

TRAVEL AT HIGH ALTITUDE



Planning the trip of a lifetime, a holiday with a difference, skiing in the high mountains or a mountaineering expedition?

This booklet is written to help you understand some of the ways your body may change as it has to cope with high altitude and the 'thin air'. It is full of information, tips and stories to help you enjoy your trip and stay healthy. Most importantly, it also covers the serious altitude illnesses which still kill those unaware of the risks.

ISBN 0-901100-76-5



This booklet is recommended by:
Association of British Mountain Guides (BMG)
British Mountaineering Council (BMC)
International Mountaineering and Climbing Federation (UIAA)

TRAVEL AT HIGH ALTITUDE



ABOUT THIS BOOK



This book has been written by people who like being in the mountains, who have a particular interest in medicine and what can happen to people at high altitude. Its contents should be treated as a guideline only, based on current knowledge.

Research into high altitude illness is not easy to do, not comprehensive and far from complete.

Anyone travelling to high areas is advised to seek medical advice before going and also, where possible, if they become ill at altitude.

First published: 2007 This edition: 2008

The authors and the publisher have made every effort to ensure that information is accurate and as up-to-date as possible. However, they are unable to accept responsibility for any loss, injury or inconvenience sustained by any person, caused by errors or omissions or as a result of the advice and information given in this book.

All rights reserved. We encourage non-commercial use of this material as long as acknowledgement is made to the copyright holder. © Medex 2007, 2008
ISBN 0-901100-76-5

This book may be downloaded free from the website; www.medex.org.uk

PERSONAL DETAILS

NAME:		You may wish to add a photograph of yourself to this page.
DATE OF BIRTH:		
NEXT OF KIN CONTACT DETAILS:		
MEDICATIONS:		
ALLERGIES:		
SIGNIFICANT MEDICAL PROBLEMS e.g. diabetes, high blood pressure		
TREATMENT INFORMATION:		
INSURANCE DETAILS:		

DAILY AMS SCORES

Day	Alt	AMS Score										Notes			
		Morning					Evening								
		H	G	F	D	S	T	H	G	F	D		S	T	
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															

Headache, Guts, Fatigue, Dizziness, Sleeping, TOTAL

Score 0=Fine to 3=Worst

CONTENTS

1	Preface	22	The Joints / Muscles
2	Finding out about High Altitude	23	The Extremities
3	What is High Altitude?	24	The Eyes
4	Where in the World is High?	25	The Mouth / Teeth
5	Europe	26	The Ears / Nose
6	North & South America	27	The Reproductive Bits
7	Africa	28	Sleep
8	Asia	29	Children at Altitude
9	Australasia	30	Porters
10	Antarctica	31	What to do in an Emergency
11	Acclimatisation	32	Incident Record Card
12	The Effects of Altitude	33	Pills & Potions
13	Acute Mountain Sickness	35	Oxygen
15	The Brain	36	Pre-existing Conditions
16	HACE	39	Healthy Environment
17	The Lungs	40	Recommended Reading
18	HAPE	41	Useful Websites
19	The Heart / Blood	42	Credits
20	The Stomach / Bowels	43	Daily AMS Score Card
21	The Kidney / Bladder	44	Personal Details



PREFACE

In 1991 some doctors interested in mountain medicine saw a young, fit climber die on the Mera La. The doctor with him knew little about the risks of severe altitude mountain sickness.

The tragedy inspired the doctors to study altitude illness and share this information with others. The organisation 'Medical Expeditions' was born with this as its mission.

Ten years later, again high on the Mera La, Medical Expeditions' members saw an elderly Japanese lady slip into a coma and die, having been left behind by her friends. Another life was lost. Despite all the research and education there is still much that needs to be done to save such lives.

Since the early 1990s members of Medical Expeditions have, along with others, been busy studying mountain medicine.

They have done their best to improve the knowledge of doctors responsible for, or advising, people travelling at altitude.

This book looks at the effects

that travelling at altitude can have on your body and aims to help you to understand why you may not feel well or get ill. It suggests ways to avoid illness and suggests what you should do if you get an altitude related illness. Our own experiences and real cases have been used as examples.

The deaths on the Mera La were caused by going to high altitude, but both could have been avoided had simple rules been followed.

Medical Expeditions is teaching doctors about high altitude illness and wants others to learn about it too.

This book is our best attempt at helping everyone to stay healthy travelling at altitude.



Medex would like to thank the following for their written contributions:

Damien Bailey	The Joints / Muscles	Mark Howarth	The Eyes, Healthy Environment
Denzil Broadhurst	Finding out about High Altitude, What is High Altitude, Where in the World is High?, Europe, North & South America, Africa, Asia, Acclimatisation, The Effects of Altitude, Acute Mountain Sickness	Oly Kemp	The Lungs
Mike Brookes	What to do in an Emergency	Juliette Levement	The Lungs, Sleep
Keith Burgess	Sleep	Mandy Jones	Sleep
Simon Currin	Preface	Ian Manovel	Pills & Potions
Gerald Dubowitz	The Heart / Blood, Sleep	Alex Martin-Bates	Pre-Existing Conditions
David Geddes	The Mouth / Teeth	Dan Morris	The Eyes
Sandra Green	The Joints / Muscles	Stephan Sanders	Children at High Altitude
David Hillebrandt	HAPE, HACE, The Stomach / Bowels, The Kidney / Bladder, The Reproductive Bits	Eli Silber	The Brain
		Chris Smith	Europe, HAPE, HACE, Porters, Healthy Environment
		Jill Sutcliffe	Healthy Environment
		Henriette Van Ruiten	The Extremities
		Catharine Wilson	Africa, Australasia, Antarctica, Acute Mountain Sickness, The Lungs
		Jeremy Windsor	The Ears / Nose, Oxygen

Medex would like to thank the following for their case studies:

Jim Duff, Gill Macquarie, Martin Rhodes, Ronnie Robb, Jacky Smith

Medex would like to thank the following for their photographs:

Bruce Bricknell	Page 33	Chris Smith	Front cover, Page II, 5, 11, 15, 19, 21, 22, 28, 30, 31, 39
Denzil Broadhurst	Page 17, 23	Jacky Smith	Page 29
Simon Currin	Page III, 9, 10, Back cover	Catharine Wilson	Page 42
Diana Depla	Page 24	Jeremy Windsor	Page 35
Gerald Dubowitz	Page 12, 14, 20, 26, 41		
Rachel Hamilton	Page 6		
David Hillebrandt	Page 25, 27		
Annabel Nickol	Page 7		
Gill Macquarie	Page 4, 40		
Nick Mason	Page 2		
Ronnie Robb	Page 13		
Stephan Sanders	Page 1, 3,		
Dorje Sherpa	Page 8		

Medex would also like to thank:

All those who commented on the booklet drafts
The UIAA for their supporting grant

Editors:

General: Denzil Broadhurst, Chris Smith

Medical: Simon Currin, David Hillebrandt, Jim Milledge, Paul Richards

CREDITS



USEFUL WEBSITES



British Mountaineering Council (BMC) www.thebmc.co.uk/medicine
 Certec www.certec.eu.com
 Epilepsy action website www.epilepsy.org.uk/info/sportsandleisure/index
 Foreign & Commonwealth Office travel advice www.fco.gov.uk/travel
 Frostbite www.christopherimray.co.uk/highaltitudemedicine/frostbite.htm
 Gamow Bag www.chinookmed.com
 General travel information www.fitfortravel.nhs.uk
 International Porter Protection Group (IPPG) www.ippg.net/guidelines/index.html
 International Society for Mountain Medicine (ISMM)
www.ismm.org/np_altitude_tutorial.htm
 Kathmandu Environmental Education Project (KEEP) www.keeppnepal.org
 MEDEX www.medex.org.uk
 - has a full list of UK doctors holding the UIAA Diploma of Mountain Medicine
 Mountains for Active Diabetics (MAD) www.mountain-mad.org
 Oxygen (constant flow system) www.topout.co.uk and www.poisk-ltd.ru
 Oxygen (demand flow system) www.summitoxygen.com
 Portable Altitude Chamber (PAC) www.treksafe.com.au
 Union Internationale des Associations d'Alpinisme (UIAA) www.uiaa.ch/index.aspx

FINDING OUT ABOUT HIGH ALTITUDE

This booklet has been put together by two linked organisations with an interest in high altitude travel and high altitude medicine.

