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 ***LIFE ON THE EDGE***

***How the body copes with extreme conditions***

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Sample translation by Kari Dickson

**(pp 1-4)**

**Introduction**

It was just past one o’clock when the sun broke through the clouds over the mountains. The outcrop and rock face towered above George Mallory, and it was the last time he was seen by anyone, other than the student Andrew Irvine, for 75 years. It is unlikely that he was aware that the sun beams, which reflected in his snow goggles and reached far down into the valley several thousand metres below, would be the basis of one of mountaineering’s great mysteries. Irvine followed Mallory up into the Death Zone, then cloud enveloped the mountain once again and the two men were wiped out of time. They had a camera with them, which if it is ever found, could give the answer as to what happened that day in June 1924. There is no way of knowing if the climbers had any idea of the fate awaiting them on the mountain, but they pushed on undeterred towards the roof of the world. The oxygen tanks on their backs would be empty before they got back to Camp 4, but we know that the two men never made it that far.[[1]](#footnote-1)

The optimal living conditions for human survival are a warm climate at sea level. However, not everyone lives like this. Many people find themselves in extreme places, high above or far below sea level, or in very hot or cold climates. Our desire for life changing experiences and adventure has resulted in exposure to some of the harshest environments on earth. Many more people are forced to live in dangerous situations because the alternative is even worse. Even though the media seems quickly to lose interest in the constant movement of refugees, people are still dying in the Mediterranean. War, poverty and terror have forced people to leave their homes and face conditions where survival is dependent on warm clothes, shelter, food and fuel. The availability of food and shelter in particular, as well as the ability to adapt, have made it possible for many cultures to settle in hostile environments. Expeditions to some of the most extreme places in the world have shown that it is possible to survive long periods in harsh environments, where conditions test our human faculties. The ability to cope with challenges such as a limited oxygen supply, the risk of overheating or extreme cold is a prerequisite for survival.

The origins of our existence lie in Africa. This is where we evolved from our ancestors, the hominids. Traces from four of the main *hominid* families have allowed scientists to outline our evolutionary history. Most discoveries have been made in the Rift Valley in Ethiopia, a huge geographic area that was created when the African and Arabian continental plates moved apart some 40 million years ago. Humankind’s ancestors first moved out of the area two million years ago. *Homo erectus* was the first of the *hominids* to travel out of Africa and settle in large parts of Eurasia. All our knowledge comes from fossils. *Homo erectus* is the predecessor of modern man, *Homo sapiens sapiens* – in other words, you and me. Genetic studies and fossil findings give strong indications that we too originate from Africa. Our ancestors there were happy with the surroundings and conditions for thousands of years, until they started to move north towards the Middle East around 130 000 – 115 000 BC. People came to Europe far later, possibly about 45 000 years ago. Around the same time, humans also found their way to Japan and Australia. Climatic conditions vary enormously between the various places where we have settled[[2]](#footnote-2),[[3]](#footnote-3). What does this do to our bodies? How can we best adapt?

Areas with tougher climatic conditions, where access to food was more limited, were settled later. The settlement of the coldest areas in northeast Siberia, northern Canada and Alaska, as well as Greenland, is assumed to have started around 4 500 years ago. Peoples such as the Bedouins on the Arabian peninsula and in the Sahara have adapted to living in dry, hot and barren desert areas – surroundings that differ enormously from those of the Inuits, for example. Other peoples migrated to the mountains. Many cultures have their origins high above sea level in the Himalayas, Andes and east central Africa[[4]](#footnote-4). The human body faces many challenges when we settle at such high altitudes. Harsh weather and cold temperatures make demands on our ability to protect ourselves from the environment. The discovery on 19 September 1991 of a body frozen in a glacier, at an altitude of 3 200 meters in the Ôtztal Alps in Austria, shows that people were high up in the mountains long before conquering peaks became a hobby. The frozen man, who has been named Ötzi, is thought to have died around 3 200 BC. He had been fighting at least two other people. We know this because of blood traces found on the body and the spearhead that was found in Ötzi’s left shoulder[[5]](#footnote-5). So it was neither the altitude nor the cold that killed him.

