HEALTH MATTERS: Dealing with Altitude

The purpose of this information is to explain some of the basic facts about altitude and its effects on the human body. We are not doctors and are not suggesting any specific drug or medical course of action to deal with maladies that may arise due to being at altitude. We recommend that before you venture into altitude you do some reading to inform yourself of what it is and how it affects your mind and body. We suggest you talk with people and doctors who are trained in altitude illnesses. It is your responsibility to learn the latest information and what drugs may help you with altitude sickness.

**** The material in this information sheet may not be the most current - check with your doctor! ****

We believe a POSITIVE ATTITUDE is as important as any remedy or drug you might want to use. Your mind and body can do amazing things when you let them adapt properly. Get in good physical and cardiovascular shape before arriving to altitude. Your body and your mind will thank you! Be informed, listen to your body, hydrate constantly and ascend slowly. If that does not work... DESCEND to lower altitudes as soon as possible!

A) Altitude Illness - where and when do we get it?

In general, it is rare to experience altitude illness below 6,000' (1,800 mts). The following scales define altitude: **High altitudes** range from 8,000' - 12,000' (2,438 - 3,658 mts), **Very High altitudes** range from 12,000' - 18,000' (3,658 - 5,487 mts) and **Extreme altitude** is anything over 18,000' (5,500 + mts)

B) Altitude and its effects on the human body.

As the altitude increases above sea level the barometric pressure is reduced - the air is less dense the higher up you go. The concentration of oxygen molecules remains the same, but the number of oxygen molecules per breath is reduced. In order to oxygenate your body properly your breathing rate has to increase (even during rest and sleep). This extra breathing increases the oxygen content of your blood but not to the same levels as at sea. Since the same amount of oxygen is still needed to do activity your body has to adjust to having less oxygen to do the same amount of work or in some cases even more. Air in the higher altitudes tends to be drier due to less moisture in the air, which affects your hydration levels of the body. In some cases, the combination of high altitude and lower air pressure causes fluid to leak from the capillaries in both the lungs and the brain. **Going to higher elevations without acclimatizing properly may lead to serious and in some cases life-threatening illnesses and conditions**. The higher the altitude the more severe the effects of altitude are on the body.

**** In order to avoid problems at altitude it is important to acclimatize properly ****

C) Acclimatization and how to deal with altitude.

As you rise in altitude your body needs time to adjust to the changes in atmospheric pressure and oxygen concentration in the air - this is called **acclimatization**. **The best way to avoid problems at altitude is to avoid abrupt ascents to high altitudes.** The major cause of altitude illness is going **"too high - too fast"**. Gradual ascent is the best and safest method to avoid altitude illness. The higher you go the more severe the symptoms may be and the more dangerous the illness can become. There are several types of altitude illness and all people are affected by them differently. There are **NO** specific factors like sex, age, physical condition or genetic make-up that correlate with a susceptibility to getting altitude sickness. **Everyone acclimatizes to altitude at different times! It's a very personal situation and do not compare yourself to others.**

Having been to altitude in the past **does not guarantee** that you will not get altitude sickness the next time you go high **nor does it mean you do not need to acclimatize properly**. If you do not live at altitude you still need to acclimatize - although the psychological aspect may be in your favor based on your past experience. All people acclimatize at different rates and manners. Many different changes in your body happen as it adapts to operate with less oxygen and you need to learn to be aware of them. As the body begins to acclimatize some the following occurs.

- Depth of respiration increases a lot while adapting to decreased atmospheric pressure in the lungs.
- Body production of red blood cells increases to carry more oxygen - the blood becomes more viscous.
- Pulmonary arterial pressure increases - forcing blood into areas the lungs normally don not use at sea level.
- Production of an enzyme increases and facilitates the release of oxygen from hemoglobin to body tissues.

In general, avoid abrupt ascents to sleeping altitudes over 10,000' (3,048 mts) from sea level. Avoid elevation gains of over 1,000' (300 mts) per day above 10,000' (3,048 mts). Elevation gain of over 1,000' (300 mts) per day is not recommended unless you're acclimatized. A good rule of thumb is to **"climb high - sleep low"**. This means: it's ok to do daily trips (at moderate exertion) to higher elevations which help in the acclimatization process, but you return to sleep at a lower altitude each day. Once in elevation, a gradual rate of ascent of about 1,000'(300

mts) per day is a good way to acclimatize and prepare for higher destinations. Once properly acclimatized higher elevation gains are ok.