Medical Expeditions' aims are:

- To investigate all aspects of altitude related illness.
- To educate mountaineers and trekkers and their doctors about the nature and avoidance of altitude related illness.

Established in 1992, it has acquired an internationally respected reputation for its research and educational work.

Medical Expeditions specialises in researching on relatively large sample groups over a long period of time. A typical expedition is comprised of 75 members exposed to altitude for 6 weeks.

Medex is a club which organises adventurous expeditions worldwide and supports the work of Medical Expeditions. It provides a link between those who have an

interest in adventure and in adventure medicine. Medex has run successful expeditions to Everest in 1994, Kangchenjunga in 1998 and Hongu in 2003.

To find out more about what we do, or to join us, please take a look at our website.



WHAT IS HIGH ALTITUDE?



Good question! In this book, we are talking about going from close to sea level to anywhere above 2,000m. Our bodies are used to working at home. When we go higher they need to adapt.

Altitude starts to have an effect around 1,500 - 2,000m. The body starts to behave slightly differently as it tries to make up for the change in oxygen levels. Go up too fast to about 2,500m and altitude illnesses are common.

Given enough time to adapt, most people can adjust to altitudes between 5,000m (Everest base camp) and 5,500m. Above 5,500m few people can adjust any more. Health and ability then get worse.

So what's different about travel at altitude? The main difference is that as you go higher the air pressure gets lower (the air gets 'thinner'), and this means for any single breath that you take there

will be less oxygen for your body. Oxygen is needed to give you the energy to move, but is also needed simply to keep your body alive - for your brain and digestion to work, for healing cuts, and all those normal things your body does without you knowing about it.

As your body gets less oxygen it adapts. You breathe faster and deeper. It makes more red cells to carry more oxygen in the blood. Changes take time to happen. If

you go slowly you should stay healthy. Go up too fast and you risk suffering from altitude related illnesses, such as Acute Mountain Sickness (AMS).

9,000m	Death zone	Everest
8,000m		▲ 8,850m
7,000m	Extreme altitude	Kilimanjaro
6,000m		▲ 5,985m
5,000m	Very high altitude	Inca Trail
4,000m		▲ 4,198m
3,000m	High altitude	Ben Nevis
2,000m		▲ 1,344m
1,000m	Sea Level	
0m		

RECOMMENDED READING

The High Altitude Medicine Handbook, by Drs Pollard & Murdoch

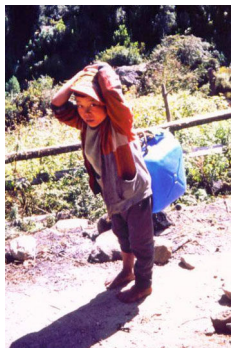
Bugs, Bites, and Bowels, by Dr Wilson-Howarth

Altitude Illness: Prevention & Treatment, by Dr Stephen Bezruchka

Pocket First Aid and Wilderness Medicine, by Drs Jim Duff and Peter Gormley



HEALTHY ENVIRONMENT



The environment at high altitude is more fragile than at low altitudes. As a result, natural processes are incredibly slow and any damage can be more long lasting.

At home water, fuel, food supply and sewage disposal are rarely a concern for us. At high altitude we need to be responsible. What we do will affect the local people and others who visit the area after us.

Be aware that some hosts are now stretching their precious resources to the limit to provide 'modern' facilities to make guests 'happy'.

Water is scarce:

- Do nothing that will pollute rivers.
- Avoid hot / cold showers - a bowl of water will do.
- Use an earth toilet, not a flush toilet.

Food is hard to grow:

- Buy food where it is plentiful.
- Take care if buying food in remote areas - people may be selling you their winter rations.

Wood is precious:

- Ensure you take all the fuel you need with you - for everyone.
- Actively discourage staff from collecting and burning wood.
- Support tree planting schemes.

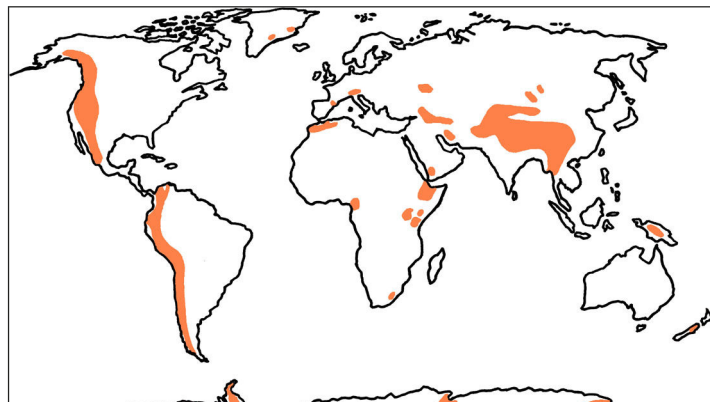
Waste is a huge problem:

- Don't buy bottled water - empty bottles have nowhere to go.
- Carry out everything you carry in. Take packaging off at home.
- Dispose of batteries back home.
- Be aware of what is happening to all your group's waste and stop bad practices.
- Use deep, well placed pit latrines. Bury deep or spread poo (or carry it), it can take years to break down.
- Plan sanitary wear disposal.

Flora and Fauna are adapted to a fragile life at high altitude:

- Don't uproot plants.
- Avoid damaging thin soils.
- Protect all wildlife.

WHERE IN THE WORLD IS HIGH?



There are many places in the world where you can go to high altitude.

You can choose to, by going on a trekking or climbing holiday. It may come as more of a surprise when using high ski runs, driving or cycling over high passes or even flying into towns and cities which are high.

Each high altitude area has its own problems. Before travelling you should find out more about where you are going.



EUROPE

Ask someone to name the high mountain ranges of the world and they will most likely name the Himalayas and the Andes. Most people don't know that the mountains of Europe are high enough to cause people to suffer from high altitude illnesses. In fact many holiday makers and novice climbers in the Alps will often know little or nothing about high altitude illness. High altitude headaches on tourist trips are possible, and some people will suffer from other problems too.

In the Alps it is easy for people to get to high altitude really quickly and easily using cable cars, mountain railways and ski lifts. Many of the mountain passes have high points that are over 2,000m.



Climbing trips in the Alps or in parts of Eastern Europe can also put you at risk of altitude related illness - especially when sleeping in the mountain huts.

