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Puff Experiment

It is a known fact that rising too quickly to the water's surface can cause scuba divers to suffer decompression sickness - commonly called "the bends." And sudden exposure to high altitude can result in the same symptoms in pilots and space crews.

Decompression sickness results from exposure to low barometric pressures that cause inert gases - mainly nitrogen - that are normally dissolved in body fluids and tissues to come out of physical solution and form bubbles. A common symptom is joint pain, which is how the nickname "the bends" was earned.

Symptoms in more serious cases include headaches, memory loss and blurred vision. Extravehicular activities (EVA), or space walks, pose a risk of nitrogen bubble formation because they provide a very low-pressure environment.

Little is known about how the lungs can be affected by long-term exposure to microgravity - the near-weightlessness found in the environment of space. Pulmonary Function in Flight, or PuFF, research focuses on lung function both following EVA and inside the Space Station.

It's laying the groundwork for future experiments that are key to understanding and maintaining crew health. By using future lung experiments on the International Space Station, scientists hope to find new ways to protect the health of space travelers in the years ahead. They also hope to gain a better understanding of the effects of gravity on the lung here on Earth.

Each PuFF session includes five lung function tests, which involve breathing only cabin air. The focus is on measuring changes in the evenness of gas exchange in the lungs and on detecting changes in respiratory muscle strength.

Unevenness of gas exchange is a hallmark of virtually every pulmonary disease. Gas exchange can be temporarily disrupted by the filtration of the lungs and nitrogen bubbles in the bloodstream.

Changes in respiratory muscle strength may result from long periods in the absence of gravity. This experiment uses a manual breathing valve, flow meter, pressure-flow module, pressure and volume calibration syringes and disposable mouthpieces. Data is stored in the personal computer located in the Human Research Facility and transmitted to the ground.