

HIGH ALTITUDE TRAVEL

Altitude illness may develop in any traveler going to 2500m/8000ft or higher. The low level of oxygen at high elevations can be stressful to the body, resulting in hypoxia. Acclimatization is the slow and gradual process of the body adjusting to the decreased availability of oxygen at high altitude. Acclimatization is a time dependent process. The body can adjust to moderate hypoxia, but it can take 2-4 days for the acclimatization process to take place. Some people acclimatize more slowly than others. Sleeping at altitude produces the most hypoxia; day trips to high altitude with return to low altitude for sleep are much less stressful on the body.

Risk for altitude illness is not affected by training or physical fitness. Anyone can get altitude illness. All travelers to high altitude destinations need to know the symptoms of altitude illness and listen to early warning signals before symptoms worsen.

It is OK to get altitude illness. It is not OK to die from it.

Risk for Altitude Illness= (Rate of Ascent) x (Altitude)

SYMPTOMS OF ALTITUDE ILLNESS

Acute Mountain Sickness (AMS)

Headache, loss of appetite, nausea and vomiting, extreme fatigue

High Altitude Cerebral Edema (HACE)

HACE is the severe progression of AMS, usually as a result of continued ascent with symptoms of AMS. Profound lethargy, drowsiness and confusion develop and progress rapidly to coma and death.

High Altitude Pulmonary Edema (HAPE)

Symptoms include unusual breathlessness upon exertion and eventually while at rest. Symptoms can occur without any preceding symptoms of AMS and can progress rapidly to death

RISK BY TYPE OF TRAVEL

Typical Tourist Destinations

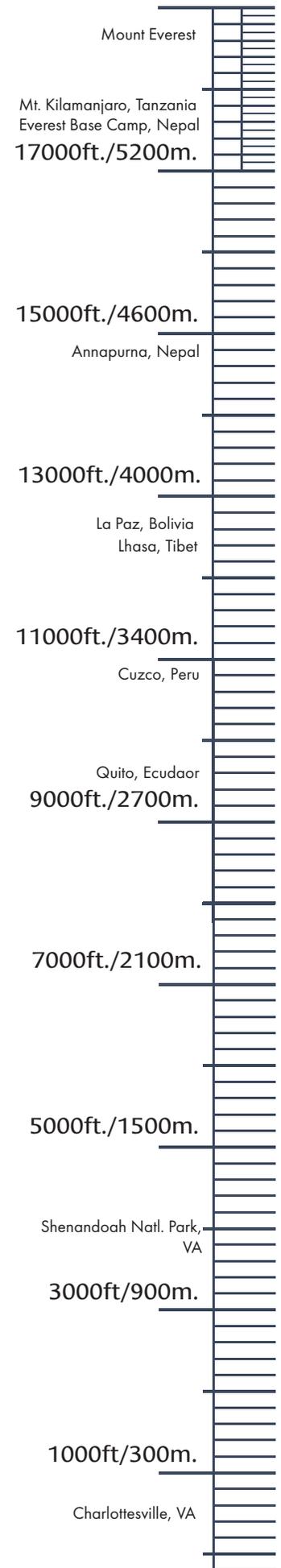
At typical tourist destinations (e.g., at altitudes of around 3,000 m or 9,800 ft), mild symptoms can occur but the severe forms of AMS (HAPE or HACE) rarely occur.

There is more risk for the traveler who hikes vigorously or flies directly to higher destinations, because these modes do not allow for gradual acclimatization. Relatively high altitude destinations include: La Paz, Bolivia; Lhasa, Tibet; and Cuzco, Peru

High Altitude Trekking

Trekkers are at higher risk of HAPE and HACE.

- Altitude illness affects 50% or more trekkers on popular high-altitude routes.
- Most trekking itineraries take a "one-size fits all" approach towards the pace of the trek, and thus cannot guarantee that altitude illness will not occur



PREVENTION OF ALTITUDE ILLNESS

Acclimatization

Ascend gradually.

Return to a lower altitude to sleep.

Ascend no more than 500 m per day (1,600 ft per day).

Avoid alcohol and only participate in mild exercise for the first 48 hours.

It is important that the traveler learn to recognize symptoms of altitude illness in the event they occur. Deaths from altitude illness almost

invariably result because symptoms were ignored or not recognized.

Never ascend to sleep at a higher altitude with any symptoms of altitude illness.

Medications for Prevention of Altitude Illness

Acetazolamide (Diamox)

Acetazolamide accelerates acclimatization; a process which takes 24-48 hours may speed up to about 8 hours. It can prevent AMS if taken before ascent. It can also speed recovery if started once symptoms develop, although this can take longer. It will not “mask” any symptoms. Acetazolamide does not protect against worsening AMS if ascent is continued. There is no rebound effect if the medication is stopped.

Start taking acetazolamide (125mg twice a day) the day before ascending, each day during ascent and continue to take for 24-48 hours after arrival at highest altitude.

Precautions:

Persons with multiple drug allergies or a history of a life-threatening reaction to sulfa drugs should have acetazolamide administered in a controlled environment before the trip.

