscles grow bigger and stronger when they are used. They become weak after long periods of inactivity. They also shrink. Some muscles are constantly used on Earth. They work against gravity. For example, muscles in the back and legs

hold people upright. Without these muscles, people would fall over.

Microgravity conditions mean these muscles are not being used. Michael Stenger is a NASA scientist. He said, “Being in space is a lot like [lying] around doing nothing.”<sup>5</sup>

***Being in microgravity affects the way muscles work.***



The process of muscle loss can happen quickly. NASA estimates that astronauts can lose up to 20 percent of muscle mass on a spaceflight lasting five to eleven days. The effects may be more severe during longer spaceflights.

The heart pumps blood throughout the body and to the brain. The heart pushes blood upward against the force of gravity. It does not need to work as hard in space. Blood can float easily into the head. Microgravity causes the heart to shrink. Scott Kelly stayed in space for 340 days. Very few astronauts have spent this long in

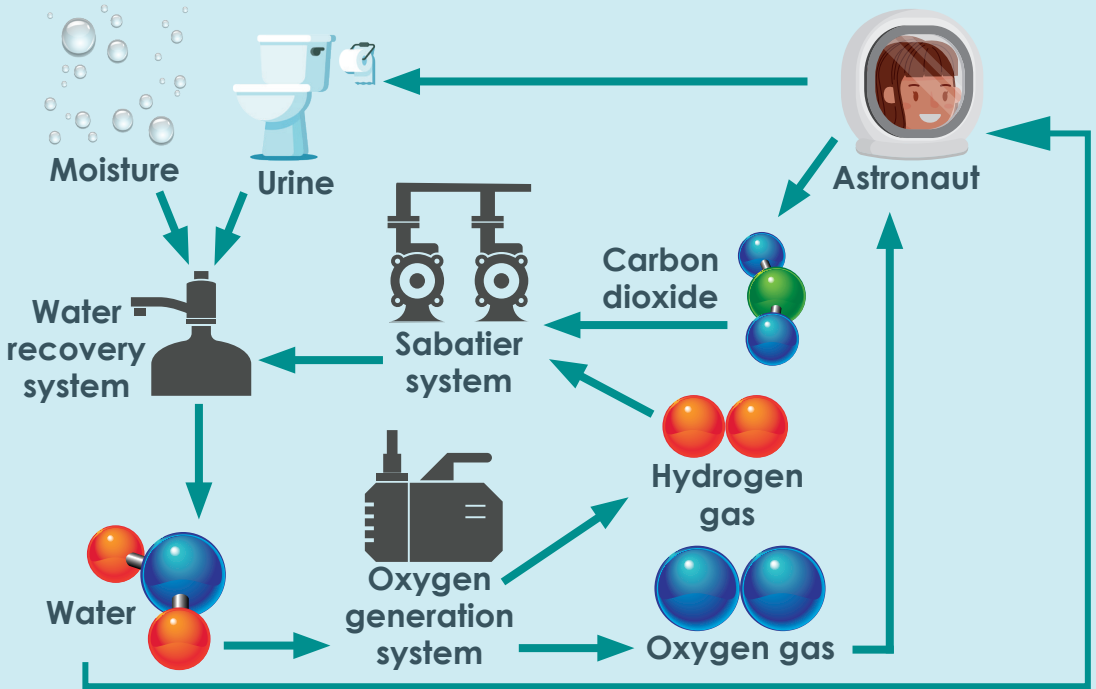
space. His heart lost 27 percent of its mass during this time.

Bone health is also affected by microgravity. Bones support people as they stand and move. They do not need to provide as much support in space. They begin to lose **density**. They become weak. Weak bones are at risk of breaking.

## IMPROVING BONE HEALTH

Scientists study ways to improve bone health in space. Nutrients like calcium and vitamin D can strengthen bones. Eating foods with these nutrients helps bone health. NASA is also testing medications. Certain drugs may reduce the risk of broken bones.

# WATER AND OXYGEN RECOVERY



*Systems onboard the ISS help recycle oxygen and water. The Sabatier system helps produce water.*

Water is also needed for the OGS.

Water contains the elements oxygen and hydrogen. Special electrical devices split the water into these parts. Oxygen and hydrogen become gases after being split apart. Astronauts breathe the oxygen.



# GLOSSARY

## **atmosphere**

the layer of gas surrounding a planet or moon

## **density**

the amount of material in a given amount of space

## **isolation**

the state of being alone or feeling separated from other people

## **module**

a unit that is operational on its own but can also be part of the larger structure of a space station

## **orbit**

a round path that an object takes when traveling around another object in space

## **radiation**

a form of energy that can cause health problems

## **rotate**

to spin around a center line

## **space walk**

a time when an astronaut is in space outside of a spacecraft or space station

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