Today, people live all over the world, including Antarctica, if one includes the scientists who winter there. Most of us live in temperate climates and in areas where it is possible to get enough food, when not prevented from doing so by political agendas, violence, disease and conflict. However, some cultures have developed in extremely hostile environments, where people have to adapt to great physiological challenges. Physiology is a very important branch of medicine and biology, and is the study of how living organisms function. Many people live in areas that would not be compatible with the body’s physiology, if we did not have ways of isolating the body from its surroundings.

In contrast to poikilotherm animals, such as snakes or lizards, people maintain a core temperature of 37 degrees Celsius. Many important processes in our body are dependent on this temperature remaining constant. Enzymes are catalysts for the bodily processes that allow us to get energy from the food we eat. In other words, enzymes are essential for our survival. And in the human body, these enzymes function optimally at around 37 degrees Celsius. Thus, both negative and positive changes in the temperature might have swift consequences for the functioning of our heart and brain. In order to maintain a stable core temperature without any great effort, it is therefore sensible to live in temperate zones. Here, insulation and sufficient energy from food can keep us warm through the winter. If we are exposed to the cold without sufficient shelter, our body temperature can quickly fall below 37 degrees and we risk freezing to death. How can one survive on the South Pole? We know that it is possible. Roald Amundsen and Robert Falcon Scott both reached the most southern point in the world more than 100 years ago. Today, the Amundsen-Scott base is still located here. Scientists winter in Antarctica without any great problem, even though the temperature outside can fall below minus 60 degrees. For Scott and his men, conditions would have been more extreme. The thin tent canvas would never have been enough to keep out the cold, had there not been sufficient fuel or food. However, there are people who have survived being cooled to a body temperature of well below 20 degrees. A chilled heart may stop beating, but there are examples of people who have survived for seven hours after their hearts ceased to function, due to cold. How is that possible?

Heat is not without dangers either. It is important that our body temperature does not rise too much. When the thermometer measures much more than 40 degrees, the situation is serious. We are even less equipped to deal with high temperatures than we are with low. The body faces many challenges when crossing a sunburnt and scorched desert. How can you prevent yourself from overheating in the Sahara? An increase in body temperature of more than 10 degrees is critical, but in some rare cases it is possible to survive. During a heatwave in the USA, a man was admitted to hospital with a body temperature of more than 46 degrees. Once in hospital, he soon cooled down and survived. After almost a month in hospital, he was allowed to go home without any permanent damage[[6]](#footnote-6). What happens to the body when it gets too hot?

Maintaining a stable core temperature is not enough for the body. We are also dependent on a sufficient supply of oxygen to the brain and other vital organs. The cells get energy by burning nutrients such as sugar and fat. This process not only needs the right temperature to function, but also that oxygen is transported to the cells via the blood. The oxygen density is greatest at sea level, so we have most oxygen in our lungs when we stay at that level. When one moves several thousand metres above sea level, the oxygen density will be lower. When Felix Baumgartner undertook the first parachute jump in history, he was totally dependent on an extra supply of oxygen. The air around him at such an extreme height would not keep him alive. Baumgartner jumped out of a helium balloon 39 kilometres above sea level and broke the sound barrier before landing safely in New Mexico[[7]](#footnote-7). Without the help of aircraft, we can only reach great altitudes by climbing mountains. It takes twenty-four hours to travel by train from the lowlands of China to altitudes above 5 000 meters in Tibet. This mountainous region was once so isolated from the rest of the world that the Tibetan language is markedly different from that of neighbouring countries at the foot of the mountains. The highest peak in the Himalayas is Mount Everest, towering 8 848 meters above sea level. The oxygen density in the air on the ridge around the mountain is less than a third of what we breathe in the lowlands, so it is harder to saturate the red blood cells with oxygen. Our cells need a supply of oxygen in order to use energy, and to keep us alive. When climbing at high altitudes, it is sensible to carry oxygen tanks so one can breathe in extra oxygen. But what happens if the tank is finished before you get back to camp?

