

Jet Lag and Altitude Affect Performance and Safety

Jet lag causes sleep disruptions, altered mood, loss of appetite, stomach upset, disorientation, and aches and pains—all of which can lead to poor performance and increased risk of accidents on the race course. Jet lag can occur whenever 3 or more time zones are crossed, especially West to East.

The effects of jet lag are amplified by altitude and the fact that PPIHC practice and competition occur very early in the day. Riders, drivers and crew need to be aware that athletic performance peaks around 1600 to 2000 hours when reaction time is faster, grip and back strength are stronger, flexion is greater, exercise endurance is longer, and the perception of physical exertion is lower than it is earlier in the day. We must also factor in lower atmospheric pressures and lower concentrations of oxygen at high altitude with increased oxygen need for muscle and cognitive work.

Six strategies for minimizing the effects of Jet Lag and High Altitude:

1. Light exposure management
2. Melatonin and adrenal cortex supplements
3. Hydration
4. Fitness training and nutrition adaptations
5. Acclimate to high altitude
6. Prescription drugs, acetazolamide, sildenafil and modafinil

Light

When an athlete travels from west to east, they should be exposed to more light in the morning and less light in the afternoon. When traveling from east to west, light should be minimized in the morning and maximized in the afternoon.

Seasonal Affective Disorder light devices (450-480nm) at approximately 1500 lux are excellent for maximizing light exposure, and light-blocking glasses that block between 80% and 98% of incident light in the blue range work to minimize light exposure. Ideally these interventions should be implemented 2-3 days before the time-zone shift.

Recommended light device

Recommended glasses

Melatonin

Melatonin is a hormone produced by the pineal gland in the brain during darkness and is responsible for the synchronization of circadian rhythms. Light, especially in the blue range (emitted from electronic devices, LED and fluorescent lights and natural sunlight) suppresses melatonin production.

I recommend my athletes take [3 mg of melatonin](#).

The general rule is:

- evening administration advances one's body clock (induces sleepiness) for eastward travel and
- morning administration delays it (helps keep you awake) for westward travel.

Using melatonin to minimize jet lag works best if it is taken 30 minutes before/after the athlete's normal sleep/wake cycle, and taken at least three days after the time-zone shift.

Adrenal Cortex

Just as melatonin helps induce an athlete's natural sleep rhythms, cortisol, from the adrenal glands, naturally spikes upon morning awakening to get the mind and body going. I recommend my athletes take an [adrenal cortex supplement](#) containing raw bovine adrenal concentrate to help maintain alertness when their body's clock is telling them it's time to sleep. Two in the morning upon awakening is my suggested dose.

Hydration

Rule of thumb: every day, in ounces, drink $\frac{1}{2}$ your ideal body weight. For example, if your ideal body weight is 180lbs, drink 90oz of water every day. This is your baseline hydration. Any fluids you consume while sweating/working out, is in addition to your baseline volume. Avoid "sports drinks" that contain simple carbohydrates. My preferred electrolyte replacement drink for workouts and competition is [Precision Hydration](#) since it contains only the electrolytes needed and no extra ingredients to impede proper absorption.

Fitness Training

Training adaptation should begin at least 7 days before travel. Reduce training volume and intensity, adjust training timing to the destination time zone, and choose an evening flight for travel eastward.

During flight, to help them begin to adapt, I suggest my athletes change their watches to the destination time as soon as they board the plane. They make the environment as comfortable as possible— using pillows and supports while minimizing distractions.

They eat according to the destination times and make sure they are well hydrated throughout the entire flight.

According to the direction of travel and the athlete's time-zone management plan, during flight and for 2-4 days after landing, they use eyeshades, noise cancelling ear-plugs, melatonin, adrenal cortex, and/or light-emitting devices.

Acclimate to high altitude

Ascent to altitude causes physiologic stress because of the reduced air density and decreased partial pressure of oxygen, frequently resulting in altitude illness. Acute mountain sickness (AMS) can occur in un-acclimatized people who quickly travel from <1000 ft to altitudes of 6,000 ft (2,000 m) or greater, although not all individuals are affected to the same extent or in the same manner. AMS is characterized by headache and/or gastrointestinal distress (loss of appetite, nausea, or vomiting), insomnia, lightheadedness, dizziness, and fatigue. Above altitudes of 9,800 ft (3,000 m), pulmonary or cerebral edema, (fluid in the lungs and swelling of the brain), can occur. AMS can be made worse by strenuous exercise.

The only established means of preventing or minimizing AMS is through staged acclimatization. The most accepted process is to ascend no higher than 8,000 ft (2,400 m) the first day and then sleep at that altitude for four to seven days before climbing higher. Alternatively, ascend to 8,000 ft (2,400 m) the first day and then gain no more than 500 ft (150 m) each subsequent day. This is difficult when training for the PPIHC so prescription medication to reduce the risk of AMS is sometimes given.

Prescription Medications

- Acetazolamide can be prescribed when proper acclimatization to high altitude is not possible.
- Sildenafil may help with oxygen delivery to the muscles and brain at high altitude.
- Modafinil is prescribed occasionally for those who require extra mental alertness due to circadian rhythm disturbances from jet lag and lack of sleep.

Do not take any of these medications without the proper advice of a physician who knows your medical history and has given you a physical exam.

Oxygen Prescriptions & Altitude Medicine Consultation

Any competitor interested in an altitude/hypoxia consultation with the PPIHC's Medical Director, Dr. Matthew Angelidis (in partnership with UCHHealth) please reach out to Alex (alex@ppihc.org). Dr. Angelidis can prescribe oxygen (as necessary) as well as discuss any additional intervention needed.*

*The altitude medicine consultation will be free of charge, but any prescription/oxygen expenses will be the responsibility of the competitor.