Sunstroke is a life-threatening condition in which the body's heat-regulating system fails, due to exposure to high temperatures.

Sunstroke can occur when the body's mechanisms to rid itself of excess heat are overwhelmed by a very hot or humid environment, or strenuous physical activity.

People particularly susceptible to sunstroke are young children, the elderly, individuals not used to physical activity and concomitant excessive sun exposure (such as overseas visitors walking in the mountains in Africa), people suffering from certain chronic medical conditions, and those involved in certain sporting activities.

Symptoms of sunstroke include elevated body temperature; hot, dry skin; hyperventilation; mental confusion; and eventual unconsciousness.

The primary treatment goal for sunstroke is to lower the elevated body temperature rapidly in a controlled fashion.

**Sunstroke can be prevented by drinking plenty of water and avoiding overtaxing the body in hot weather and while exercising.**

**Alternative names**

Heatstroke

**What is sunstroke?**

(heatstroke) is an acute, life-threatening condition in which the body's heat-regulating system fails, due to prolonged exposure to high temperatures, excessive production of heat or commonly a combination of the two. The body is unable to lose heat adequately in order to return to its normal temperature. Body temperature rises to very high levels, which can damage major organs.

Sunstroke can be preceded by heat exhaustion, when excess loss of fluids and salt in sweat results in marked weakness. Heat exhaustion becomes sunstroke when your body can no longer maintain a normal body temperature.

Heat exhaustion may be accompanied by heat cramps: sudden painful muscle spasms in the arms or legs, and sometimes the abdomen.

**What causes sunstroke?**

In a hot environment, your body rids itself of excess heat through increasing blood flow to the skin, sweating and breathing out warmed air. These mechanisms can sometimes be overwhelmed, however, leading to heat-related symptoms, which, if left untreated, can lead to sunstroke.

When blood temperature rises above its normal range, a control centre in the brain (the
hypothalamus) signals the circulatory system to increase blood flow and enlarge the blood vessels, particularly those in the skin. As more blood flows through the enlarged vessels, excess heat from the blood passes into the cooler air. If this is not sufficient to cool the blood, the sweat glands begin to produce sweat, which cools the skin as it evaporates. If the air temperature is very high, however, the blood may not cool down enough as it circulates through the skin. Also, when you lose too much fluid, the blood volume decreases, and body temperature increases. If the body continues to generate heat faster than you can lose it, the core temperature (central body temperature) may rise to dangerous levels, causing heat exhaustion or sunstroke.

Sunstroke usually occurs after exposure to high temperatures, for example from working in an extremely hot environment, especially one to which you are unused; exercising too strenuously, particularly in summer; or when you have a high fever associated with illness. Humid weather also renders the cooling mechanism of sweating less effective. Overdressing, overeating and drinking too much alcohol can be contributing factors.

The primary cause of symptoms is loss of sodium and chloride (which make up salt), rather than the amount of water.

**Who gets sunstroke and who is at risk?**

Anyone exposed to high temperatures is at risk of sunstroke, but the following groups are at particularly high risk and must take special precautions to avoid hot, poorly ventilated places and exertion in hot weather:

Young children

Elderly people

People with certain chronic conditions such as:

- Arteriosclerosis and congestive heart failure
- Diabetes mellitus
- Alcoholism
- Skin disorders that may impede heat loss such as ectodermal dysplasia, congenital absence of the sweat glands, or severe scleroderma.

People taking certain medications that may interfere with temperature regulation. Some such medications include: gastrointestinal drugs containing atropine (e.g. Donnatal); antidepressants or antipsychotics (e.g. Thorazine, Haldol, Prozac); antihistamines (e.g. Benadryl); certain cardiovascular medications including betablockers (e.g. Blocadren) and diuretics (e.g. Diuril); and Parkinson's disease medications.

People taking part in certain types of sporting activities, such as long-distance running or cycling.

People known to be susceptible to the effects of extreme heat.
**Symptoms and signs of sunstroke**

Symptoms of sunstroke may include:

- Hot, dry skin
- No sweating (usually)
- Skin is first flushed, then pale or purple
- Hyperventilation (rapid, shallow breathing)
- Rapid, bounding pulse (alters between a higher intensity than normal, then disappears quickly)
- Body temperature rises rapidly to 40°C or higher
- Headache
- Muscle cramps
- Dilated pupils

Signs of mental disorder may include incoherent speech, disorientation, confusion, aggressive speech or behaviour, agitation and hallucinations.

- Lethargy or stupor (reactions become extremely slow and sluggish)
- Convulsions
- Loss of consciousness

Symptoms of heat exhaustion may include:

- Weakness and fatigue
- Tense or aching muscles
- Nausea and vomiting
- Pale, clammy skin
- Weak, rapid pulse
- Confusion
- Normal body temperature (usually)
- Heat cramps
- Heavy sweating
Dizziness or lightheadedness

Fainting

Dark yellow or orange urine

Headache

Diarrhoea

**How is sunstroke diagnosed?**

The doctor will review your symptoms and take blood pressure and temperature readings. Rectal temperature is used rather than temperature in the mouth. He or she may also take a sample of your blood and urine for testing.

**How is sunstroke treated?**

Treatment of heat-related illness depends on its severity.