A family of four took the mountain railway from Grindelwald (1,034m) to the Jungfrauoch, walked up to the hut at 3,650m and had a picnic. After about 4 hours at altitude, the 11 year old complained bitterly of a headache. The family descended on foot and then by train. The boy was sick on the descent. On reaching the valley he swiftly recovered. His symptoms were caused by Acute Mountain Sickness (AMS) which the family had never heard of.

LUNG CONDITIONS

Before you go:

- Know that even mild breathlessness at home can seriously affect you at altitude.
- Ensure you are up to date with travel vaccinations and consider flu vaccine.
- Build up training, starting at lower altitudes and lower levels of exertion.

At altitude:

- Gain height gradually without rushing.
- Prevent problems - reduce activity, take medication and descend if needed.

ASTHMA

Some people get worse as cold and exercise trigger attacks. Most improve due to an increase in the body's own steroids and reduced airborne allergens.

Before you go:

- Do not go unless your asthma is stable.
- Ensure you are up to date with travel vaccinations and consider flu vaccine.
- Include spare inhalers / spacers and steroids.
- Know triggers for your asthma and try to avoid these on your trip.
- Build up training, starting at lower altitudes and lower levels of exertion.

At altitude:

- Carry all your inhalers at all times.
- Prevent problems by reducing activity, taking medication and descend if needed.
- Avoid anti-inflammatory drugs (like aspirin and ibuprofen).

EPILEPSY

Before you go:

- Make sure your epilepsy is stable. Aim to be seizure free for at least 6 months.
- Be aware of issues regarding driving, belaying, etc and make sure your companions are aware of the problems.
- Ensure any Malaria medication doesn't interfere with your own medication.

At altitude:

- Avoid illness - it may affect your medication.
- Know your epilepsy trigger factors (e.g. alcohol, tiredness) and avoid them.
- Epileptic medications can affect sleep and change coordination. These symptoms can also be caused by altitude illness, if in doubt descend.
- Remember fits in some places could be life threatening, and you may be drowsy after fits and need rest.

DIABETES**Before you go:**

- Before booking get a specialist eye test. If you have eye damage avoid going very high.
- Before booking get expert medical advice if you have poor circulation or nerve damage.
- Establish good glucose control over preceding months.
- Get a robust glucose monitor (and spare) that will work at altitude and in the cold.
- Find out what you will be eating. Plan your diet.
- Take spare insulin to cover changes in requirements.
- Practise managing diabetes when exercising hard and in adverse conditions.
- Make contact with 'Mountains for Active Diabetics' (MAD).

At altitude:

- Always carry emergency glucose, glucose monitor and medication.
- Stop insulin freezing e.g. inside pocket close to skin.
- Avoid infection. Get help fast if you become ill. Never stop insulin.
- Remember exercise reduces and rest increases insulin need.

HEART CONDITIONS & HIGH BLOOD PRESSURE**Before you go:**

- Get your heart checked out and get advice on emergency medications for new onset chest pain.
- Have a stable and acceptable blood pressure prior to departure.
- Find out about problems with BP medicines with exercise, altitude and cold.

At altitude:

- If you feel unwell, stop further ascent, consider descent. Tell your companions.

ALLERGIES / ANAPHYLAXIS

Once a reaction has been treated it may recur, without warning, within the next 24 hours. Aim to get to medical care as soon as possible.

Before you go:

- Get adrenaline, antihistamines and steroids.

At altitude:

- Carry MedicAlert bracelet / necklace with allergies on it.
- Carry auto-injector adrenaline (EpiPen) at all times and be prepared to use it.

NORTH & SOUTH AMERICA

Skiing and climbing in the Rockies may put you at risk, and some people will be affected in the towns and cities. For example the town of Leadville, Colorado is above 3,000m.

The major mountains of North America are in the northern latitudes, where air pressure is lower for the same altitude than at the equator.

In the Andes it is possible to fly or even drive into places such as Cusco (3,326m), or La Paz (3,600m) without any acclimatisation en route. You

should rest for the first few hours then take things easy for a few days before trying one of the high treks such as the Inca trail.

FIFA have banned international football matches in La Paz in Bolivia since the home team have a major advantage due to their natural acclimatisation to the lack of oxygen.



A businessman hoping to clinch a multimillion dollar contract flew to La Paz (3,600m) in Bolivia the day before an important meeting. His company had decided to save on the expense of sending him a few days early to enable him to acclimatise. He felt so ill when making his presentation that he lost the contract. The next time he will make sure he gets the chance to acclimatise.

AFRICA

The major problems occur on Kilimanjaro, where due to the costs being based on the number of days you are on the mountain, many organised groups ascend far faster than the recommended 300m per day. It is possible to spend time on some of the adjacent mountains to

help acclimatise before tackling the main summit.

Some companies are starting to offer itineraries which take account of this. It is worth spending a bit extra to stay safe and achieve your goals. Find out from the trekking company how many people did and

how many didn't reach the top (or Gilman's Point) on their last few trips. Ask how many days they were trekking. A safe ascent should take 8 to 10 days.



An experienced British Mountain guide with training in mountain medicine was leading a group up Mt Kilimanjaro (5,895m). They came across a very scared group with a collapsed 17-year-old boy. The guide injected dexamethasone at the same time as commencing a rapid and life saving descent. On arrival at a hut shelter he used his satellite phone to contact a UK climbing doctor who advised further descent through the night. Two days later the boy was fit and well. Had anyone in the group known a little more about altitude illness they may have been able to avoid the emergency. Sadly they all learned some lessons the hard way.

PRE-EXISTING CONDITIONS

People do go to high altitudes with pre-existing medical conditions. If you suffer from a condition, you must talk to your doctor about whether or not you should go to high altitude and, if you do, how you should take care of yourself.

With any condition there is more risk to health when travelling to remote locations. The key is to lower this risk as far as possible. Be prepared to give up part or all of your trip for safety reasons.

Before you go:

- See your doctor / specialist at least 6 months before your trip. Find out about the risks your condition poses for travel at high altitude.
- Make a medical plan and what, if any, support you will need. Find out what medical help may be available. Think about what you will do if things go wrong.
- Make a contacts list for your condition for home / where you are going.
- Make everyone aware of your medical condition, the signs, symptoms and treatment. Your illness could affect everyone in your group.
- Get first aid / medical training for yourself and others if necessary.
- Make a kit with your medicines. Make clear labels and instructions. Have spare supplies and split the kit between people to lower the chance of losing it all.
- Ask your doctor to prepare an official letter, explaining your condition, treatment and contact details (translate if necessary).
- Tell your travel nurse about your conditions before vaccinations, etc.
- *Get medical insurance that covers your condition and the risks of the trip. It can be hard, very expensive or impossible to cover what some people want.*

At altitude:

- Always carry your medical information letter / MedicAlert bracelet.
- Each day, write down medicines taken and any changes in your condition.
- If symptoms worsen avoid further ascent, consider the possibility of altitude related illnesses and descend as necessary.
- Be honest with everyone about changes in your medical condition.
- Look after your family, friends and other travellers.

OXYGEN

The lack of oxygen causes many high altitude illnesses, the only real way to fix the problem is to get more oxygen. This can be done simply and sensibly by DESCENDING, or if this is impossible there are two ways to get more oxygen at altitude.

(1) From an oxygen bottle

Oxygen cylinders can be fitted with a face mask. The person needing oxygen simply puts on the mask and breathes in the oxygen, mixed with some of the surrounding air. If using a 'constant flow' kit (oxygen flowing all the time) at 2 litres per minute, a bottle containing 300litres will last 2 to 3 hours. If using a 'demand flow' kit (oxygen flows only when breathing in), the same bottle may last 6 to 9 hours.

