

Heat-Related Illness

Traveler Summary

Introduction

Thermoregulation and acclimatization determine human heat tolerance and vulnerability to heat stress. They are key factors in determining the degree to which humans can accommodate high temperatures. Humans gain heat more easily than they lose heat. Travelers visiting a country where temperatures or humidity exceed those at home or who plan to exercise vigorously (or more vigorously than normal) should take extra precautions against heat-related illnesses.

Thermoregulation

Thermoregulatory mechanisms enable humans to maintain an average core body temperature of 36.8°C +/- 0.5°C (98.4°F +/- 0.9°F) and to survive in variable temperatures ranging from polar to equatorial. The body gains radiant heat from a hot environment and generates heat through metabolism (physical activity, shivering, and digestion). Heat is lost through exposure to a cool environment (air, air conditioning, and water), by evaporation of sweat or water from the skin, and by ingestion of cold fluids. Evaporation may be assisted by a breeze or a fan. Appropriate clothing can help prevent the absorption of radiant heat or permit the evaporation of sweat.

Acclimatization

Thermoregulation maintains body temperature in a given climate. Acclimatization (the process of the body adjusting to changes in the environment) in a hot environment increases the cooling responses of the body and protects against dehydration and salt deficiency. This process takes a minimum of 7 to 10 days, after which the risk of heat-related illness diminishes. Two hours or less is the advised maximum amount of time for exercise heat-stress during the acclimatization period. Acclimatization to wet-heat conditions takes longer than acclimatization to dry-heat conditions and may not even be attainable. Sportsmen, hikers, and outdoor workers (including military personnel or aid workers) may need specially designed acclimatization schedules. Behavioral adaptation to a hot climate may also be necessary; for example, proper pace when exercising is important so that heat gain does not outpace heat loss.

Heat-Related Illness

Heat rash ("prickly heat") can appear as an area of raised spots or patches of reddened, sensitive skin. It usually forms in body areas that are not exposed to air, such as underarms and groin. Sweatgland ducts may be blocked and become itchy.

Treatment: Travelers should use cool baths or compresses to help soothe irritated skin, apply 1% hydrocortisone cream to the affected areas to decrease itching, and keep the skin as cool and dry as possible.

Heat syncope is fainting or dizziness associated with overheating. It occurs when the body, in an effort to cool itself, causes the blood vessels to dilate to such an extent that blood flow to the brain is reduced.

Treatment: Travelers should lie or sit down, drink cool, nonalcoholic liquids, loosen or remove tight clothing, cool off with a fan or shower, and acclimatize.

Heat edema is swelling of the ankles and/or hands due to dilation of blood vessels.

Treatment: Travelers should elevate their legs, wear compressions stockings, and acclimatize.

Heat exhaustion is the body's response to an excessive loss of water and salt. It commonly results from overexertion in a hot, humid environment where evaporation of sweat is impaired and fluid intake has not kept pace with fluid loss. Symptoms include exhaustion, weakness, dizziness, headache, nausea, thirst, rapid pulse, and low blood pressure. Body temperature is usually raised to 38.5-40°C (101.3-104°F). Cerebral function is normal.

Treatment: Travelers should treat these symptoms immediately: find a cool, shady spot to rest, take a cold bath or shower or mist the skin with cold water and fan (to assist with evaporation), and drink cool, nonalcoholic liquids. Muscular cramps indicate salt depletion. If they occur, travelers should drink liquids with added salt: use 1 to 2 level teaspoons of salt for each liter (about 4 cups) of fluid. If untreated, heat exhaustion can lead to heat stroke. Travelers should not take fever-reducing

medications.

Heat stroke is the most serious heat-related disorder. It may follow heat exhaustion or arise spontaneously in a very hot environment, even before the development of water and salt depletion symptoms. Body temperature is usually above 40°C (104°F). Cerebral function is abnormal.

Heat stroke occurs when the body is unable to control its temperature. The core body temperature rises rapidly, the sweating mechanism fails, and the body cannot cool down. Symptoms include headache, confusion, irrational behavior, drowsiness, shortness of breath, and unconsciousness. Victims often complain of feeling cold and may shiver. The skin may be hot and dry or profusely sweaty. Heat stroke can be rapidly fatal. If the body temperature continues to rise, multiple organs can fail.

Heat stroke is divided into 2 types: exertional and classic (nonexertional). Exertional heat stroke predominantly occurs in healthy people who are exercising or working in a hot and humid climate, but it can also affect those who are unfit or not acclimatized to the weather. Classic heat stroke most commonly affects children, the elderly, or chronically ill persons with underlying risk factors.

Treatment: Victims should be cooled down as quickly as possible: remove clothing, immerse trunk and limbs in a cold bath (preferably iced) or a natural body of cold water, or (second best) mist the skin with cold water and fan. Medical help should be sought immediately. Do not give fever-reducing medication.

Risk Factors

- | Exposure to environmental temperatures above 35°C (95°F)
- | Physical activity (e.g., swimming) in water temperatures above 33°C (91°F)
- | Physical activity in the heat, especially for children
- | Physical activity while wearing excessive, insulating, or impermeable clothing
- | Advanced age, due to the decreased ability to sweat and dissipate heat even while at rest
- | Obesity, poor physical conditioning, lack of acclimatization, alcohol abuse, and dehydration
- | Cardiovascular, respiratory, renal, or neurological diseases; mental illness; febrile illness; and skin conditions that affect sweating (e.g., extensive scarring or recent severe sunburn)
- | Use of medications that may interfere with heat regulation, notably barbiturates, benzodiazepines, phenothiazines, anticholinergic drugs, certain antipsychotics, tricyclic antidepressants, diuretics, sympathomimetics, amphetamines, and cocaine
- | Pilgrimages to destinations with high temperatures, such as Hajj and Umra pilgrims (see *Hajj and Umra Travelers*) to Saudi Arabia and Hindu pilgrims to India
- | Lack of air conditioning during heat waves in cities with normally moderate climates

Prevention

When outdoors, travelers should wear light-colored, lightweight, water-vapor permeable clothing that covers as much skin as practicable to prevent absorption of radiant heat. Fabrics such as cotton and linen are good choices. Avoid synthetic materials. Clothes should fit loosely for maximum cooling effect. On bright days or in the sun, travelers should wear a comfortable, ventilated, light-colored hat with a wide brim and use sunscreen to prevent sunburn (see *Sun Protection*).

In the heat of the day, travelers should seek shade and a breeze, rest indoors in the afternoon, and schedule sightseeing and other physical activities in the early morning or evening. In addition, travelers should maintain hydration by regularly drinking enough water to keep the urine a pale-yellow color.

A normal diet usually contains adequate salt; salt supplementation or the use of sports drinks is unnecessary. Sweat rates during exercise in the heat average 1 to 1.5 liters/hour (4-6 cups/hour). Salt supplementation is not necessary for losses of less than 8 liters. Increasing dietary salt at meals should generally be sufficient for longer expeditions or periods of exercise.

Deliberate strategies for prevention should be included when planning activities with an identifiable risk of heat-related illness.

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