Heat Injury

Understanding Heat-Related Illness

Heat stroke is the most severe form of heat-related illness. It can cause agitation, seizures, coma, rhabdomyolysis, multiple organ failure, and even death. Why is heat stroke so serious? We can think of the human body like a car. A car burns fuel in order to run, which produces heat. In a hot environment, heat from the surroundings is also transferred to the car. Although the car has a cooling system, if its cooling capacity cannot keep up with the accumulation of heat, the car may overheat and malfunction. The human body works in a similar way—when the body produces too much heat or cannot release heat effectively, heat-related illness may occur.

Causes of Excessive Body Heat

1. **Excessive heat production by the body**
   This may occur when the body generates too much heat due to strenuous exercise, certain medical conditions (such as hyperthyroidism), or the use of drugs that increase metabolism (such as amphetamines or cocaine).

2. **Excessive absorption of heat from the environment**
   This commonly occurs in areas exposed to direct sunlight or in hot, enclosed spaces. Extra caution is needed for children, older adults, and people with limited mobility, as they may be unable to leave a high-temperature environment on their own. Continuous exposure to heat may lead to heat-related illness.

Common Types of Heat-Related Illness

Common heat-related illnesses include **heat cramps, heat syncope, heat edema, heat exhaustion, and heat stroke**.

- **Heat cramps** usually occur during or after strenuous exercise, often when beginning to rest. Symptoms include painful muscle spasms or cramps. Adequate water and electrolyte replacement are necessary.

- **Heat syncope** refers to a brief loss of consciousness after prolonged standing in a hot environment. In most cases, simply moving the person to a cool shaded area and laying them flat is sufficient.

- **Heat edema** occurs after prolonged standing or sitting in a hot environment, leading to swelling of the hands, feet, or lower limbs. It usually resolves naturally within a few weeks and generally does not require special treatment. Elevating the legs or wearing compression stockings may help speed recovery.

Prevention of Heat-Related Illness

Taiwan is located in a subtropical region, so we should always remain alert for heat emergencies. Avoid staying

too long under direct sunlight or in hot enclosed spaces. During exercise or outdoor activities, remember to:

- Drink enough water and replenish electrolytes
- Wear loose-fitting, breathable, light-colored clothing

If heat-related illness occurs, the general principles of management are:

1. Move the person to a cool or shaded area
2. Cool the body
3. Replenish fluids and electrolytes
4. Seek medical attention promptly

First Aid for Heat-Related Illness: What We Can Do

As mentioned in “What Are the Symptoms of Heat-Related Illness?”, heat-related illnesses include heat cramps, heat syncope, heat exhaustion, and heat stroke. The first three are considered milder forms of heat-related illness. Although the patient’s body temperature may rise, it rarely exceeds 40°C. In these situations, the most important thing is to quickly relieve the patient’s current condition.

First, assess the surroundings and situation. For example, heat-related illness often occurs under direct sunlight or in hot and humid environments. Therefore, the following steps should be taken:

1. Move to a Cool, Shaded Area

Move the patient to a cool, shaded, and well-ventilated place so they are no longer exposed to the environment that caused the heat injury. Suitable locations may include under a tree, inside a nearby shop, or under a covered walkway.

Keep bystanders at a reasonable distance to avoid blocking airflow and reducing ventilation around the patient.

2. Loosen Clothing

Heat-related illness may occur because clothing is too tight or not breathable enough. Loosen or remove excess clothing and encourage the patient to lie down and rest.

If the patient is experiencing heat cramps, gently stretch the affected muscles and continue monitoring the patient’s condition for improvement.

3. Cool the Body

For moderate to severe heat-related illness—especially heat stroke—rapid cooling to below 39°C is critical and greatly affects the patient’s prognosis.

Methods include:

(A) Cold Water Immersion

Place the patient's body in cold water while keeping the head above the water surface. Cooling through conduction and convection is currently considered the fastest and most effective cooling method.

(B) Water Spray and Fanning

If cold water immersion is not possible, remove the patient's clothing, pour cool water over the body, and use a fan or manually fan the patient. Air movement promotes evaporation and improves heat loss.