(2) Inside a pressure bag

Those suffering from AMS, HAPE or HACE can be placed inside a

'bag', known as a Portable Altitude Chamber, Certec or 'Gamow Bag'. The bag is 'pumped up' to increase the pressure inside - so the oxygen breathed is like that 2,000m lower. The person should stay inside for 1 hour but may need several hours. Lifting the head end may help with breathing. Although these bags can be a life-saver, there are problems:

- Hard to talk to the person inside.
- An unconscious person needs someone inside to monitor them.
- They can damage the eardrums.
- The air inside needs changing.
- Recovery is often short-lived.



A couple decided to climb Kilimanjaro (5,895m) by the Marangu route. After two days trekking they reached the Horombo Hut (3,760m). Within two hours the husband began to feel breathless. During the night he began to cough up pink frothy spit and became unconscious. He had HAPE and was placed inside a 'Gamow Bag' for 4 hours. He came round and was able to descend with porters' help. In hospital he made a complete recovery.

ASIA

The most popular areas for high altitude trekking and climbing are in this part of the world.

From Nepal, Pakistan or India it is usually possible to make a gradual ascent into the mountains - ideally avoiding the highest landing strips. 84% of people flying in to the

Hotel Everest View (3,860m) suffered AMS.

A gradual ascent to the Tibetan plateau is impossible, so AMS symptoms must be carefully monitored and exercise kept to a minimum until acclimatised.



While cycling from Lhasa to Everest Base Camp, a group had crossed two 5,000m passes in 8 days. On day 9, at 4,150m, one member of the team woke up feeling dizzy and nauseous, was shivering and unable to walk straight. By midday, with no improvement, the group decided to go down. This was over a 5,150m pass. The casualty turned blue, was hardly breathing, 'rattling' and frothing at the mouth. Once over the pass, her condition improved. The group stayed at 4,100m that night and the local doctor wrongly diagnosed high blood pressure. Luckily they met a climbing doctor with drugs to treat altitude illness. They dropped to 2,400m by truck the next day and finally on to Kathmandu for medical attention.

AUSTRALASIA

New Zealand has many peaks over 3,000m but very few reported incidences of altitude illness requiring evacuation, though frostbite is common on Mount Cook.

Australia's highest point Mount Kosciuszko (2,200m) is an easy walk so is unlikely to cause altitude problems but it is still possible.

Papua New Guinea / Indonesia have a number of mountains over 3,000m, the highest being Puncak Jaya (Carstensz Pyramid) at 4,884m. Many tourists report AMS symptoms spoiling their trip and some trekkers have died. As with the

African peaks it is worth trying to ascend more slowly and acclimatising if possible. The difficult tracks, lack of reliable maps, muddy wet seasons, limited medical care and risk of tropical illness can turn what looks like an easy weekend into a nightmare.

Borneo - Mt Kinabalu 4,101m can be climbed rapidly, resulting in a high incidence of AMS.



In 1982 two climbers were stormbound for two weeks on the summit of Mount Cook. When the weather improved, and they were rescued, both had suffered frostbite to their feet due to the combination of cold and altitude. Both men had their feet amputated. They have each returned since then to summit the mountain, with one of them also summiting Everest.

Problem	Drug	Dose
AMS	Paracetamol	500mg tablet, 2 tablets 4 times a day
Headache	and / or ibuprofen	400mg tablet, 1 tablet 3 times a day
AMS	Metoclopramide	10mg tablet up to 3 times a day
Nausea	or Prochlorperazine	1 to 2x5mg tablets up to 3 times a day
AMS Prevention	Acetazolamide	Half a 250mg tablet 2 times a day, started 24hrs before ascent
HACE	Oxygen gas	Breathed continuously - cylinder or pressure bag
	Dexamethasone - Corticosteroid	8 - 16mg a day in divided doses, for up to 5 days
	Acetazolamide	250mg tablet, 1 tablet 3 times a day
HAPE	Oxygen gas	Breathed continuously - cylinder or pressure bag
	Nifedipine	20mg MR tablet 2 times a day
	Acetazolamide	250mg tablet, 1 tablet 3 times a day
Diarrhoea	Ciprofloxacin	750mg 2 times a day
	or Azithromycin	Capsules taken daily for 3 days
	Loperamide	2mg capsules taken up to 8 times
Dehydration	Electrolyte rehydration solution	in 200ml of boiled and cooled water
Infections	Amoxicillin	250mg 3 times a day for at least 5 days
	and / or Metronidazole	200mg 4 times a day or as recommended by doctor
Cough	Pholcodine	Linctus 10ml up to 4 times a day
Sore Throat	Lozenges with anaesthetic	i.e. Benzocaine
Dry chapped lips and skin	Lip balm & sunscreen	with at least SPF 15 - skin section
	Moisturiser cream	
Blocked nose	Pseudoephedrine	60mg 3 times a day
	or Xylometazoline	Nasal spray
Cold sores	Aciclovir	5% cream - 5 times a day for 5 days

PILLS & POTIONS

No trip to high altitude should leave without certain medicines. Some are prescription only and should only be taken on the advice of a doctor. Some of them can save your life while others will ease some symptoms, leaving you to enjoy the trip.

Opposite is a brief list of drugs used at altitude. Use it to help you decide what to take, but remember medical advice changes so check before you go.



Always carry a letter from your doctor about your medicines to avoid legal problems.

Before you go:

- Take this list to your doctor and use it to discuss what to take and how to administer it.
- Buy medicines at home. Your chemist should stock all except oxygen. Medicines may be cheaper abroad but may be fake.
- Confirm any allergies.

At altitude:

- Make sure **you** have your medicines and doctor's letter.
- Carry medicines labelled with the doses in quick to open, zip-lok bags. Keep them in two or more places in case you lose some.
- Always wash tablets down with water - they will work better.

I was stung on the shoulder with a needle-like pain. Three minutes later I started to feel itchy. After another minute I fell into someone's arms as the 'lights went out'. The team shouted for our medical barrel. Oxygen, adrenalin, antihistamine and a drip were all given in a matter of minutes. An hour later I started to recover. Next day I was able to carry on with the trip. I owe my life to the quick actions of our group's doctor. I now always carry an EpiPen in case I get stung again.

ANTARCTICA



Antarctica is the coldest, highest, windiest, driest and iciest continent on earth with an average altitude of 2,300m. The highest point is Mount Vinson at 4,892m. The ice can reach a depth of 4,700m in places.

Most people visit Antarctica as part of organised expeditions or work projects and have training in altitude conditions and guides. However with the continent opening up to independent travel some

companies are offering climbing packages. It is worth remembering that pressure is lower in the Polar Regions. Low pressure weather systems can also lower the pressure further. As a result reduced oxygen levels and AMS will develop at lower altitudes than elsewhere.

Extreme cold makes altitude related problems even worse.

A fit 66-year-old tourist flew from the Patriot Hills camp at 887m to the Pole at 2,800m. She hurried the 300m to the flags to take photos then needed help to climb the 30 steps into the NSF research base. She was short of breath and had a headache. She was treated with oxygen, fluids and simple painkillers. Later that day she was able to walk back to the plane and made a full recovery at Patriot Hills the following day.

ACCLIMATISATION

When the body slowly adapts to lower oxygen levels the process is called acclimatisation.

Different people acclimatise at different speeds, so no rule works for everyone, but there are good guidelines.

