

Hypoxia in the aircraft cabin

By Robb Leigh MD

The human body's ability to adapt, survive and prosper in diverse environments is just one of life's many wonders. People who live in the Sahara Desert, the North Pole, the Himalayas, and even large cities with greater than 20m inhabitants, are prime examples of adaptation success stories.

Despite this ability to adapt, however, some environments – including high and moderate altitude settings – can present challenges to humans.

For years, humans have tried to conquer the highest peaks around the world, most notably Mount Everest. One of the biggest obstacles to high altitude conquest has been relative lack of oxygen, known as hypoxia.

When the human body ascends, the air becomes thinner as the atmospheric pressure decreases and fewer oxygen molecules are available than at sea level. At varying times during ascent, individuals, based on their own tolerances, may begin to exhibit hypoxic symptoms such as headache and fatigue that gradually worsen as altitude increases. Such symptoms are a direct result of insufficient oxygen, negatively impacting on normal metabolic function (the body's chemical processes).

In the aircraft cabin, the body can adapt and tolerate the moderate altitude setting with few effects. Aircraft cabins are pressurised to a comfortable 1,830m to 2,400m of altitude, where most people without heart or lung disease cope well without supplemental oxygen. At this altitude, mild hypoxia is common but can be tolerated by most passengers. The aircraft also tolerates the moderate pressure gradient better than when exposed to repeated large pressure gradients, as the aircraft experiences less metal fatigue.

The altitude, oxygen and hypoxia connection

Even moderate altitudes of up to 3,050m tend not to cause significant symptoms

in healthy adults. Some passengers may experience lightheadedness and headache at lower altitudes, whereas other people can tolerate altitudes as high as 3,660m without significant symptoms. Nonetheless, altitudes higher than 3,660m cause symptoms for everybody.

Why? Oxygen is necessary for human metabolism and energy production. All human cells need oxygen to survive. The brain – with its high metabolic rate –

(4lpm) is recommended, which will probably correct the hypoxia. Individuals experiencing extreme symptoms from the onset should be administered high-flow oxygen immediately and medical advice should be sought on-board or via telemedicine venues.

For those passengers with pre-existing cerebrovascular or coronary artery disease, other complications may arise at altitude, such as transient ischaemic attack that can lead to full-blown stroke



Whether flying or attempting to climb Mount Everest, moderate and high altitudes can cause humans to suffer from a relative lack of oxygen, known as hypoxia.

and the nervous system are particularly affected when the body receives inadequate oxygen.

Relative hypoxia may cause confusion and impaired judgement, not unlike hypoglycaemia (low blood sugar). The symptoms are non-specific and could easily be confused with other conditions. The main symptoms include headache, fatigue, lightheadedness, shortness of breath, nausea, confusion, poor judgement and decreased visual acuity. These symptoms will resolve promptly once altitude is lowered or when oxygen is administered.

When treating hypoxic passengers with mild symptoms who are otherwise stable, low-flow supplemental oxygen – two litres per minute (lpm) – is initially recommended. If the passenger does not show signs of improvement within several minutes, high-flow oxygen

or acute coronary syndrome that can result in heart attack. Passengers with these known conditions should use supplemental oxygen during air travel to minimise the risks.

As is common with any inflight emergency, early consultation with land-based physicians allows for better management of the situation and can reduce the number of unnecessary aircraft diversions. ■

As a practising emergency physician and a medical advisor for MedAire, Robb Leigh is involved in handling medical emergencies daily in an urban emergency room as well as remotely via MedAire's venues.

The **Regional** International Medical Advisory is provided courtesy of ERA member MedAire Ltd.