**** Going too high - too fast is asking for trouble. Avoid problems...acclimatize properly! ****

D) Preparation and Prevention.

The best way to prevent illness is to **prepare** and **prevent**.

Preparation:

Before you get to altitude some previous preparation for your body and mind is important. If you prepare properly **before** you depart then you are helping your body get ready for the challenge.

1) Arrive at altitude in good cardiovascular health (smokers are not putting the odds in their favor)

2) If possible, do not drive or fly to altitude - start below 10,000' (3,048 mts) and walk higher. If you cannot avoid driving or flying - take it easy the first 24 to 48 hours before moving higher.

3) If you are above 10,000' (3,048 mts) do not go higher than 1,000' (300 mts) per day and take a rest day.

4) 'Climb High - Sleep Low' - you can go higher than 1,000' (305 mts) for the day but return to sleep low.

5) 'Don't go up... until Signs come down'- if signs of illness develop, wait and rest until they clear up.

6) Listen to your body and look for signs and symptoms - if symptoms increase go down, down, down!

7) HYDRATE! - DRINK 4-5 quarts (liters) a day – this means you will be emptying your bladder often during the day. Urine should be clear & copious. If it is yellow or dark it likely means you are not dehydrated, so start drinking! At altitude the air is drier and with the simple act of breathing your body looses moisture - replenish it!

8) Take it easy & do not over do it - light activity is better than sleeping because respiration decreases during sleep - thereby exacerbating high altitude illness symptoms.

9) Avoid tobacco and alcohol including sleeping pills, barbiturates and tranquilizers - they further decrease the respiratory drive and result in worsening the symptoms. Combining them is foolish.

10) Eat a diet that's high in carbohydrates and low in fat and white sugar – 50-70 % should be in carbohydrates. Eat fats & proteins on rest days but not at night since more oxygen is needed for digestion.

11) Keep in mind that not everyone acclimatizes at the same rate - make sure the group is well acclimatized before going higher. Do not put other peoples' health in danger by going higher - thereby endangering yours too if a rescue is called for.

12) The acclimatization process is hampered by not being physically fit, dehydration, poor diet, over-exertion, alcohol and drugs.

Prevention:

The best way to prevent altitude sickness preparing properly. In some cases **natural remedies** and **prescription drugs** may help in the complex process of acclimatization and the prevention of illnesses.

**** Knowing when to go down is one of the best remedies for altitude illness! ****

E) Types of Altitude Illness.

Illnesses caused by altitude are broken into 2 categories:

(I) Mild Altitude Illness: Acute Mountain Sickness (AMS)

(II) Severe Altitude Illness: High Altitude Pulmonary Edema (HAPE), High Altitude Cerebral Edema (HACE)

**** WARNING: CONSULT YOUR DOCTOR BEFORE TAKING ANY DRUGS! ****

Mild Altitude Illness

Acute Mountain Sickness (AMS) is common to travelers that ascend to altitudes over 7,000' (2,190 mts) quickly and without acclimatizing properly first. This is the mildest form of illness and can be easily cured or even avoided following a few basic preventative steps and alleviated by giving time for the body to adapt to altitude. The incidence & severity of AMS are related to altitude, speed of ascent, physical exertion and prior acclimatization. Some people are particularly susceptible to AMS and feel similar types of effects every time they ascend in altitude. Some people adapt to altitude better than others.

Signs and Symptoms: The affected person suffers from fatigue, shortness of breath, nausea, headache, loss of appetite, "flu-like" symptoms and has difficulty sleeping. The malaise may begin immediately to two or more days after ascent. Minor swelling of the hands, face or feet may be early signs of AMS. Children and older people are usually more susceptible to AMS than adults. Sleep may be sporadic and light and is often interrupted by frequent awakenings during which the subject has irregular breathing patterns that are characterized by periods alternating from rapid breathing to no breathing. When sleeping your body changes breathing patterns - this is when altitude affects the respiratory process more.

Treatment: When the milder symptoms develop it's a signal to go no higher until the symptoms have been resolved completely - which should disappear in 1-3 days.

1.) Watch the person closely for telltale signs of progression to more severe forms. Within a couple to three days the person should have improved enough to go higher but with caution. Symptoms will improve quickly once descent is initiated to lower elevations - a few thousand feet lower help immensely!