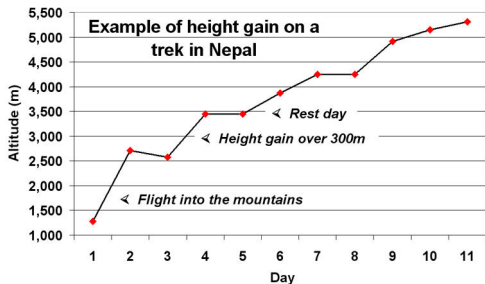
Over 3,000m go up slowly, sleeping no more than 300m higher at the end of each day. Going higher during the day is ok as long as you go down to sleep ("walk high - sleep low"). If you go up higher and can't descend - take a rest day to allow your body time to 'catch up'.

This may seem very slow, and some people will comfortably be able to go up much faster, but in a group someone will always be the

slowest to acclimatise - and the timetable should be made to keep them healthy. A rest day scheduled after every 2 to 3 days will also help.

Driving or flying to high altitude means more people will suffer from AMS.

It is really sensible to find out about the height of your planned route before you travel. Better still, make a drawing to show the height that you will sleep at each night. If you don't know - ask. There's no better way to spot the days which are likely to cause altitude illness.



INCIDENT RECORD CARD

Fill out as much of the incident record card as you can before leaving the scene. It contains valuable information for emergency staff and may help further treatment of the casualties.

For each casualty:

- Name:
- Date of birth:
- Allergies:
- Medication:
- Previous medical problems:
- Time of last meal / drink:
- What happened:
- Injuries:
- Treatment given:

For your group:

- Exact location:
- Type of incident: (what happened)
- Hazards in area:
- Access to the area: (how to get to you)
- Number of casualties:
- Equipment needed:

Time:

Date:

Name of recorder:

Signature:

WHAT TO DO IN AN EMERGENCY

- The fact you are reading this section suggests that you are planning ahead or that something has gone badly wrong. Whatever the case, the most important thing is not to panic. The following points are aimed at helping you to deal with an emergency.
- Make sure everyone is safe - yourself, any casualties, the rest of the group. If one person has hypothermia, the chances are others may have it too. Move to somewhere safe if you have to. Do not become another casualty.
- Have one person in charge.
- Collect the information you need. Use 'ETHANE' as a guide.
- Treat casualties as best you can. Prioritise care based on how bad each injury is. Basic first aid is OK. Simple splinting and kind words can go a long way.
- Make evacuation plans - local transport, carry or helicopter.
- Keep everyone warm and safe until help arrives - it could be minutes, hours or days.



Helicopter Landing Zone

- Find firm, level ground (or even slope below 10°), about 100 paces in diameter.
- Clear loose objects & people from the area.
- Mark with 'H' using stones, or use flashing torch or brightly coloured clothing to attract attention.
- 1 person stand outside zone, back to wind making Y shape with arms.
- Do not go to helicopter until told to by the crew.

Exact location.

Type of incident.

Hazards to rescuers.

Access to the incident.

Number of injured / ill.

Equipment required.

- Communicate. The sooner you call for help, the better. Radios and telephones may not work in the mountains. Give your location first (so they know where the problem is). Be accurate.

THE EFFECTS OF ALTITUDE

Most people going high have to deal with altitude related illnesses. Dealt with correctly, they are unlikely to be a major problem. Dealt with incorrectly they can be disastrous - spoiling the trip for the person who is ill and those with them.

Being honest about how you feel each day can make a difference, and knowing what's happening to you could save your life.



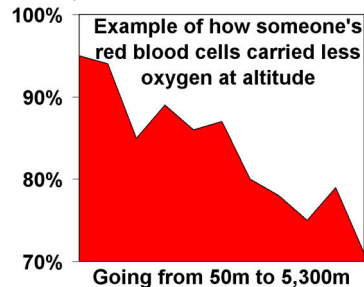
Some very strange things can happen to your body when you go high!

Most people who have been to altitude can tell you about having headaches, being out of breath, sleeping badly and not feeling hungry. These are symptoms of AMS. AMS is uncomfortable, not life threatening. If the AMS symptoms become severe and you keep going higher - fluid in the brain (High Altitude Cerebral Oedema - HACE) or fluid in the lungs (High Altitude Pulmonary

Oedema - HAPE) can happen and these can kill you very quickly.

What people don't know about is that you'll need to pee more, your balance may become unsteady, your eyesight could change and your nails will grow differently.

We hope the following pages will tell you about some of the things you may experience and how best to deal with them. Some are mainly about comfort, but some can lead to long term damage to health or death. Finding out about what your body is doing as it goes higher is fascinating and can become part of the fun of travel! In fact, when you think how clever your body is at dealing with such big changes, you may even want to know more!



ACUTE MOUNTAIN SICKNESS (AMS)

The common symptoms for AMS are:

- Headache.
- Nausea (feeling sick).
- Vomiting (being sick).
- Fatigue (feeling tired).
- Poor appetite (not hungry).
- Dizziness.
- Sleep disturbance.

A simple scorecard is shown on the next page, and on Medex expeditions everyone keeps a check of their scores twice a day.

It's good if everyone logs how they feel while travelling (copy the sheet in the back of this booklet) - and is honest with others in the group. Everyone can help make decisions - to go up, to have a rest day, or to go down. As a group, everyone's health and happiness is



equally important.

Hiding illness or pushing someone on could be fatal.

Some people just seem to acclimatise slowly, and need to take things more gently.

If you are unfit, it doesn't mean you are more likely to suffer, but overdoing it might be risky. If you are unused to exercise, feeling tired while trekking is not surprising. Similarly if you are sleeping in a tent every night and are not used to it, your sleep may be poor. The food may also be very different.

The most important thing is: are the symptoms getting better or worse?

If you think you are getting worse - walk down (at least 500 to 1,000m lower for sleeping). Give your body extra time to acclimatise. Don't leave this decision until it's too late.

Before you go:

- Learn about the symptoms of AMS.
- If you plan to use Diamox - learn all about the side effects and try one at home to find out how you feel.
- Check you are not allergic to Diamox (a sulphonamide).

PORTERS

If you (or your travel company) are hiring porters to help with your holiday, you are responsible for them. You must consider their health and safety - it is as important as your own.

Porters who have trekking jobs don't always live at high altitude all the time. They can suffer from altitude illnesses in the same way that visitors do. In the past ill porters were seen as 'useless', 'paid off' and sent home. Many died going down alone.



Kulbahadur, a 33 year old porter was left by the trail when he was too ill to carry his load in the Everest National Park. Later he was found unconscious by another trekking group, eventually losing his feet to frostbite. He never knew the name of the company or the nationality of the trekkers he was carrying a load for.

The International Porter Protection Group (IPPG) have set clear standards which all parties should aim to achieve. These include the provision of:

- Adequate clothing and footwear.
- Adequate shelter, food and drink.
- Medical care and life insurance.
- Care on descent if ill.
- Appropriate sized load to carry.

Questions to ask companies (or yourself)

1. Does the company you are thinking of trekking with follow IPPG's five guidelines on porter safety?
2. What is their policy on equipment and health care for porters?
3. What do they do to ensure the trekking staff are properly trained to look after porters' welfare?
4. What is their policy on training and monitoring porter care by its local ground operator?
5. Do they ask about treatment of porters in their post trek questionnaire to clients?

