

## Health Aspects of Mountain Warfare

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Mountain environment is one of the most challenging areas of warfare. Cold, wind, rugged terrain, avalanches / landslides, ultraviolet radiation, altitude / hypobaric hypoxia and often a combination of those factors are environmental threats, which cause specific health disorders, standard military medical units are often not sufficiently prepared for. In addition, military tactics aggravate those environmental challenges, compared to civilian mountaineering. A short preparation time, a lack of acclimatization possibilities, a prolonged stay at high altitudes, additional equipment, a weak chain of evacuation and hostile forces caused large number of casualties in past mountain campaigns, and still do today. A significant proportion of those casualties is caused by environmental factors.

Not least through the war on terrorism, mountain warfare is not a problem of the past - in contrast, it is of increasing frequency. Therefore, it is of utmost importance, that military leaders are able to identify, the most challenging environmental factors in addition to tactical threats: Rugged terrain, cold weather and altitude / hypobaric hypoxia. According to the main environmental hazards, different preventive measures exist. Personnel selection, intensive mountain mobility training, behavioral training in extreme environments, adapted time calculations, use of pack animals, a special diet, sufficient mountain equipment, training in treatment of mountain specific diseases and prolonged field care, training in air rescue and alternative evacuation techniques can reduce the influence of mountainous environment. However, most of them have to be initiated well in advance, some of them even years before deployment.

The environmental factor truly unique to mountainous environment is long-term exposure to altitude / hypobaric hypoxia. Experience outside specialized mountain units is often very rare and the effects are therefore often underestimated. Besides performance decrements (some strenuous military tasks like move under direct fire or carriage of heavy equipment might be impossible at high altitudes) potentially lethal high-altitude illnesses exist. To deal with this challenge, acclimatization protocols, adapted time calculations and profound knowledge in (medical) prevention and treatment of high altitude illnesses is paramount. However, natural acclimatization during combat missions is almost impossible, due to logistical and tactical reasons. Preacclimatization at natural heights or in hypobaric chambers is possible, however, deacclimatization has to be considered. A promising alternative may be acclimatization in normobaric hypoxia shortly before operations at altitude are launched.