(C) Apply Ice Packs

Place ice packs on areas with abundant blood flow near the skin surface, such as the arms, armpits, neck, and knees, to help dissipate heat.

If the patient loses consciousness or experiences severe convulsions, follow the "Call–Check–CABD" emergency response steps:

- Check responsiveness
- Call for help
- Perform chest compressions if needed
- Open the airway
- Check breathing
- Use an AED if available

The patient should be placed in the recovery position (lying on their side with the head tilted back slightly) while ensuring the airway remains open.

Seek emergency medical assistance immediately and continue cooling efforts during transport to the hospital to maximize the patient's chances of recovery.

Even if the patient regains consciousness during first aid, they should still be transported to the hospital. Do not allow the patient to walk independently or leave the scene before medical personnel arrive.

4. Give Fluids

This step should only be performed if the patient is fully conscious and able to swallow safely, to avoid choking or aspiration.

Provide electrolyte-containing drinks (such as sports drinks) or cool water with a small amount of salt. For conditions such as heat cramps or heat exhaustion, isotonic or hypertonic fluids are recommended to help restore fluid and electrolyte balance.

5. Seek Medical Attention

If at any point the patient's condition becomes more severe or exceeds what you can safely manage, do not hesitate or attempt to handle it alone. Seek professional medical assistance immediately.

In Taiwan, the emergency number is **119**.

While waiting for emergency services to arrive, continue repeating the first four steps:

1. Move to a cool area
2. Loosen clothing
3. Cool the body
4. Provide fluids (if appropriate)

Two Important "Don'ts" in First Aid: Prevent Secondary Harm

Do Not Use Alcohol or Fever-Reducing Medication

"Do not use alcohol, and do not give fever-reducing medication."
Sometimes, good intentions may unintentionally cause additional harm to patients with heat-related illness.

As mentioned earlier, the first priority is to move the patient to a cool, shaded area and lower their body temperature with cool water. Although alcohol evaporates quickly and may temporarily create the sensation that the skin has cooled down, it can actually cause the skin pores and blood vessels to constrict due to the cold sensation, which interferes with the body's ability to dissipate heat effectively.

Although patients with heat-related illness may feel extremely hot, the mechanism behind their elevated body temperature is completely different from that of a typical fever.

A normal fever is usually caused by infection or inflammation. Pyrogens released by pathogens or cytokines produced by the immune response raise the body temperature, typically between 38–41°C. Patients may experience chills or alternating sensations of hot and cold. Fever-reducing medications help by suppressing inflammation and lowering body temperature.

However, heat stroke occurs because the body's temperature regulation center and sweating mechanisms fail in a hot and humid environment. Therefore, fever-reducing medications are not effective for heat stroke patients.

Heat Stroke: The Golden Three Hours

What should we do if we encounter a patient suffering from heat stroke, the most severe form of heat-related illness?

Although most treatment steps are similar to those described earlier, heat stroke patients are already in a critical and life-threatening condition.

Research has shown that if a heat stroke patient has a body temperature above 40°C and loses consciousness,

but their core body temperature is not reduced to below 39°C within three hours, the mortality rate increases significantly.

Because every minute counts, the best approach is to follow the **"Three Rapid Principles"**:

1. **Rapid recognition**
2. **Rapid cooling**
3. **Rapid transport to the hospital**

These actions help buy valuable time for the patient to receive advanced medical treatment as soon as possible.

Conclusion

When heat-related illness occurs, staying calm and responding rationally can help reassure the patient and improve the efficiency of first aid.

Remember the five key steps:

1. Move to a cool, shaded area
2. Loosen or remove clothing
3. Cool the body
4. Provide fluids
5. Seek medical attention

These actions can minimize the severity of heat-related illness.

Also remember the two important "don'ts":

- Do not use alcohol
- Do not give fever-reducing medication

Avoiding these common misconceptions can prevent delays in proper treatment.

Even if we are not healthcare professionals, we can still help save lives by applying these basic first aid principles for heat-related illness.

Information from CDC