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SFU creates portable extreme environment

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(PhysOrg.com) -- A Simon Fraser University lab's invention will make it easier for researchers to travel anywhere to study how extreme environments affect various populations, including the elderly, athletes and the sick.

In fact, SFU environmental physiologist Matthew White and his lab colleagues could eventually turn their portable breath-monitoring-and-manipulation device into a backpack for creating portable extreme environments.

Called an End-Tidal Forcing (ETF) system, the invention regulates the composition and availability of air gases a person inhales and exhales on a breath-by-breath basis.

The device mimics air conditions in extreme environments by delivering various levels of nitrogen, carbon dioxide and normal air into a volunteer's lungs.

"Under normal conditions, we breathe in air that contains 20.9 per cent oxygen, 79 per cent nitrogen and only .03 per cent carbon dioxide," explains White. "Our blood transports the mixture of gases that we inhale, including the vitally important oxygen, from our lungs to our body's tissues."

The ETF system can induce the experience of breathing on Mount Everest by having a volunteer inhale air in which the mixture of gases is lower in oxygen than normal.

The ETF system consists of a computer, a valve control system, a metabolic cart with gas and flow sensors, gas-filled bottles and respiratory tubing with a mouth-piece to deliver gases to the volunteer.

To test the physiological impact of extreme altitude/depth environments on humans, SFU researchers have relied on a pressure-controlled hypo/hyperbaric chamber in the Department of Biomedical Physiology and Kinesiology's Environmental Physiology Unit (EPU).

"The EPU's hypo/hyperbaric chamber remains critical to our research because of its exceptional capabilities," says White. "But the flexibility of the ETF is akin to having a portable Mount Everest or ocean floor."

White's lab is also using the ETF system to study the physiological responses of the elderly in hot environments in the hopes of better understanding the impact of global warming on Canada's aging population.

White plans to extend his research to studying people with lung and heart diseases in climate-change-related hot environments.

The *European Journal of Applied Physiology* is about to publish an article on a study that employs White's ETF system, which is explained in a March 2009 article in the *Respiratory Physiology & Neurobiology Journal*.

Provided by Simon Fraser University