

New Framework Aims to Transform High-Altitude Medicine Through Whole-Body Approach to Hypoxia

HSMI framework offers a vision for prevention diagnosis & treatment for more effective healthcare strategies in the world's most challenging environments

SHANNON, CLARE, IRELAND, June 11, 2026 /EINPresswire.com/ --
<https://doi.org/10.1038/s41392-026-02836-9>

As increasing numbers of people live, work, and travel at high altitudes, experts are calling for a major shift in how altitude-related health conditions are understood, diagnosed, and treated. A new perspective published in *Signal Transduction and Targeted Therapy* highlights the growing burden of illnesses linked to low-oxygen environments and introduces a comprehensive framework designed to advance the future of high-altitude medicine.

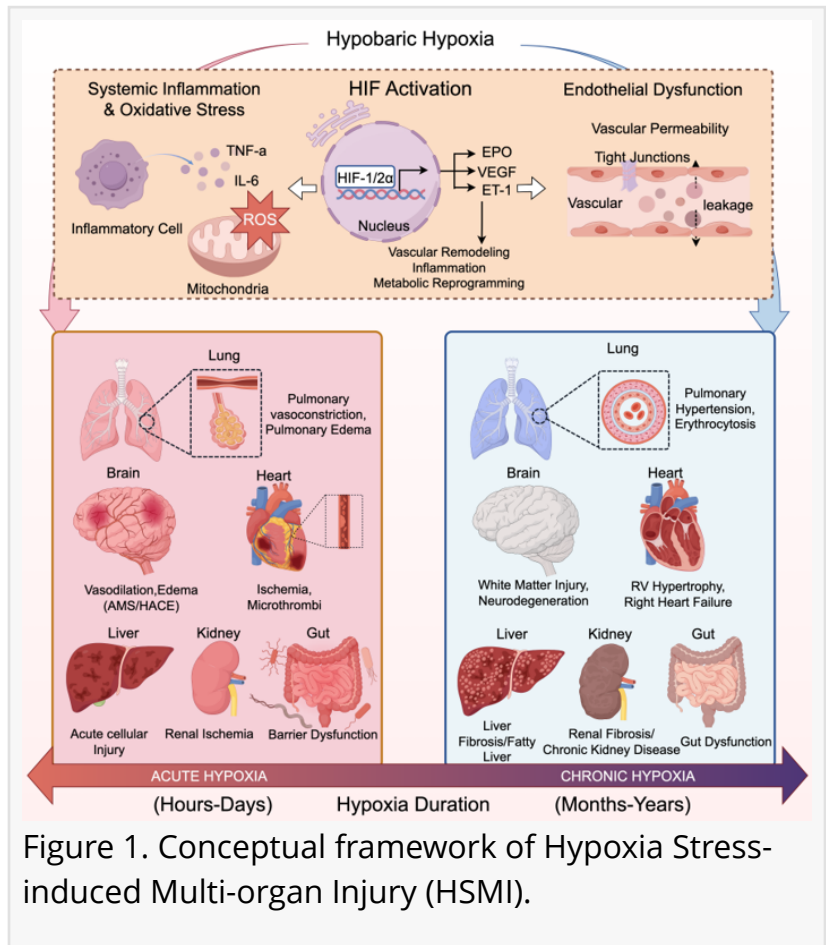


Figure 1. Conceptual framework of Hypoxia Stress-induced Multi-organ Injury (HSMI).

High-altitude regions, generally defined as areas above 2,500 metres, are home to millions of permanent residents and attract large numbers of visitors each year. Exposure to reduced oxygen levels can affect multiple organs and contribute to a wide range of conditions, including acute mountain sickness, pulmonary complications, cardiovascular disorders, metabolic disturbances, and long-term organ damage. Despite decades of progress in understanding individual altitude illnesses, many conditions continue to be viewed and managed separately.

The article proposes a new model known as Hypoxia Stress-induced Multi-organ Injury (HSMI), which views altitude-related illnesses as interconnected manifestations of a common underlying

process. Rather than focusing on isolated organs, the framework emphasizes how oxygen deprivation triggers widespread biological responses that can affect the lungs, brain, heart, liver, kidneys, and gastrointestinal system over time.

“For decades, altitude-related illnesses have been treated as separate problems” said Prof. Fengming Luo, corresponding author of the study at West China Hospital, Sichuan University. “HSMI shows they are interconnected responses to oxygen deprivation. That changes how we think about early diagnosis and prevention.”