2.) For headaches you can give over the counter drugs like Tylenol (500-1000 mg.) or ibuprofen (Motrin) (400-600 mg.) or similar drugs designed for headaches. Mate de Coca (Coca tea) is natural and the traditional Andean cure and works wonders at altitude. Other natural herbs and remedies also work well - consult someone knowledgeable in those fields for suggestions.

3.) You may consider using a prescription drug like Diamox (acetazolamide) as treatment as well. Doses of 125 mg twice a day is the usual suggested dosage. Some people require higher doses than others.

4.) Minimize any type of activity or sudden movements - especially when getting up after lying down.

5.) Avoid sleeping pills at altitude! They interfere with the body's adaptation process and reduce respiratory rates, which in turn work against you while at altitude.

6.) HYDRATE! Pretend you are a goldfish and drink all day. It is one of the simplest ways to keep you healthy at altitude. You need to replenish lost liquids due to breathing and dehydration at altitude.

Severe Altitude Illness

High Altitude Pulmonary Edema (HAPE) is the more severe form of altitude illness. It can be fatal if not treated properly. It can affect both children and adults and seems to get worse on the third night. Basically this is the abnormal fluid build-up in the lungs (partly due to the lack of normal air pressure and extra workload lungs have to do at altitude). It can develop within the first four days of getting to altitude - mostly due to maladaptation to altitude (Too High - Too Fast!). Early diagnosis is key and descent to lower altitudes is necessary and must not wait if at all possible. Treatment at a hospital is mandatory for follow up diagnosis and treatment.

Signs and symptoms: Signs similar to acute **AMS**, tightness in the chest, cough with congestion, trouble breathing, marked fatigue, increased heart and respiratory rate, a feeling of impending suffocation even at rest and especially at night, bubbly sounds in the chest area and a persistent cough with liquid that is watery, white and frothy. Cyanosis (a bluish hue to the lips and fingernails) that indicates that not enough oxygen is reaching the brain. Confusion and irrational behavior are further signs that not enough oxygen is reaching the brain. If not treated quickly unconsciousness or coma may occur with death coming soon.

Treatment: IMMEDIATE DESCENT IS MANDATORY! If oxygen is available, immediate use combined with a rapid descent to lower altitude - going down a minimum of 2,000' - 4,000' (610 - 1220 mts) or more is best. If possible, evacuate to a hospital. The use of Diamox may help the condition temporarily. **If symptoms persist evacuation to a hospital is the only answer!** Complication from infection and other factors may affect the treatment and recovery time**.**

High Altitude Cerebral Edema (HACE) is the swelling of the brain tissue from fluid leakage. **This is life threatening and must be treated immediately!** This condition often comes from the pre-existing condition of HAPE and is complicated by staying at high altitudes for extended periods of time. Onset is sudden and with little warning - that is why monitoring HAPE closely is so important. **IMMEDIATE DESCENT IS MANDATORY!** Administering oxygen is vital and evacuation, accompanied with trained personnel, to a hospital is necessary. Professional care is needed for treatment and follow-up care.

Signs and symptoms: severe headaches, hallucinations, bizarre behavior, ataxia (loss of coordination), weakness, rapidly decreasing levels of consciousness, disorientation, loss of memory, psychotic behavior or coma - followed by death.

Treatment: Immediate administration of oxygen and **IMMEDIATE DESCENT!** Oxygen and descent will help prevent neurological damage and if done quickly enough possibly death. Evacuation to a medical facility is absolutely essential or death may be near. Follow-up treatment is mandatory.

**** RULE OF THUMB: If signs & symptoms do not get better, the best and first answer is to DESCEND! ****

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NATURAL REMEDIES:

Mate de Coca (Coca Tea):
In the Andes, the natural leaf of the coca plant has been used for centuries to aid in the prevention and in the cure of hundreds of maladies and is the traditional herb of choice. It is very good for the altitude and has been proven to help with mild cases of **AMS** by being brewed in hot water (like a tea) and drunk often during the day. It also aids in the digestion process at altitude and good for headaches and minor aches and pains. They even make it into toothpaste! It is being exported to medicinal laboratories worldwide.

There are other combinations of natural herbs and minerals that will aid in treating altitude sickness, but they are beyond the scope of this paper. Try natural health stores and online and see what may work for you.