Not only is the supply of oxygen lower at high altitudes, the climate is often harsher, which is why most people live in lower lying areas, where it is also easier to harvest food. The majority of people have traditionally got their food from farming the land or fishing in the rivers and sea. Gathering food underwater is a challenge as we do not have gills and so cannot make use of the small amounts of unbound oxygen in water. However, in some places in the world, cultures have specialised in diving down to the seabed to collect shells and other foodstuffs. Elsewhere, it is only in the past couple of centuries that diving equipment has helped us to breathe under water. The explosive development of technological aids in the 1900s has made the ocean depths available to ordinary people of means. In 2012, the film director James Cameron, who is more famous for directing the feature film *Titanic,* piloted the Deepsea Challenger to the bottom of the Challenger Deep, 11 kilometres below the surface of the Pacific Ocean. More people have landed on the moon than been down to Challenger Deep, an indication of how dangerous it is for humans to spend time in the depths of the ocean. So how do free divers deal with the lack of oxygen and heat in the water?

In this book, we will look more closely at how the human body deals with extreme conditions. We go from the bottom of the Mariana Trench to the top of Mount Everest, where the remains of Mallory and Irvine are still in the Death Zone. The two climbers failed to make it back to camp. We will visit the scorching Death Valley and follow Amundsen and Scott to the freezing South Pole. Some incredible stories will help us to understand how it is possible to survive and what happens to the body when we expose ourselves to extreme conditions.

**(pp 14-18)**

India is an enormous peninsula, shaped like an arrowhead that points south to Sri Lanka in the Indian Ocean. Before it became a peninsula around 35-55 million years ago, it was an island on a tectonic plate that was gradually moving north towards Eurasia. The collision of the Indian plate and Eurasian plate created the most spectacular and massive mountain chain in the world. When the Indian Plate was pushed under the Eurasian, the latter was pressed up and the Himalaya and Karakoram Mountains were lifted. Today the peaks tower high above sea level, and Mount Everest, at an altitude of 8 848 meters, is the highest of them all. The mountains make up the border for three of the world’s nuclear powers: India, China and Pakistan, and all have been involved in cross-border conflicts in the region. These border conflicts have meant that soldiers have had to be transported to high altitudes to guard the border with neighbouring states. War and conflict in the lowlands, where most people are acclimatised to live, constitute a threat to everyone’s life and health. But the high altitudes expose the soldiers to multiple health risks, in addition to conflict, such as altitude sickness and the dangers inherent in their surroundings. For the past 30 years, the air and climate in this mountainous region have constituted a real risk to many Indians and Pakistanis. Two years after Partition in 1947, India and Pakistan signed a ceasefire which agreed the border between the two countries. The Siachen Glacier in the Karakoram Mountains is given as part of the border in the 1949 agreement and a subsequent agreement in 1972. Using a glacier to demark a border is harder than using other geographical divides, such as rivers or mountains. Grense Jakobselv, the river that runs between Norway and Russia, is only a few metres wide and is a good divide to mark the border, whereas the Siachen Glacier, the second longest in the world excluding the polar regions, covers a full 700 square kilometres. In addition, glaciers are constantly moving, and the landscape along the mountain border between India and Pakistan will continue to change as long as the glacier exists, thus making it impossible to demark a borderline. Any such borderline would also be hidden every winter under an average snowfall of 10 metres. All this, in addition to the fact that the glacier lies at altitudes between 3 500-6 000 meters, and the temperature here can fall to minus fifty. The climatic conditions on the glacier and in the surrounding area make it a very harsh environment for people, which is why the borderline here between India and Pakistan was so poorly described in the ceasefire agreement. Both countries believe that they have sovereignty over the glacier, and at the end of the 1970s, Pakistan and India allowed climbing expeditions into the Siachen region. As the permits were issued in the belief that each country had authority over the area, this could be interpreted as a strategic claim on the glacier and surrounding mountains. When Pakistan allowed a Japanese climbing expedition climb the 7 385-metre high Rimo I near Siachen in 1984, the Indian authorities saw this as a further attempt to claim the glacier. This assumption proved to be right as both countries made plans to send military forces into the area. But India beat Pakistan to it and secured the peaks in and around the glacier. The new border has been subject to attack from both sides and somewhere between 3 000-10 000 soldiers are posted there.[[8]](#footnote-8)

