Exploring how the body adapts to exercise at altitude-hypoxia affects muscle and nerve responses

June 30 2009

Exercise requires the integrated activity of every organ and tissue in the body, and understanding how these respond to the decreased oxygen levels present at moderate to high altitude is the focus of the current special issue of *High Altitude Medicine & Biology,* a peer-reviewed journal published by Mary Ann Liebert.

The entire issue is available free online at www.liebertpub.com/ham. Guest Editor Peter D. Wagner, MD, Distinguished Professor of Medicine & Bioengineering at the University of California, San Diego, presents six review articles written by expert researchers in the field of high altitude medicine that explore various aspects of exercise at altitude, including muscle and nerve function, metabolic responses, and changes that occur at the cellular level.

Hypoxia, or reduced blood oxygen levels, represents a threat to the body, explains Dr. Wagner. "These threats are countered by immediate physiological responses and also by longer term adaptive responses...to enhance both O2 transport and exercise capacity," he writes in an editorial introducing this special issue.

In the review entitled, "Air to Muscle O2 Delivery during Exercise at Altitude," José Calbet, from the University of Las Palmas de Gran Canaria (Spain), and Carsten Lundby, from Arhus University (Denmark), propose that humans maintain a functional reserve of

oxygen in the muscles that they can draw on during exercising in hypoxia. Philo Saunders, David Pyne, and Christopher Gore, from the Australian Institute of Sport (Canberra), focus on the potential benefits athletes might achieve by training at moderate altitude in, "Endurance Training at Altitude." The implications of reduced oxygen for the human nervous system are the topic of an article by Markus Amann, from the University of Zurich and the University of Utah, and Bengt Kayser, from the University of Geneva, titled, "Nervous System Function during Exercise in Hypoxia."

How hypoxia brings about changes in the proteins expressed by muscle cells to help them adapt to lower oxygen availability is explored in two reviews: "Muscle Bioenergetics and Metabolic Control at Altitude," by Paolo Cerretelli, Mauro Marzorati, and Claudio Marconi, from the National Research Council, Milan, Italy, and, "Plasticity of the Muscle Proteome to Exercise at Altitude," by Martin Flueck, from Manchester Metropolitan University (UK). Hypoxia also affects the ability of muscles to contract, as Stéphane Perrey and Thomas Rupp, from the University of Montpellier (France), explain in, "Altitude-Induced Changes in Muscle Contractile Properties."

Source: Mary Ann Liebert, Inc.