

Where Oxygen Fades



Overcoming High-Altitude Hypoxia with a Portable Hyperbaric Mask: A Pilot Study

 **BiALP – Alpine, Disaster and Wilderness Medicine Research**

 **SIMAE – Italian Society of Medicine of Extreme Ambients**

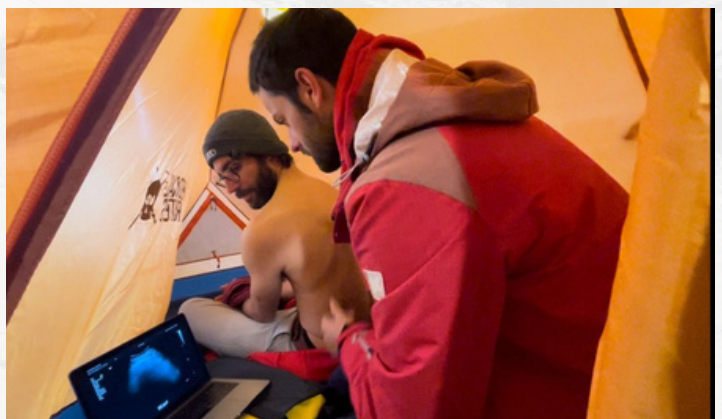
Overview: High-Altitude Illnesses

Acute high-altitude illnesses are conditions caused by the reduced availability of oxygen at high altitudes. **Acute Mountain Sickness (AMS)** is the most common form. Symptoms include headache, nausea, fatigue, and disorientation. In severe cases, it can progress to “**High-Altitude Pulmonary Edema (HAPE)**”, characterized by fluid accumulation in the lungs, leading to breathing difficulties and decreased oxygenation, or to “**High-Altitude Cerebral Edema (HACE)**”, which can rapidly result in death.

Our Goal

Positive pressure masks, such as CPAP devices, have been shown to offer significant benefits, **eliminating the need to carry heavy oxygen cylinders**. They work by increasing pressure during exhalation, allowing greater lung expansion and thus **better oxygen absorption**. However, the devices studied in scientific literature so far rely on electricity. As a result, these studies do not reflect real-world conditions, where expeditions often venture for days into extreme and cold environments.

Our project aims to study the effects of lightweight, non-electric mechanical masks, which are simpler than CPAP devices. **We will test their effectiveness for the first time at altitudes exceeding 6,000 meters**. Our goal is to **enhance mountain safety**, opening up new possibilities for high-altitude exploration. Preliminary tests will take place in the **Italian and Swiss Alps**, followed by **trials on Mount Aconcagua in Argentina**.