By the turn of the century, around 1 300 Pakistani soldiers and 2 000 Indian soldiers had died on the Siachen Glacier. Despite frequent exchanges of fire, less than 10 per cent of injuries in the conflict are due to enemy action. The highest post in the area on and around the glacier lies at an altitude of 6 800 meters, so it is understandable that the soldiers there are at risk of severe altitude sickness. Many of the soldiers have died from high altitude pulmonary edema (HAPE), a serious and direct complication of altitude. In order to prevent such deaths, procedures have been drawn up for the ascent so that soldiers can acclimatise on the way up. Good procedures have proved to be decisive as 15 per cent of all soldiers who were flown directly to altitudes of 4 500 meters or higher, developed HAPE. It is also important for tourists to consider the potential serious consequences of flying directly to such high altitudes. Many airports in South America and China lie high above sea level; the airport in La Paz, for example, is at 4 000 meters, and many tourists experience symptoms of altitude sickness.[[9]](#footnote-9)

The Siachen Glacier is more or less inaccessible on the Indian side, so the transport and evacuation of any injured or sick soldiers is dependent on helicopters. The use of helicopters at this altitude is not ideal, as the rotary blades cannot generate as much lift as at lower altitudes. Flying with helicopters at high altitudes is therefore very risky, as illustrated by several accidents during brave attempts to rescue sick climbers from Base Camp on Mount Everest. In bad weather, it is more or less impossible to rescue those in need of help. A portable pressure chamber has been designed that can provide life-saving first aid to anyone who is sick on or around the Siachen Glacier, in order to deal with serious altitude sickness in such situations. The pressure chamber is very different from those that are used to prevent divers working at great depths from developing decompression sickness. The portable pressure chamber is in fact more like an airtight bag that fits around the body of the patient. When the bag is pumped up with the accompanying foot pump, in much the same way that a lilo is pumped up, the air pressure and oxygen density increases in the bag around the person. This is equivalent to moving the person several thousand metres down the mountain, so the sick person has a better supply of oxygen inside the bag than they would outside.[[10]](#footnote-10)

The flight paths for scheduled flights often lie at over 10 000 metres, so well above Mount Everest. Because an airplane is a sealed cylinder, the pressure can be increased, as it is in the portable pressure chamber. Consequently, we do not suffer from altitude sickness when we fly from Oslo to Frankfurt. The air pressure inside the cabin varies according to the type of plane, but in many it will be equivalent to around 2 000 MASL when cruising. The air pressure in airplanes is therefore similar to that at the top of the highest Norwegian mountains. When an airplane reaches cruising height, bags of peanuts and crisps will be distended, clearly demonstrating that the air pressure is lower than at sea level. The air that is blown into these airtight bags in a factory requires more room, so when the pressure is lower, the bag distends. In a portable pressure chamber, which is inflated to increase the oxygen density around the person with altitude sickness, we want to blow as much air as possible into the bag to increase the air pressure. The bag therefore becomes distended like a bag of peanuts on a scheduled flight. The air pressure inside the chamber will be higher because the air has been compressed.

