

## The High Altitude Traveller

### Definition of high altitude?

- High altitude - 2400m & 3658m
- Very high altitude - 3658m & 5500m
- Extreme altitude – 5500m and 8848m

### Where do people go?

Bogata in Columbia 2645m

Quito in Ecuador 2879m

Cuzco in Peru 3225m

La Paz in Bolivia 3658

### What is Acclimatization

- The process of the body adjusting to the decreased availability of oxygen at high altitudes
- Don't usually worry about elevations below 2500m as altitude illness rarely occurs lower than this

### What happens to you physiologically during ascent?

- The air still contains 21% oxygen but barometric pressure decreases so you have to work harder to obtain the oxygen by breathing faster and deeper
- Important to avoid anything that will decrease breathing e.g. alcohol and certain drugs
- Despite increased breathing its not possible to attain normal blood levels of oxygen at high altitude
- Persistent increased breathing results in a reduction of carbon dioxide in the blood
- Build up of CO<sub>2</sub> in the blood is a key signal to the brain that it's time to breathe
- If awake not a real problem, but if asleep, odd breathing pattern can happen
- Periodic breathing – consists of cycles of normal breathing which gradually slows, breath-holding and a brief recovery period of accelerated breathing
- Breath holding may last 10 – 15 seconds
- This is not altitude sickness....
- Dramatic changes take place in the body's chemistry and fluid balance during acclimatization - this results in an altitude diuresis
- Reason unknown, though it has an effect on increasing the concentration of red blood cells and perhaps improving the blood's oxygen carrying ability to a degree
- Also counteracts the tendency for oedema formation
- If not 'peeing' more at altitude, may be dehydrated or not acclimatizing well

## **So if you're not acclimatizing well, what can happen**

- Acute mountain sickness (AMS)
- High altitude cerebral oedema (HACE)
- High altitude pulmonary oedema (HAPE)

## **AMS**

- No telling who will develop AMS
- Selection of symptoms that indicates your body is not acclimatized to its current altitude
- There is an ideal altitude where your body is in balance – most likely the last elevation you slept at
- Extending above this is an indefinite gray zone where your body can tolerate the lower oxygen levels but not yet acclimatized
- Go too high above what you are prepared for and you get sick
- 'Zone of tolerance' increase with you as you acclimatize
- Limit your daily upward travel to stay within that tolerance zone
- Climb high sleep low
- Avoid alcohol
- Sleeping tablets
- Narcotic pain relief

## **Diagnosis of AMS**

- When a headache is present with one or more of the following symptoms after an ascent above 2500 meters (8000 ft)
  - Loss of appetite, nausea or vomiting
  - Fatigue or weakness
  - Dizziness or light-headedness
  - Difficulty sleeping

Because symptoms of mild AMS can be vague, useful rule of thumb is

- If you feel unwell at altitude, it is altitude sickness unless there is another obvious explanation
- AMS can lead on to life threatening illness

## **Treating AMS**

- Rest
- Fluids
- Mild analgesia
- Improvement usually occurs within one or two days but can take up to three or four
- Do not ascend further until recovered
- Descent is also an option – recovery will be rapid
- Once acclimatized to 3000m further ascent should be gradual, no more than 300m in sleeping altitude per day and a rest day every three days

## **HACE**

- The brain swells and ceases to function properly
- Can progress rapidly and be fatal in a matter of a few hours to one or two days
- Patient often confused and doesn't realise they are ill
- Other symptoms – ataxia, lethargy
- Straight line walk – if fail presume to have HACE!

## **Treatment of HACE**

- Descent without delay to at least the altitude they woke up feeling OK
- Other treatments could include oxygen, hyperbaric bag, dexamethasone
- People with HACE usually survive if they descend soon enough – staggering gait may persist for 4 days
- Once recovery is complete, and there are no symptoms, cautious re-ascent is acceptable

## **HAPE**

- Often occurs with AMS but not thought to be related and signs of AMS may be absent
- Signs and symptoms of HAPE
  - Extreme fatigue
  - Breathlessness at rest
  - Fast shallow breathing
  - Cough, possibly productive of frothy or pink sputum
  - Gurgling or rattling breaths
  - Chest tightness, fullness or congestion
  - Blue or gray lips or fingernails
  - Drowsiness
- Usually occurs second night after an ascent
- More frequent in young fit climbers
- Immediate descent is essential as choice of treatment – may need to be carried
- Unless oxygen is available, delay may be fatal
- These patients can also commonly develop HACE

## **Acetazolamide**

- Forces the kidneys to excrete bicarbonate, the base form of carbon dioxide; this re-acidifies the blood, balancing the effects of hyperventilation
- Acts as a respiratory stimulant especially at night
- Net effect is to accelerate acclimatization
- Lessens the risk of AMS
- Not an immediate cure for AMS – may half the time acclimatization takes, and doesn't cover up symptoms
- Doesn't protect against worsening AMS

### **Who should use acetamolozide and guidance for use ?**

- Travellers who would be flying directly into areas of altitude
- Travellers who have experienced altitude sickness before
- 125mgs twice daily started two days before ascending and continued for three days above 3000m
- Trial dose at sea level before travel
- Side effects can include nausea, circum-oral and finger tingling, diuresis, more unusual, rashes, flushing and thirst
- Contra-indicated in those allergic to sulphonamides
- Unlicenced in the UK for this purpose

### **Useful websites to access further information**

Information sheets at [www.travax.nhs.uk](http://www.travax.nhs.uk) and [www.nathnac.org](http://www.nathnac.org)

The International Society for Mountain Medicine  
[www.ismmed.org](http://www.ismmed.org)

The British Mountaineering Council  
<http://www.thebmc.co.uk/>