PRESCRIPTION DRUGS:

Diamox (acetazolamide):
This prescription drug helps prevent fluid retention (it's a diuretic), decreases alkalosis, stimulates ventilation (breathing) and decreases hypoxemia during sleep. It helps you breathe faster so that you can metabolize more oxygen - this is especially helpful at night when the respiratory drive is decreased while sleeping (that's why sleeping pills are not good at altitude!) **This drug is a sulfonamide (Sulfa family) and can cause severe allergic reactions to those allergic to sulfa drugs. Do not take it or administer to anyone who has this allergy**. **If you do not know if you are allergic or not - get checked out by your doctor BEFORE departing on a trip**. Its' effects are not immediate that is why it has been recommended to start the dose 24 hours before arriving at altitude. The usual dose is 125 mg twice a day (morning and evening) - some people may require a higher dose than others. **Common side affects are** tingling or numbing of the lips, fingers and toes, as well as alteration of taste (beer, colas & carbonated beverages).

Procardia (Nifedipine):
This prescription drug is a blood pressure medication and has been used in the prevention and treatment of **HAPE**. It works by relieving the pressure and build up of liquids in the lungs. Must be administered by qualified medical personnel with adequate training to monitor subsequent signs and symptoms.

Decadron (Dexamethasone): [a steroid]
This prescription drug is used in the treatment and prevention of severe **AMS** and **HACE** by greatly reducing cerebral edema. Although it works well doctors do not use it often.

NON-PRESCRIPTION DRUGS:

Ibuprofen:
Besides being good for altitude headaches, it helps to decrease the bloods' ability to clot (sort of diluting it) - which in cases of **HAPE** or **HACE** may help to prevent blood clots forming and later dislodging and go to the lungs or brain and causing a stroke or other serious problems.

OTHER OPTIONS:

Oxygen:
Administered in controlled doses, oxygen is simply the safest and most sensible treatment for high altitude illness next to simply going down in altitude.

Suggested acclimatization process for climbing in the Bolivian highlands

If you come by plane to La Paz you will be arriving at 12,200' (3,700 mts). Very likely you will get a mild form of altitude sickness known as **"Soroche"** that affects most people in one form or another. Symptoms are typical of AMS: mild headache, labored respiration, accelerated pulse, lethargy, fatigue, insomnia, loss of appetite and dehydration. With proper acclimatization most of these symptoms disappear within a few days. Rest, take it easy, eat lightly (mostly carbohydrates - few fats) and hydrate - **not with alcohol!**

Day 1: Arriving in La Paz you should take it easy and rest. Some walking is fine (avoid the hills) to visit museums or take a city tour in a vehicle the first day. Eat light and stay away from good Bolivian beer.

Day 2: An easy day hike to some of the outskirts near La Paz should be good. Listen to your body and rest when you feel tired. Catch up on some reading. Keep yourself from getting cold and do not think because the sun is hot that you are in the tropics. If you catch a cold then your defenses will be weaker.

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Days 3-5: A visit to Tiwanaku for 1/2 day or possibly continue to Lake Titicaca for a three or four day trek around Copacabana and the Island of the Sun. The lake height is 12,500'/ 3,900 mts.

Days 6-7: Now you're probably ready for the next step - an easy trek to the basecamps averaging 14,500'/4,400 mts of the Royal Mountain range like; Condoriri, Huayna Potosi or Mururata.

Days 8-14: After a week of acclimatization then you're probably ready to do some climbing of the smaller peaks like Pequeno Alpamayo (17,700/5,400 mts.), Ilusion and Tarija and finishing with Condoriri proper (18, 525'/5,648 mts.) Or, you can continue with treks along trails that surpass the 16,400'/5,000 mts. mark.

Once you get really well acclimatized you can go for the big peaks (20,000'-21,400'/6,100-6,500 mts.) like Huayna Potosi, Illampu, Ancohuma, Illimani and Sajama.

REMEMBER:

~ ACCLIMATIZATION IS A PERSONAL ISSUE, YOU ARE UNIQUE, LISTEN TO YOUR BODY.

~ ALTITUDE WILL ALWAYS DICTATE WETHER YOU HAVE A SAFE AND ENJOYABLE TRIP.

~ COME PREPARED, GET IN SHAPE, STOP SMOKING, EAT HEALTHY. COME WITH A POSITIVE ATTITUDE.

~ RULE OF THUMB: IF SIGNS AND SYMPTOMS DO NOT GET BETTER, YOU MUST DESCEND!

~ PROPER ACCLIMATIZATION WILL PUT THE ODDS ON YOUR SIDE!

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