In addition to low oxygen density and altitude sickness, the greatest challenges facing the soldiers who are posted in the Siachen area are the cold and vast amounts of snow. Hypothermia is a danger in itself, and can also make altitude sickness worse. There are often major avalanches in the area, which on several occasions have cost many lives. At the end of May 2012, a massive avalanche hit a huge military camp on the Pakistani side, killing 140 people. Its peripheral location, combined with the altitude of 4 000 meters and difficult weather conditions, made it extremely difficult to provide international aid following the avalanche. No one who was in the camp at the time survived.[[11]](#footnote-11)

There are several groups of people, in addition to the soldiers on the Siachen Glacier, who are exposed to high altitudes in the Himalayas and Karakoram Mountains. The mountainous nations here have temples, monasteries and uncultivated areas that are deemed to be sacred, one example is the Jokhang Temple in Lhasa. Pilgrims come from all over Tibet to walk around the holy building, which lies at 3 500 meters. Other temples and sacred sites lie even higher, and therefore entail greater health risks for the pilgrims. Pilgrimages have been made to high-lying areas for centuries. In Nepal, local folklore includes stories and legends about pilgrims having visions or behaving oddly when they reach the high holy temples. One such place is the Gosaikunda Lake, which is important in Hindu mythology as it is believed to be the home of the two great gods Shiva and Gauri. Hindus therefore see the lake as sacred, and many thousands visit every year to swim in its holy water, which appeared when Shiva thrust his trident into the source. In more recent years, pilgrims have taken buses up to an altitude of 2 000 meters and then walked up the steep mountainside to the lake where they spend the night at 4 300 meters above sea level. Such a swift ascent is not without danger and is clearly at odds with the recommendation that one should only climb 300 metres within a twenty-four hour period at altitudes of 3 000 metres or more. Previously, it was not possible to drive a bus to the foot of the mountain, so pilgrims became gradually acclimatised to the low air pressure as they climbed. Scientists have accompanied the pilgrims and carried out examinations at the Gosaikunda Lake, and discovered that nearly 70 per cent of people show signs of altitude sickness. Many of the pilgrims have also fasted, and some do not even drink water, which can be very dangerous in the dry mountain air. People can easy become dehydrated in such conditions. As many as 31 per cent also showed symptoms of cerebral edema (HACE), a serious form of altitude sickness that can be life-threatening if one does not quickly descend. Fortunately, the goal of the pilgrimage is to bathe in the lake and most pilgrims then quickly return to lower altitudes, and so do not become seriously ill.[[12]](#footnote-12)

Both HACE and HAPE are also feared complications for tourists and climbers at high altitudes in the Himalayas, South America and East Africa. The clearest illustration of the dangers of climbing at high altitudes is the fact that so many die attempting to reach some of the highest peaks in the world. Between 1972 and 1992, 3 per cent of climbers attempting to conquer Mount Everest using oxygen tanks died, and this figure rises to 8.3 per cent of those who did not have oxygen with them. Over 80 per cent of climbers who have died on Everest, died on the day they reached or attempted to push the summit. Not only is there a high risk of falls, avalanches, hypothermia and exhaustion, they are then at an altitude of 8 000 metres or more, and statistics show how dangerous such altitudes are for the human body. Not surprisingly, the area above 8 000 metres is called the Death Zone. Many of the victims behaved oddly, became unsteady and had problems moving normally before they died. These symptoms indicate the onset of HACE, which has then been the cause of death. At least a third died of altitude-related complications.[[13]](#footnote-13)