This integrated perspective could help overcome longstanding challenges in the field. Current diagnostic approaches often rely heavily on symptoms rather than objective biological indicators, making early detection difficult. The article highlights the need for real-time diagnostics, advanced biomarkers, portable imaging technologies, and continuous physiological monitoring capable of identifying health risks before severe symptoms develop.

The proposed roadmap also focuses on understanding why individuals respond differently to altitude exposure. Factors such as genetics, age, sex, and population-specific adaptations may influence vulnerability to hypoxia. Incorporating multi-omics technologies, artificial intelligence, and predictive modelling could enable more personalized risk assessment and prevention strategies for people ascending to or residing at high altitude.

In addition, the article outlines opportunities for developing precision therapeutics that target the biological mechanisms driving altitude-related illness. Such approaches could move beyond symptom management and support interventions aimed at preventing or reducing long-term organ damage associated with chronic hypoxia.

As global engagement with high-altitude environments continues to expand, the HSMI framework offers a new vision for prevention, diagnosis, and treatment, providing a foundation for more coordinated and effective healthcare strategies in some of the world’s most challenging environments.

Article Reference

Wenjin Sun, Xuan Zhang, Ling Chen, Lei Chen, Cheng Deng, Shizheng Wu, Fengming Luo, Advancing high-altitude medicine: a model for the future, *Signal Transduction and Targeted Therapy*, <https://doi.org/10.1038/s41392-026-02836-9>

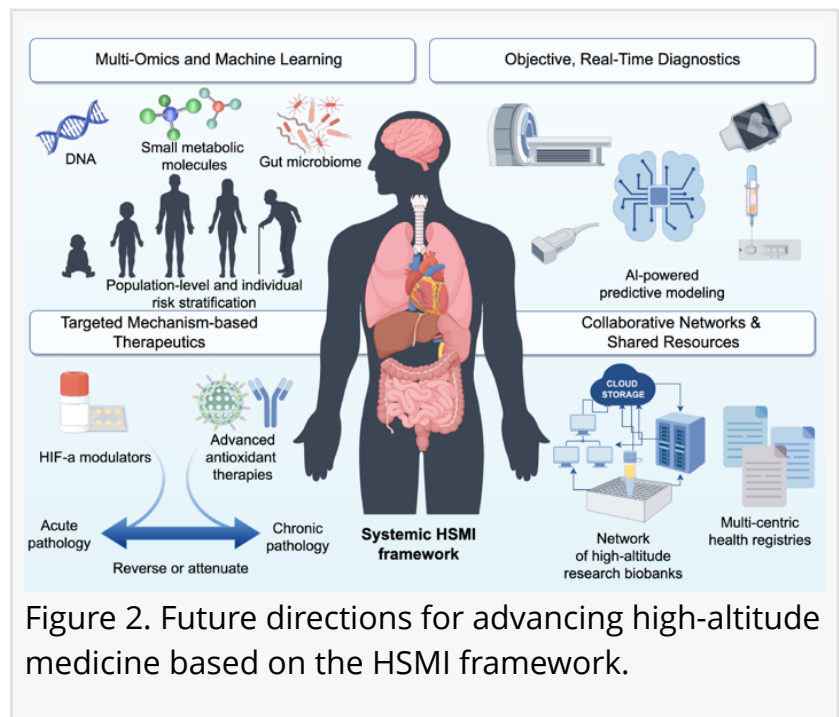


Figure 2. Future directions for advancing high-altitude medicine based on the HSMI framework.

Keywords

High-Altitude Medicine, Hypoxia Stress-Induced Multi-Organ Injury (HSMI), Hypoxia, Precision Medicine, Altitude-Related Diseases

Qiu Sun

Signal Transduction and Targeted Therapy

sttt@scu.edu.cn

This press release can be viewed online at: <https://www.einpresswire.com/article/918942338>

EIN Presswire's priority is source transparency. We do not allow opaque clients, and our editors try to be careful about weeding out false and misleading content. As a user, if you see something we have missed, please do bring it to our attention. Your help is welcome. EIN Presswire, Everyone's Internet News Presswire™, tries to define some of the boundaries that are reasonable in today's world. Please see our Editorial Guidelines for more information.

© 1995-2026 Newsmatics Inc. All Right Reserved.