CHILDREN AT ALTITUDE

Children have the same problems at high altitude as adults, but it is more difficult to tell when they are having these problems. It is essential to climb slowly to allow children time to acclimatise.

Young children can't tell you how they feel. The carer should be guided by the child's fussiness, eating, sleeping and playing. If these are worse than usual the child should be assumed to have altitude illness and stay at the same

altitude or descend until they are better.

Older children can describe the symptoms of AMS, which are the same as for adults. Assume symptoms are caused by altitude and stay at the same altitude or descend until they are better.



Before you go:

- Discuss plans with your doctor at least 3 months before leaving.
- Think about: clothing, clean water supply, strange food, sunscreen, sunglasses, preventing boredom and realistic goals.
- Consider how you would get help if your child became seriously ill and who would look after them if you became ill.
- Be sure this is a sensible holiday for the children.

At altitude:

- Treatment for children with altitude illness is the same as for adults, but children weighing below 40kg need smaller doses of medicines and prefer syrups.
- Carry a card with children's weight, drugs and doses on.
- *Remember descent is the best treatment.*

4 year old Tommy was taken to Colorado's Arapahoe Basin ski resort at 3,290m. He had enjoyed staying with friends lower in the valley, but was very unsettled during the first night at the resort. The next day he was miserable and refused meals. After he was sick he was taken to the resort doctor who diagnosed AMS and recommended descent. In the valley he was back to normal 6 hours later.

AMS Scorecard			Total
Headache	None	0	
	Mild	1	
	Moderate	2	
	Severe / incapacitating	3	
Guts / Stomach	Good appetite	0	
	Poor appetite, nausea	1	
	Moderate nausea or vomiting	2	
	Severe / incapacitating	3	
Fatigue / Weakness	Not tired or weak	0	
	Mild fatigue / weakness	1	
	Moderate	2	
	Severe / incapacitating	3	
Dizziness / Light-headedness	None	0	
	Mild	1	
	Moderate	2	
	Severe / incapacitating	3	
Difficulty sleeping	As well as usual	0	
	Not as well as usual	1	
	Woke many times, poor night	2	
	Could not sleep at all	3	

At altitude:

- If you have a headache and a total of 3 or more for the others, do not go any higher.
- If you have a headache, and a total of 3 or more for the others, have got no better or got worse - go down.



Diamox The drug acetazolamide (trade name Diamox) can be used to reduce the effects of AMS, useful where big height gains are unavoidable. It also helps periodic breathing (see page 28). It works by speeding up acclimatisation, but does not mask the symptoms of AMS. You can still get AMS, HAPE and HACE while taking it.

Some people are allergic to Diamox. There are side effects, e.g. tingling, especially of hands, feet and face. Some people find this unpleasant, but it is not harmful and will go away when you stop taking the drug. It also makes you pee even more.

THE BRAIN

The brain is affected by altitude because it needs a good supply of oxygen and may swell causing pressure.

High Altitude Cerebral Oedema

(HACE) is caused by brain swelling and can kill very quickly if not treated. Some people feel no effects. Others may

suffer any (or all) of the following:

Headaches - very common at altitude, especially if you suffer headaches or migraine at home.

Loss of balance - co-ordination and balance may be affected. Older people and those who are acclimatised feel less effect. 'Clumsiness' and bad judgements increase the risk of accidents.

Mood changes - on a 'trip of a lifetime' there will be good days and bad days. Bad days can trigger disappointment and depression. Be prepared for mood swings!

AMS / HACE - see other pages.

Stroke - developing sight or speech problems and / or a weak arm, leg or face are signs of a stroke. (Some migraine sufferers have similar effects during an 'aura').

Before you go:

- Learn the signs of HACE & stroke.
- Prepare medical supplies.
- Consider expectations / fears and who will support you on bad days.

At altitude:

- Headache (AMS) avoid triggers - dehydration, exhaustion, alcohol - treat with painkillers.
- Stroke - treat with ½ a 300mg aspirin & descend. See a doctor.
- Be honest about how you feel.

I set off at the back, with a sore head, coughing. My cough and head got worse. A 'drag' feeling began in my mouth. When I met the others, I plucked up the courage to ask if 'my speech was slurred'. The shock hit me. I had heard myself mumble incoherently. They looked horrified, my words just dribbled out, I couldn't use my left arm, no power, my left hand tingled, the left of my face was paralysed and my head sore. I was done for!!! Expert medical care and rapid descent saved my life.

SLEEP

Disturbed sleep during the first few nights at altitude is common and normal. You may be slow in getting to sleep, wake up a lot and feel that you have not slept well, or feel less refreshed.

Poor sleep may be related to



how well your body is adjusting. As you acclimatise sleep usually improves. People with AMS may

also sleep badly, suggesting poor acclimatisation.

Other things such as cold, someone snoring, or an uncomfortable bed or tent may also be a problem.

Before you go:

- Invest in your sleep comfort - a good quality sleeping bag and mat.
- Bring ear plugs to aid sleep.
- If being treated for obstructive sleep apnoea, check with a specialist sleep doctor.

Altitude may increase the number of times you need to pee, so you lose more sleep.

Many changes are because you breathe more. In some people this may cause 'periodic breathing' at night, where rapid breathing is followed by periods when breathing briefly stops, sometimes causing you to wake up. This is common over 2,800m, and almost everyone gets it over 5,000m. Apart from worrying your tent mate, it does not appear to be harmful and gets better with acclimatisation.

Snoring may be made worse by dry, dusty air but night-time blockage of the airway at sea level ('obstructive sleep apnoea') does not appear to get worse with altitude.

At altitude:

- Expect to need more sleep.
- Consider avoiding caffeine and alcohol later in the day.
- If your sleep does not improve after a few nights do not go higher - consider going down to allow acclimatisation.

I slept so badly! My tent mate must have got up every hour in the night to pee!

THE REPRODUCTIVE BITS

Ladies - acclimatisation increases the body's iron-rich red blood cells. If you suffer from heavy periods discuss iron supplements with your doctor before travelling.

When travelling, periods can be difficult and disposing of sanitary wear a problem. Periods can be controlled, maybe by a change in contraception. This needs planning.

There may be an increased risk of blood clots in the legs when

taking the combined contraceptive pill at altitude. In reality this risk is low in a fit, active, non smoking lady unless staying above 4,500m for over a week. Many women use 'the pill' for period control.

Progesterone is safe at any altitude and is available as the 'mini pill'. In an injection, implant contraception or Intra Uterine System (Mirena) it may also prevent periods.

Ladies and gents - barrier methods such as condoms don't give full protection against disease. Abstinence always works. Dispose of condoms properly as they take many years to rot.

A child's organs are being formed in the first three months in the womb. It is probably best to avoid high altitude during this time.

Before you go:

- Plan contraception and period control 6 months before travelling.



After a successful trek to the summit of Kilimanjaro (5,895m) a traveller celebrated with a tour of the east African coast and game parks. He avoided malaria but returned home HIV positive.

HACE

The main signs:

- Severe headache.
- Become clumsy.
- Act differently - unhelpful, violent, lazy.
- May have bad, non-stop vomiting.
- Blurred vision.
- See, hear, feel, smell odd things.
- Confused.
- Reduced consciousness.

Can they:

- Touch nose with index finger with eyes closed? Repeat rapidly.
- Walk heel to toe in a straight line?
- Stand upright, with eyes shut and arms folded?
- Do simple mental maths?

If not able to do or have difficulty doing any of the above, suspect HACE.