The British were the first to start exploring the area around the summit of Mount Everest in the 1920s. George Mallory took part in the first expedition in 1921. He was an English mountaineer, who had studied history at Cambridge, where he was first introduced to climbing. He had also taken part in the Battle of Somme and survived the First World War. In 1921, he resigned from his teaching post in order to join a British expedition to the Himalayas, which was to map the area around Mount Everest and find a possible route to the summit of the world’s highest mountain. Already the following year, Mallory returned with two other climbers, in an attempt to push the summit. It was important for British expeditions at the time to climb in the correct and socially accepted way, and the use of oxygen tanks was seen by many as unacceptable. Even though the three climbers were stymied by the low oxygen supply, as they did not have oxygen tanks with them, as well as the fact that they were moving in unknown terrain, they managed to reach an altitude of 8 225 meters before weather conditions forced them to turn back. During the same expedition, another team of climbers led by George Finch, decided to defy the unwritten rules, and set off with oxygen tanks in an attempt to reach the summit. Mallory observed that Finch and his team coped better with the conditions and were able to climb faster than he and his team had done, and this enabled them to reach an altitude of 8 321 meters. In 1924, the now 37-year-old Mallory made his final attempt to reach the summit of the highest mountain in the world. When asked why he wanted to conquer Mount Everest, it is said he replied: ‘Because it is there’, a reply which has later become very famous.[[14]](#footnote-14) Having observed that Finch had climbed better with oxygen, he also used oxygen tanks in his attempt to push the top, contrary to what was popularly accepted. On 4 June 1924, he set off from Base Camp at 6 500 meters, with the 22-year-old student Andrew Irvine, carrying oxygen tanks on their backs.

Conrad Anker was part of a team that went to look for the bodies of Mallory and Irvine on the north side of Mount Everest in 1999. At an altitude of 8157 meters, he spotted a piece of fabric lying under some stones in the scree that covers the mountain slope. It is not unusual to find remnants of cloth on Everest, and there are tent remains all over the mountain. However, Anker stopped and looked around at the grey landscape, and then saw something white about 30 metres away that did not look like snow or ice reflecting in the sun, it was paler in colour. As he approached, he saw that it was a foot sticking out from the stones. Only the back of the body and the bare foot were not covered in clothes. These were not made from Gortex or any other synthetic fabric. The dead climber had on seven or eight layers of wool, silk and cotton. Anker knew immediately at this was someone who had been on the mountain for a long time, and the hope that he had found who they were looking for took root. In order not to give anything away on the open radio network that could potentially be heard all over Nepal, he alerted the others in the team by talking in code. Jake Norton was nearest when they heard the first message from Anker, which contained the word “boulder”, the code word for body. When he was then invited for tea and chocolate on a scree slope at 8 2000 meters, Norton knew that something special was hiding under the stones.[[15]](#footnote-15)

The name tags on the clothes of the climber that Anker found in 1999 confirmed that it was Mallory lying in front of him, frozen to the ground with his face in the dirt. His arms were outstretched with his hands planted in the scree, as though he was clinging on to the ground. Around the waist of the mummified climber, the team found a rope that was broken at one end. It was the climbing rope, the lifeline that had connected Mallory and Irvine, which had broken at some point on the way up or down from the summit of Mount Everest. It was clear that Mallory had had a bad fall when the rope broke, his right elbow appeared to be dislocated, and both the tibia and fibula in his right leg were broken. A pair of undamaged sun goggles were found in his pocket, which could indicate that Mallory and Irvine had turned back after sunset. It is unlikely that he would have taken the goggles off in daylight. According to Mallory’s daughter, he also had a photograph of her mother with him, which he was going to leave at the top of Mount Everest. When he was eventually found, his body was well preserved and the clothing was almost intact. There were several other documents in his wallet, but the photograph was nowhere to be found. Both these discoveries have led to speculation that the two climbers in fact reached the top of Mount Everest, and thus the possibility that the mountain was first conquered in 1924. However, the first successful and verified ascent of the world’s highest mountain was not to happen for a further 29 years. On 29 May 1959, the Sherpa mountaineer, Tenzing Norgey reached the summit with Emund Hillary, a beekeeper from New Zealand. Much of the evidence indicates that Mallory and Irvine were on their way down when they fell. Mallory’s body was found further down the mountain from where the highest evidence of the two climbers was found. We still do not know if Irvine died in the same fall. However, it is more likely that the two climbers died due to exposure to freezing temperatures, physical strain and in all likelihood, altitude sickness when they ran out of oxygen.[[16]](#footnote-16)

