

ALTITUDE TRAINING | ALPINE SPORTS & TREKKING

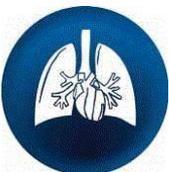


**BASICS IN HIGH ALTITUDE KNOWLEDGE |
HYPOXIC CHALLENGE TESTS FOR PREDICTION OF
THE SUSCEPTIBILITY TO ACUTE MOUNTAIN
SICKNESS | PREACCLIMATISATION**

Duration of basic altitude physiology instruction and hypoxic challenge tests with progressive loads: **2,5 hours**. Please arrange an **appointment at least 8 weeks before your journey** to high altitude in generally good physical condition.

Preacclimatisation-Training should be performed close to your planned trip.

5-15 sessions of IHHT® | Interval hypoxic hyperoxic training, customized respiratory exercising with hypoxic (low) and hyperoxic (high) oxygen mixtures) are recommended depending on the severity level of the ascent and estimated altitude profile.



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BASICS

Exposures to high altitude are associated with a decline in endurance performance and the risk for high altitude illnesses of which acute mountain sickness (AMS) is the most common. AMS is characterised by unspecific symptoms like headache, dizziness, nausea, vomiting, loss of appetite, fatigue and insomnia. Although usually benign and self-limiting the presence of AMS markedly compromises the feeling of well being, reduces the chance to reach the summit and to return safely, and may progress to life-threatening high altitude pulmonary (HAPE) or cerebral edema (HACE). Among other factors the degree of altitude acclimatization determines the risk to develop AMS with a lower risk in well acclimatized compared to non acclimatized persons.

High altitude sojourns are more and more common for different populations. Besides mountaineers or skiers, there are businessmen traveling to Colorado, South America, and other regions, tourists visiting historic sites in the Andes, scientists working at telescopes in the Andes, in Hawaii, or at the world's highest mines located at 5,300 m in Chile. Several 10,000 trekkers hike the Annapurna Trek every year with the highest point of this trek being Thorong La (5,416 m). **Time pressure is the reason why Mt. Kilimanjaro (5,860 m) is considered as the most dangerous mountain in the world.** More and more people try to climb it within 3–4 days and only a minority reaches the summit healthy. Businessmen are another group with limited time or unforeseen trips to high altitude. Principally, correct acclimatization was, is, and will ever be the “gold standard” for any altitude sojourn. But if immediate ascent or intermittent hypoxia >4,000 m (rsp. 12.5–13% O₂ at 1 bar) cannot be avoided, preacclimatization avoids altitude-related diseases and stabilizes the performance of the persons. Physiologically, the main problem for the body is the management of the decreased oxygen pressure. If there would be no system to adapt to hypoxic conditions, an altitude of about 1,500 m could not be survived without accidental oxygen. Fortunately, there are multiple systems to manage the problem, some of them reacting within seconds or minutes (e.g., pulse rate, breathing frequency, breathing volume, shift of the oxygen binding curve), some others in days or weeks (e.g., circulation, hemoconcentration, ventilatory acclimatization), or even years or generations (e.g., vascular growth).

The vulnerability of a person to acute mountain sickness (AMS), high altitude pulmonary edema (HAPE), and high altitude cerebral edema is influenced by the hypoxic pulmonary ventilatory drive (HVD), although this correlation is not strong enough to use HVD as a predictor of a person's ability to cope with high altitude conditions. HVD is genetically determined. But there are other important factors which are responsible for the individual fitness at altitude and the risk of altitude-related diseases as the limitation of diffusion capacity of the alveolar membrane or of minute breathing volume, the erythrocytes form, plasticity, size, and age, or increased plasma volume or low hematocrit, respectively.



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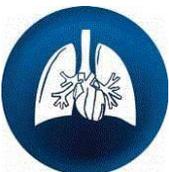
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Most knowledge about acclimatization strategies and ascent profiles are mainly based on empirical data, but these include >1,000 years of high altitude sojourns (military operations in the region today called Tibet, sacrifices in the Andes, and modern mountaineering and research for about 200 years). Nevertheless, there is no doubt that proper acclimatization according to the “gold standard” is the best way to prepare the body for high altitude. Acclimatization is of special importance for any lowlander who will sleep at an altitude >2,500 m or who will stay at >4,000 m for >1–3 h.

Persons with pre-existing conditions may need special advice or, in some cases, restrictions. The “gold standard” includes slow ascent (+500 m sleeping altitude every second day or a maximum of +1,000 m/week, beginning at 2,500 m), sleep with slight upper body increases, no breathing with pressure, and workload below the anaerobic threshold during the acclimatization phase. In some situations, such an ideal acclimatization profile cannot be realized. It may be impossible if the person has to fly to airports at high altitude (e.g., in the Andes or Tibet), if urgent and unexpected work has to be done at high altitude (e.g., for industrial maintenance and services at high altitude facilities or for some special rescue purposes), or “critical” mountains where a good altitude profile is difficult to be realized (e.g., Ruwenzori Mountains). While a preacclimatization for 24–48 h should be possible for most industrial or business tasks, the setting for most rescue operations is different. For normal alpine (helicopter) rescue, preacclimatization is not necessary, mainly because the crews stay too short at altitude and most of them are partially acclimatized. But if international operations should be assisted by a backup team of unacclimatized lowlanders, the time necessary to organize such operations should be used to preacclimatize the team members. But there are even more people who may benefit from preacclimatization: persons with known problems of acclimatization.

Preacclimatization decreases the risk of altitude diseases significantly, if acute ascent cannot be avoided. The special advantage of hypoxic chambers (hypobaric or normobaric) or IHHT® | Interval Hypoxic Hyperoxic Training is the well-controlled environment, the safety for persons with individual risks or pre-existing conditions, and the easy coordination of the exposure with normal daily life and work.



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