HACE can develop very quickly with no other problems or can follow AMS and HAPE.

What to do:

- Stay with the person at all times - do not leave them on their own.
- Descend now - not later or in the morning.
- Sit them upright and keep warm.
- Give oxygen via cylinder or pressure bag if you have it.
- Give dexamethasone if you have it.
- Give acetazolamide if you have it.
- If really unable to descend - prolonged use of a pressure bag may be needed.

Consequence if ignored:

Loss of consciousness - confusion, drowsiness.

Reduced breathing.

DEATH.

In serious cases death can occur within as little as an hour of symptoms being noticed.

Remember it is possible to have AMS, HACE and HAPE at the same time.

DESCEND

DESCEND

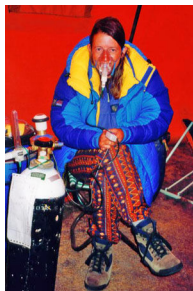
DESCEND

DESCEND

THE LUNGS

Because the air is thinner at high altitude there is less oxygen available so breathing gets deeper and quicker to compensate. This 'acclimatisation' helps you cope with the altitude better. Being more short of breath for the same exercise as at sea level is normal.

Other changes occur in the blood, which you will be less aware of, allowing the blood to carry more oxygen to where it is needed.



People often develop a dry cough at altitude. It is not entirely clear why this happens, but whilst irritating, it is not usually serious. Occasionally more serious

problems can occur with breathing.

An experienced trekker on a medical research expedition arrived at 5,200m to find her blood oxygen had dropped below what would normally keep her alive. Her lungs were filling with water, she became dizzy and had difficulty breathing at night. Descent was impossible without crossing a high pass. She was given acetazolamide tablets 500mg followed by 250mg three times a day. After 24 hours and a lot of peeing, her blood oxygen had risen to the normal level.

Fluid may collect in the lungs causing a problem known as 'High Altitude Pulmonary Oedema' (HAPE). Symptoms include severe breathlessness at rest and frothy bloodstained spit may be coughed up. People who have had HAPE are likely to get it again, often at the same altitude. This is a serious (potentially life-threatening) condition and should not be ignored.

Before you go:

- Exercise regularly, preferably the type planned at altitude; don't be short of breath due to unfitness!

At altitude:

- Walk slowly.
- Take plenty of rests.
- It's not a competition! Some people adapt better than others.
- Do not ignore signs of HAPE. Seek medical help if possible and if in doubt DESCEND!

THE EARS / NOSE

As you ascend to altitude, problems with ears and noses increase. Sunburn and skin damage to the ears and nose is a painful problem.

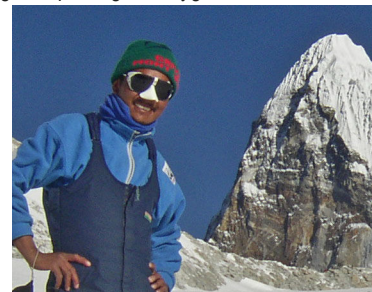
Changes in the inner ear trigger the symptoms of dizziness and light-headedness commonly found in AMS.

One of the commonest problems at high altitude is a blocked nose. Although this seems to be a minor hardship when life threatening conditions seem just around the corner, a blocked nose upsets the normal warming and humidifying process that is essential to keep the lungs healthy.

Before you go:

- Ensure gloves have a soft, absorbent patch over the thumb - great for wiping your nose!
- Pack tissues and wipes, high factor sun-block and barrier cream.

Failure to warm and moisten air when breathing in leads to a sore throat, persistent cough or in the worst cases, damage to the areas of the lung essential for the normal passage of oxygen.



At altitude:

- Dizziness could be a sign of AMS.
- Wear a wide brimmed hat and use sunblock on ears, nose and insides of nostrils.
- Use or improvise a nose guard on sunglasses.
- Blow your nose regularly.
- Use a barrier cream (eg Vaseline) to protect dried, cracked skin.

A climber with a cold was suffering from a runny nose and spent 2 days climbing Ramtang on glaciers and snowfields. The reflected sunlight badly burned the underside of his nose as the sun-block had been washed off. It took almost a week to recover fully.

THE MOUTH / TEETH

Your mouth and throat will get dry when you breathe through your mouth. Drink lots and use cough lozenges.

The sun can burn your lower lip badly. Using a zinc sun screen will help to protect it.



Before you go:

- Dental check with x-rays at least 6 weeks before you travel.
- Buy zinc glacier cream for lips.
- Buy a chap stick.
- Buy cough lozenges.

In one month at Namche Bazaar dental clinic the author of this page treated climbers from seven expeditions whose summit hopes on Everest, Lhotse, Nuptse, Ama Dablam and Pumori were ended by serious dental symptoms. None had dental checks before leaving home.

Visit the dentist before you travel. Painful teeth for days (or weeks) could ruin your trip.

All problems with teeth can be prevented. Poor hygiene can trigger the wisdom teeth problems which younger people often get. The cold air at altitude will upset un-treated broken fillings and cavities.

Too much sugar may make a decayed cavity so painful that it needs root treatment or extraction which is, in most cases, impossible on an expedition.

Most teeth and gum infections can be helped for a short time with Amoxicillin and Metronidazole. You can also take ibuprofen to cut down swelling.

At altitude:

- Drink lots to moisten mouth, lips and throat.
- Protect lips with zinc cream.
- Take antibiotics and ibuprofen for dental swellings and severe pain.

HAPE

The main signs:

- Trouble breathing.
- Tired & weary.
- Coughing.
- Froth and later blood in spit.
- Lips, tongue, nails become blue.

HAPE can develop in 1-2 hours or over several days and **even when descending**.

What to check for:

- Has there been recent ascent?
- Does it take a long time to get breath back after exercise?
- Are they breathless when resting?
- Is the breathing rate increasing?
- Can 'wet' / crackling sound be heard in chest? Put ear to back below shoulder blades.

What to do:

- Stay with the person at all times - do not leave them on their own.
- Descend now - not later or in the morning.
- Sit upright and keep warm.
- Give oxygen via cylinder or pressure bag if you have it.
- Give nifedipine if you have it.
- Give acetazolamide if you have it.
- If really unable to descend - prolonged use of a pressure bag may be needed.

Consequence if ignored:

Breathing stops.
DEATH.

In serious cases death can occur within as little as an hour of symptoms being noticed.

Remember it is possible to have AMS, HACE and HAPE at the same time.

DESCEND

DESCEND

DESCEND

DESCEND

THE HEART / BLOOD

Travelling to altitude can have several effects on your heart. The lower oxygen in the air and exercise you are doing can make your heart beat faster. This is not normally a problem but if you have a heart condition (eg angina) it can put extra strain on your heart. Your blood pressure may go up a small amount at altitude, but this effect is

not normally noticed. One of the effects of altitude is for you to produce more red blood cells (so you can carry more oxygen). This can sometimes lead

Before you go:

- Get as fit as possible.
- Try the level of exercise out at home before you try it at altitude.
- Make sure you have all your medications / prescriptions.

On a Medex trip, my BP was recorded at 168/118 one day. The group doctor said this was common on ascending but usually sorted itself out as you acclimatise. He advised that my rest day was to be taken very easily, even though I felt fine.

to the blood thickening, making the circulation sluggish. With this in mind, you should make sure you drink plenty. If you have a known heart problem (such as an irregular heart beat, high blood pressure, a heart attack or angina) or have had surgery on your heart you should talk to your doctor to make sure that what you are planning is not going to put undue strain on your heart. If you take medicines, make sure you take plenty with you.