Aconcagua: the peak of Americas

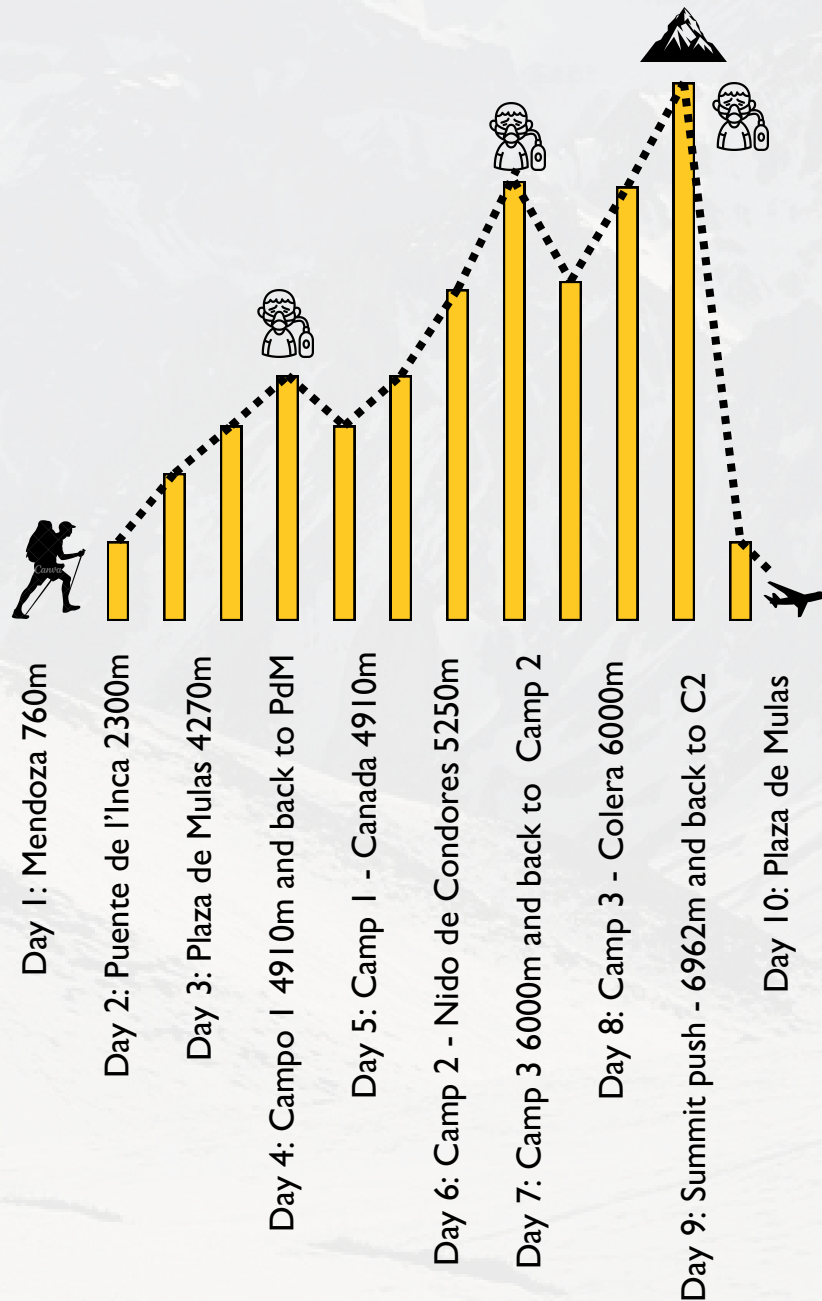
Aconcagua, standing at an altitude of 6,960 meters above sea level, is the tallest mountain in the world outside the Himalayas. Located in the Mendoza province of Argentina, it is part of the Andes mountain range. Reaching Aconcagua involves traveling to Mendoza and then transferring to “Puente del Inca”, the most common starting point for expeditions.

The most popular routes, such as the **Normal Route**, require **solid acclimatisation skills**, while more technical paths like the Polish Glacier Route present greater challenges. Key difficulties include freezing temperatures, strong winds, and the risk of altitude sickness. **The logistics are complex, involving permits and a high level of physical preparation.**

Proper acclimatization is critical for tackling the ascent, as the low atmospheric pressure at such altitudes can lead to acute mountain sickness. Planning rest days and gradual altitude progression is essential for both safety and the success of the climb.



The Expedition



The logistics



Dr. Paolo Rodi, MSc, PhD(c)

Surgical Resident in Zurich and PhD Candidate in Disaster Medicine, President of BiALP, a Research Group in Alpine Medicine.

Like surgery, every climb relies on teamwork and precision, and I believe research is the essential guide to reaching new heights.

Dr. Giovanni Cappa

Emergency and Urgent Care Physician
President of the Italian Society of Extreme Environment Medicine.



Combining the physical challenge of austere environments with the curiosity of clinical research is what fuels my dedication to medicine and exploration.



Davide Pellegrini

Alpine Rescue Operator, National Alpine Rescue Corps (CNSAS)

An alpinist by passion and an alpine rescuer by vocation, I have a deep love for high altitudes and enjoy organizing independent expeditions to explore great mountains.

Projected Expenses

- Flights: CHF 4,500 (CHF 1,500 per person)
- Aconcagua Park Permit: CHF 2,550 (CHF 850 per person)
- Base Camp Logistics Service: CHF 3,900
- Technical Equipment: CHF 4,000 (includes sleeping bags and tents for -30°C)
- Freeze-Dried Meals for 12 Days: CHF 970
- Insurance: CHF 2,250 (CHF 750 per person) - mandatory, includes helicopter rescue up to 5,000m
- Unforeseen Expenses: CHF 1,000

Total Estimated Cost: CHF 19,170



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