Persons with a history of mild sulfa reactions or rashes can take acetazolamide safely.

Side effects:

Almost always causes numbness of fingers and toes, and occasionally oral numbness as well.

Occasionally causes nausea

Carbonated beverages may taste funny

TREATMENT OF ALTITUDE ILLNESS

Non-Drug Treatment

Descent

Descent should always be the first option for tourists and trekkers

Oxygen

Oxygen is available at many tourist locations, often from the front desk of the hotel, and is helpful in treating mild altitude illness.

Bottled oxygen is carried by many trekking expeditions. However, it is expensive and heavy to carry, and thus there is usually insufficient oxygen available.

Pressurization Bags

Groups on long treks or climbs to very high altitude where rapid descent might not be possible should consider carrying a pressurization bag which can effectively mimic descent.

Drug Treatment

Acetazolamide

Can be started for treatment of AMS or periodic breathing when sleeping. See Prevention.

Dexamethasone

Dexamethasone is used to treat swelling of the brain, and can relieve the symptoms of moderate to severe AMS or HACE. Dexamethasone should not be used to treat AMS in order to continue ascent, as it doesn't accelerate acclimatization. Rebound symptoms can occur if the drug is discontinued at altitude before acclimatization occurs.

Dexamethasone 4mg is taken every 6 hours for treatment. Do not ascend until at least 12 hours after the last dose, and then only if there are no symptoms of AMS.

COMMON HIGH ALTITUDE DESTINATIONS

Climbing “Kili”

Climbing Kilimanjaro is a goal for many travelers to East Africa, since no technical climbing skill is required to reach the summit. However, typical 5 day/4 night treks are a risk factor for altitude illness. Six to nine day packages provide more time to acclimatize safely, and offer a greater chance to reach the summit. Using acetazolamide prophylaxis may cause fewer problems with altitude illness, especially if trekking over 4-5 days.

If visiting Ngorongoro crater, try to spend the last few nights of your safari here, because its elevation (2286m or 7500ft) will aid in acclimatization for the Kilimanjaro trek.

Before attempting Kilimanjaro, consider hiking nearby Mount Meru or Mount Kenya to aid in acclimatization.

Trekking in Nepal

Trekkers into the Mount Everest region routinely sleep at altitudes of 14,000–16,000 ft (4,267– 4,876 m) and hike to altitudes >18,000 ft (5,486 m). Most trekkers into the Mount Everest region arrive there by flying to a tiny airstrip at Lukla at 9,383 ft (2,860 m). The following day they reach Namche Bazaar at 11,290 ft (3,440 m). Acetazolamide prophylaxis can substantially decrease the chances of developing acute mountain sickness in Namche.

In the Annapurna region, short-term trekkers may choose to hike to viewpoints in the foothills without reaching any high altitudes. Others may undertake a longer trek around the Annapurna massif, going over a 17,769-ft (5,416-m) pass (the Thorung La). Roads have been constructed up the 2 major valleys of this trek, shortening the overall trekking distance and changing the nature of the experience (cars and motorcycles may be encountered along the trek). The total exposure to high altitude is less in this region than in the Everest region. The Langtang region has a high point of 14,000 ft (4,200 m).

Trekkers are at significantly greater risk for the more serious manifestations of altitude illness such as high altitude cerebral edema (HACE) and high altitude pulmonary edema (HAPE). All trekkers must be aware of the symptoms of altitude illness in themselves and their companions. If symptoms develop, immediate descent and medical attention is urgent.

Tropical South America

High altitude destinations in tropical South America:

- Quito, Ecuador (2800 m; 9200 ft)
- Cuzco, Peru (3400 m; 11,150 ft)
- Lake Titicaca, Peru (3800m, 12,500 ft)
- La Paz, Bolivia (3444 m; 11,300 ft)



Acetazolamide is recommended for travelers flying directly to Cuzco, Peru or La Paz, Bolivia. It can be considered for prophylaxis for travel to Quito, Ecuador, or can be started if symptoms develop.

Locals refer to altitude illness as *soroche*, and offer a cup of mate de coca, which may help some travelers. There is no data available to support its use in prevention or treatment of symptoms. However, people who drink coca tea will test positive for cocaine metabolites on drug screens for a couple of days.

If visiting Machu Picchu, consider arranging your itinerary from low altitude to high altitude. Lima is at sea level on the Pacific Coast, so there will be no adjustment to altitude. Most itineraries involve transit through Cuzco.

Alternatives to sleeping in Cuzco after arriving on a flight are:

- Travel on to the Amazon rain forest
- Descend to the Valle Sagrado (2900m, 9700ft) on the Rio Urubamba. One can then travel to Machu Picchu (2400m,7900ft) via Ollantaytambo (2700m, 9100ft), and then finally on to Cuzco (3400 m; 11,150 ft).
- Travel to Arequipa (2300m/7500ft) for a few days before land transportation to Cuzco

*Adapted from Travax 2018 and CDC Yellow Book 2018

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