If you are healthy then travel to altitude will not put any more strain on your heart than rigorous exercise at sea level.

People with inherited sickle cell problems are at risk and should avoid going to altitude.

At altitude:

- Walk slowly, don't race.
- Take plenty of rests.
- Drink plenty of fluids.
- If you have any problems, stay at that altitude, don't go higher.
- If problems persist then descend.

THE EYES

The high level of UV light at altitude can burn the eyes (snow blindness), like 'arc eye' which welders get - it feels like sand in the eyes. Rest, padding the eyes, lubricant drops and painkillers will help. Good sunglasses or goggles are needed on glaciers even when it's cloudy - UV gets through clouds. Choose glasses designed for the mountains and not for fashion. Prescription sunglasses and goggles can be made.

Contact lenses can be used, but very strict hygiene is a must, which is difficult at altitude. Daily disposable lenses are fine but must be removed at night. Laser refractive surgery can blur your

Before you go:

- Get glacier goggles / glasses.
- Sort out contact lenses and cleaning fluid.
- If you need glasses, get spares.

A 29 year old man used daily disposable soft contact lenses on Mount Everest. He didn't change his lenses for four days, and on summit day wore sunglasses, not goggles. At 8,600m his vision became blurred. At the summit he couldn't see the view or navigate. He was helped down by two Sherpas. He had snow blindness and a bacterial infection. A doctor peeled the contact lenses from his eyes, but the scarring has left his vision permanently reduced. It could have cost his life.

vision at altitude but this resolves on descent. Don't get laser treatment just before you travel - think ahead.

Tiny bleeds at the back of the eye can occur (retinal haemorrhages), which can affect patches of vision. Usually these are not dangerous and will disappear after a few weeks.

Descend if you lose vision in either eye at altitude.



At altitude:

- Wear your goggles when it is bright.
- If you lose your goggles improvise using cardboard with thin slits to look through.
- Make sure staff have goggles and wear them.
- Maintain hygiene if using contacts.

THE EXTREMITIES

At high altitude you are at more risk from burning and freezing. High levels of UV radiation at altitude can easily cause sunburn. Low temperatures and low oxygen make it easier for your skin to develop frostbite, especially in people who already have poor circulation (such as in Raynaud's disease).

Frostbite can happen to any body part in freezing temperatures and / or high winds. Early signs of frostbite are white, numb and hard skin. Re-warming is very painful and the skin may go red, itchy, blotchy and swollen. If freezing goes on, blisters may develop and finally the skin can go black and

die. This is very serious and may lead to amputation of fingers and toes.

Body parts most at risk of sunburn and cold injuries are those 'sticking out' - lips, toes, nose, chin, fingers, ears - so they will need extra protection.

Swelling around the hands, face and ankles at altitude is common. This is not serious, but it may be worth checking for other problems.



Before you go:

- Get sunscreen (SPF 15-30).
- Get total sun block.
- Get warm gloves, socks, hat, boots - be sure they fit properly.

At altitude:

- Keep hands and feet dry, change wet gloves / socks quickly.
- Wear properly fitted kit.
- Apply sunscreen / block regularly.
- Cover up from sun, cold and wind.

During an avalanche in the Himalayas, nine people were killed and several others were injured. The injured were air-lifted out to hospital. The porters involved were left behind to find their own way down, carrying the equipment of their clients. Some of the porters never made it back, but died from the cold. The clothing they had was not good enough for the conditions, but they dare not open the bags they were carrying. They died beside bags containing warm mountain clothing.

THE STOMACH / BOWELS

You may lose your appetite at altitude and AMS may make you feel sick. Changing food may affect appetite or cause the runs.

Many altitude trips are in areas where water and sanitation are poor, so the risk of the runs is higher. Prevention is better than cure. Bottled water and water filters can be unreliable. Iodine is the best, unless you have thyroid disease or are pregnant.

If you do get the runs keep hydrated by drinking plenty of purified water or rehydration solution. Traveller's diarrhoea is likely to be caused by bacteria so antibiotics may be needed.

If you have indigestion or piles at home, see your doctor well before travelling. Piles can be a misery at altitude. With indigestion, avoid indigestion causing painkillers.



Milky drinks, curd or yoghurt may soothe the problem.

Rotting toilet paper and piles of poo ruin places. Don't just leave it!

Before you go:

- Plan how to get clean water so you are not afraid to drink plenty.
- Take rehydration sachets and / or know how to make up your own.
- Find out about traveller's diarrhoea and how to treat it.
- Have a group plan for disposal of toilet paper 'in the field'.

At altitude:

- Drink plenty.
- Take your favourite snacks to eat when you're off the food.
- Always wash your hands.

When high on a Patagonian glacier a climber had to demand a sudden stop to drop his salopettes whilst roped due to traveller's diarrhoea. On a bivouac that evening he took some antibiotics and was able to continue the next day.

THE KIDNEY / BLADDER

As you acclimatise, your body will naturally make more urine. This is a good sign but may mean you need to pee more during the day and night.

Exercise in the dry air and heat of altitude can cause dehydration which can be made worse by traveller's diarrhoea. Thirst, headache and tiredness are often signs of dehydration. These can be prevented by drinking several litres of safe fluid per day. Peeing at least four times a day with a good volume of clear urine shows that enough fluid is going in at the top end.

Frequent painful peeing of small volumes (cystitis) can be a sign of dehydration. If it does not settle

after drinking two litres of fluid you may have a urine infection needing antibiotic treatment.

Older men naturally develop enlargement of their prostate glands which can increase frequency and urgency in passing urine at sea level. This can lead to painful retention of urine. If in doubt get checked by your doctor well before you travel.



Before you go:

- Buy a good pee bottle for night use.
- Ladies consider a Shewee or similar.
- Ladies may find a skirt easier for discreet peeing.

At altitude:

- Keep hydrated.
- Keep hydrated!
- Keep hydrated!

A normally fit trekker felt exhausted with a headache at the end of an easy day at increasing altitude. She was worried she was developing AMS but made a rapid recovery after drinking two litres of purified water flavoured with lemon juice.

THE JOINTS / MUSCLES

Most people who go on adventure holidays feel new aches or pains with the extra exercise.



There has been no research done that has shown a higher risk

of joint pain just because the person is at high altitude.

The knee joints and leg muscles are usually the problem areas! Support bandages or braces can be useful. However, it is best to try and improve your muscle strength so that supports are not needed. Getting fit before you go is important, whether skiing, walking, horse riding or cycling so that you can enjoy your trip.

Using two trekking poles when walking can reduce the load on the knee joints, especially if there are lots of down-hills where the strain on the knees is greatest. This could be helpful if you already have a joint problem. Reducing your weight (if you are overweight) or that of your backpack helps.

Before you go:

- Get fit with any form of exercise that is practical and increases your heart-rate.
- Try and include at least a full day's suitable exercise each week for the month prior to departure.
- If you are going to use trekking poles, get used to them before you leave.

At altitude:

- If your joints or muscles start to hurt, slow down, lighten the load, and / or consider a rest day.
- If you normally have joint pains, make sure you take your regular painkillers with you.
- The temperature can be colder - make sure you have enough layers to stay warm.

After 6 hours riding on the first day, my knees were killing me. I knew I should have ridden more than 3 times before we went. I suffered over the next few days!