**ALTITUDE SICKNESS**

The umbrella term *altitude sickness* includes everything from the mild, but unpleasant symptoms that I once experienced on the train to Tibet, to the severe and life-threatening conditions of high altitude pulmonary edema (HAPE) and high altitude cerebral edema (HACE). The mild symptoms may also be a warning that more serious symptoms are developing, and the condition can rapidly become critical. It is therefore important to recognise the symptoms, which is often difficult as they are so non-specific. In other words, it is not always easy to differentiate them from more ordinary conditions. Anyone who has had a night on the town might wake up with the next day with a headache and feeling sick, and this is often replaced by incredible fatigue later on in the day. Similar symptoms are often caused by bugs and viruses, or if you have overdone it exercising. As these relatively usual symptoms are often confused with those of altitude sickness, many people have been misdiagnosed.[[17]](#footnote-17)

The mildest form of altitude sickness is called altitude headache and is a very good description of what the person experiences, in other words, a headache that starts around twenty-four hours after ascending to altitudes of more than 2 500 meters. Therefore, by definition, one cannot get an altitude headache on the Norwegian mainland, as the summits of Galdhøpiggen and Glittertind, Norway’s two tallest mountains, are about 30-50 metres short of the 2 500-metre mark. However, there are many mountains over 2 500 metres in areas over which Norway has sovereignty: in the Sør Rondane and Mülig-Hoffman Mountains on Queen Maud Land there are in fact several mountains over 3 000 metres. The highest of these is Jøkulkyrkja, which is Norway’s highest mountain at 3 148 meters, but can only be called such if Queen Maud Land in Antarctica is counted as a Norwegian territory. The enormous polar ice waste that is named after Norway’s first queen in modern times, is home to the research station Troll. The average temperature here is minus 25 degrees Celsius, which is actually a relatively high mean temperature for Antarctica. Excursions to the colder and more exposed 3 000-meter peaks are relatively rare, so altitude headaches are not a common problem in Norwegian territory. There are, however, several places in Europe where one can climb to over 2 500 metres, for example in the Caucasus, the Alps and the Pyrenees, where one might experience altitude headaches. These are often worse at night and exertion exacerbates the symptoms, though they often disappear within eight hours if one descends to lower altitudes again.[[18]](#footnote-18)

If in addition to headaches, one also feels nauseas and experiences sleeping problems after ascending to high altitudes, this may be due to an acute case of altitude sickness. Despite the somewhat dramatic name, the condition, like an isolated headache, is a reaction to altitude. More than 50 per cent of people will experience some of these symptoms at 3 000 metres. It has been said that women are more susceptible to altitude sickness than men, but it is likely that the risk is the same for both sexes. We also know that those who have experienced altitude sickness once are more likely to be affected again when reaching high altitudes. The symptoms start to become apparent six to twelve hours after reaching high altitudes and generally subside again within a few days. The best treatment for altitude sickness is to find the quickest way back down the mountain. It is therefore important to acclimatise before taking a plane or train up to high altitudes without the possibility of a quick retreat to lower lying areas. In this way, the body can gradually adjust to the new challenges. However, many tourists still fly directly from sea level up to high altitudes, covering the distance and ascent within a couple of hours. This means that many become sick in high-lying tourist destinations such as Peru and Bolivia. In the city of Cuzco, at 3 400 meters above the Pacific ocean, scientists established that 49 per cent of tourists who landed at the airport developed altitude sickness, with 17 per cent of these becoming seriously ill. In the most extreme cases, this can result in cerebral or pulmonary edema.

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