**Emergency treatment of sunstroke**

Heat stroke is a medical emergency. If you think someone has sunstroke, call an ambulance or take the person to hospital immediately. The primary treatment goal is to lower the elevated body temperature as quickly as possible. So, while you're waiting for medical help, give first aid as follows:

Remove the person's clothing and immerse the body in a cold water bath. If this is not possible, cover the body with a wet sheet or towels, sponge down the body with cool water or rub the limbs with ice-cubes. If your water supply is limited, cooling the head and neck becomes the priority. Place ice packs (if available) at the neck, armpits and groin. Fan the person with a newspaper, towel or electric fan to increase air flow and evaporation.

After the bath, move the person to a cool place.

Elevate the feet to direct blood back toward the head.

Massage the extremities (arms and legs) to encourage the return of cool blood to the brain and the core of the body.

If the person is conscious, encourage him or her to sip water or a soft drink. If the mental state is impaired, it may be impossible to get the person to drink. Continue with external cooling in the hope that the person will recover sufficiently to begin drinking.

While cooling the body down, take the person's temperature rectally every 10 minutes and do not allow it to fall below 38.5°C. Only immerse the person in a cold bath until their temperature falls to 39.4°C. If you don't have a thermometer, continue with first aid until the body feels cool to the touch. Resume cooling if the body starts to heat up again.
**Hospital care for sunstroke**

More careful control measures are used in hospital, with better temperature measurement and regulation. Core temperature is monitored continuously to avoid hypothermia. Blood tests are used to determine salt and electrolyte levels and fluid therapy is started to correct imbalances.

Careful observation for signs of fluid and salt imbalances, and complications such as kidney failure, will be required for several weeks after the initial episode. Temperature changes may be expected for several weeks following the episode.

**Treatment of heat exhaustion and heat cramps**

Heat exhaustion and cramps can usually be resolved with home treatment. Have the person lie down in a cool place, loosen or remove clothing and sponge the body with cold water, or apply wet towels or ice packs.

You can also fan them to increase cooling through evaporation. Offer a cool salty drink, for example a teaspoon of salt dissolved in a litre of water, sipped slowly over an hour. You can add a tablespoon of sugar or a sweet drink powder as an energy boost. If the person is elderly or cannot keep the salty liquid down, he or she should be taken to hospital.

Heat cramps can be relieved by stretching and massage. Firm pressure on the cramped muscles and warm towels may help. Drinking a salty solution, as recommended for heat exhaustion, should keep cramps from recurring.

Anyone who has had heat exhaustion or cramps should rest for 24 hours afterwards.

**What is the outcome of sunstroke?**

Heat exhaustion is not life-threatening unless it is ignored, but sunstroke can be fatal if not properly treated. Once the cooling mechanism fails, the core temperature rises rapidly and death can occur in as little as 30 minutes. Some people die up to several weeks after the initial acute episode, as a result of complications such as kidney failure or heart failure. Sunstroke kills over 10% of its victims. Sunstroke may also cause permanent damage to organs such as the liver.

**Can sunstroke be prevented?**

The following guidelines can help prevent heat-related illness, including sunstroke:

Drink plenty of water whenever you spend a lot of time in the sun or a hot environment, and before, during and after exercise. Don't wait until you feel thirsty to drink, and drink more than you need to satisfy your thirst - particularly if you've been sweating.

Rest during the hottest part of the day.

Take time to get used to a new climate, or the start of the hot season, before being very active or staying in the sun. Your temperature regulation system will become more efficient as it becomes accustomed to the heat.
If you are an endurance runner or cyclist you should train in hot conditions if you know that you will race in these conditions. This allows your body to start to get used to the heat. Take care to drink adequate fluids while training and don’t overdo it when you first start acclimatising.

Limit exposure to the sun.

Wear a hat or cap, preferably one with a wide brim, especially if working in the sun - the head is particularly sensitive to heat.

Wear light-coloured, loose-fitting, lightweight clothing in hot weather. Cotton is best, as it allows air to pass through and sweat to evaporate.

Open windows, or use a fan to improve indoor air circulation.

Eat light, small meals, and limit alcohol intake in hot weather. Avoid alcohol before, during, and immediately after exercise. Alcohol causes you to lose more fluid than you consume.

Limit vigorous activity during hot or humid weather, especially during the middle of the day.

If you have to exercise in the heat, maintain a pace that allows your body to adapt to the hot weather: start with short workouts and increase them gradually over at least two weeks. Try to schedule vigorous exercise during cooler morning or evening hours. Rest in the shade for five to ten minutes every half hour, and reduce your pace if you start to feel symptoms of exhaustion.

Ask your doctor whether any medications you are taking may interfere with your body's temperature regulation. (See: Who gets sunstroke and who is at risk.) If you use any of these medications, be especially careful to limit exertion and drink enough water in hot weather.

Be able to recognise the danger signs of heat-related illness. Remember that symptoms can develop over several days or suddenly during strenuous activity.

Heat oedema and prickly heat are two conditions that signal that your body is under heat stress. Heat oedema is swelling of the hands and feet when blood vessels expand and cause fluid to pool under the skin. You may first notice this when your shoes or rings feel too tight. Prickly heat is an irritating rash caused by sweat pore blockage, usually under clothes. This may happen if you dress too warmly or wear clothing that doesn't "breathe". These conditions are not harmful, but indicate that you need to cool down to avoid a more serious heat-related illness.

**When to call the doctor**

Sunstroke is a medical emergency. Seek immediate medical help if you or someone else develops any of the following heat-related symptoms:

- Confusion
- Extreme fatigue
- Agitation
- Intense muscle aches, feverishness or nausea
Convulsions or loss of consciousness