

**STEVEN CHUDIK MD**  

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**SHOULDER, KNEE & SPORTS MEDICINE**

## **Heat and Athletic Activity**

Heat injuries endanger the health of many athletes each year. Those involved in athletics must know how to recognize and provide emergency aid to the athlete suffering from heat disorders. Most importantly, we must know how to prevent heat injuries with proper attention to conditioning, clothing, fluid intake, and be familiar with the precautions for limiting play during times of high temperatures and humidity.

### **Heat Regulation**

A small gland in the brain called the hypothalamus carefully regulates body temperature; as body temperature rises, certain mechanisms are activated to promote heat loss. These mechanisms include conduction (transfer of heat from the warm body to a cooler object); convection (transfer of heat from the warm body to the cooler environmental air); evaporation (transformation of water on the body surface into a vapor); respiration (entrance of cooler air into the body via the lungs); and radiation (transfer of heat from the warm body to the cooler environment). Physiologically, the body responds by dilating the blood vessels in the skin, enhancing blood flow to the skin, producing more sweat, and increasing the pulse and respiratory rates.

### **Heat Injuries**

If these heat loss mechanisms fail to restore normal body temperature, the spectrum of heat injury syndromes can occur – including heat cramps, heat exhaustion, or heatstroke.

Heat cramps are the mildest form of hyperthermia or heat injury. The athlete with heat cramps complains of muscle twitching, cramps, and spasm. Treatment of the athlete with heat cramps typically consists of encouraging drinking to restore adequate hydration. The athlete should stop activity and should rest in a cool environment while replenishing fluids. Heat cramps frequently occur at the beginning of the hot weather season, before the athlete has had time to adequately condition for participation at high temperature or humidity. The body's ability to improve its response to heat exposure is called acclimatization.



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The athlete with heat exhaustion, the next most severe of the heat injury syndromes, complains not only of muscle spasms and cramps, but also may complain of headache, fatigue, weakness, lack of coordination, and excessive thirst. He or she may be nauseated or have diarrhea. On physical examination, he may have slow mentation, weight loss, dry tongue and mouth, and elevated body temperature. His skin is typically ashen, cold, and clammy, and he may be sweating profusely. Treatment consist of removing the athlete to a cool place, sponging him with cool water, fanning him, and encouraging him to drink cool fluids if the athlete is able to do so. Placing ice packs in the axilla (underarm) and hip/groin area can be helpful. If the athlete is mentally confused and refuses to drink, intravenous fluids are needed.

The athlete with heatstroke, the most severe form of heat injury, may complain of all the symptoms of heat exhaustion (headache, dizziness, fatigue, vomiting, diarrhea), but his skin is hot and dry (i.e. no sweating), not cold and clammy, since the normal homeostatic sweating mechanism has been overwhelmed. In addition, he may be confused or disoriented and combative. He feels like he is burning up, and indeed, his body temperature may rise to 104 or 105 degrees Fahrenheit or greater.

Heatstroke is a medical emergency! If the athlete is not rapidly cooled, he can die. The high body temperature literally “burns up” tissues, and hence, alters function of the heart, lungs, brain, kidneys, and other organ systems. Treatment consists of rapid transport to an emergency room facility for administration of intravenous fluids and rapid cooling with either ice water lavages or ice water immersion as indicated. While waiting for transport, the athlete should be placed in a cool environment, his clothing removed, and ice packs placed about his body with fanning to speed cooling. If the athlete is alert, encourage him to drink fluids.

### Prevention of Heat Injuries

Prevention should be everyone’s first priority. Preseason conditioning improves athletes’ ability workout when the environmental heat and humidity are high, processes know as acclimatization. The amount of time an athlete takes to acclimatize can vary, and coaches and athletic trainers should be more cautious in the first few weeks of practice to make sure athletes are adjusting to surrounding conditions. Athletes should wear lightweight, light-colored, porous clothing, and should be allowed to change into dry clothes as often as necessary.



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Water should be readily available, with athletes encouraged to drink small amounts at frequent intervals (before, during and after practice), even if they are not thirsty. Athletes should be taught to “camel-up” with fluids. Athletes lose 2% of body weight before becoming thirsty, and satisfying thirst only replaces 50% of the fluid that is needed, so it is impossible to “catch-up” with hydration once the athlete falls behind. Electrolyte solutions (i.e. sports drinks) can also be helpful to replace lost electrolytes, and some athletes may prefer sports drinks to help them take in adequate amounts of fluids. It may be helpful to weigh athletes before and after practice to ensure adequate hydration and to identify those particularly prone to fluid loss.

Whenever possible, practices should be held at cooler times of the day (early morning or late afternoon), with regular rest and water breaks. Those in charge of the practice should assess environmental conditions, taking into account not only the absolute temperature, but also the relative humidity, since the latter strongly influences the athlete’s ability to sweat. (Remember, sweating is the body’s most effective means of heat dissipation.) If heat and humidity add up to over 160 (i.e. temperature is 80 ° and 80% humidity) one should be cautious and think prevention.

While all athletes must be carefully monitored for signs of heat injury, certain athletes may be more prone to heat stress and deserve special consideration. Among these are out of shape athletes, obese athletes, athletes with chronic diseases such as diabetes and kidney disorders, athletes taking diuretics, antihistamines, antidepressants, and other medications; and athletes who are so eager to please the coach that they may ignore impending symptoms of heat illness. Athletes prone to profuse sweating are also at an increased risk. Remember, too, that children are much more susceptible to hyperthermia than adults because of their reduced ability to regulate body temperature. Children generate more metabolic heat per unit mass; therefore, their sweating capacity is lower. They also have less ability to transfer heat to the skin than adults do.

Remember, heat related injuries are preventable but require a commitment to the many issues outlined above. These measures will not only optimize athletic performance, but also improve overall sport safety.

This is provided for general information. It does not purport to encompass all risks associated with exercising in hot and humid weather, nor is it a substitute for your own good judgment and consultation with competent professional regarding specific fact situations.

