

## HEAT STRESS AND ATHLETIC PARTICIPATION

Early fall football, cross country, soccer and field hockey practices are conducted in very hot and humid weather in many parts of the United States. This can lead to heat-related illnesses. Most of the heat-related problems have been associated with football, due to the special equipment and uniforms needed. From 1995 through the 2005 football season there have been 19 high school heat stroke deaths in football. This is not acceptable. Heatstroke deaths are fully preventable in high school sports if the proper precautions are taken.

During hot weather conditions the athlete is subject to the following:

**Heat Cramps** – Heat cramps are a mild heat illness that can be easily treated. These intense muscle spasms usually develop after an athlete has been exercising for a while and has lost large amounts of fluid and salt from sweating.

**Heat Syncope** – Weakness, fatigue and fainting due to loss of salt and water in sweat and exercise in the heat.

**Heat Exhaustion** – Heat exhaustion is a moderate heat illness that occurs when a child continues to be physically active even after he or she starts suffering from ill effects of the heat, like dehydration. The child’s body struggles to keep up with the demands, leading to heat exhaustion.

**Heat Stroke** – Heat stroke is a severe heat illness that occurs when an athlete’s body creates more heat than it can release, due to the strain of exercising in the heat. This results in a rapid increase in core body temperature, which can lead to permanent disability or even death if left untreated. An acute medical emergency related to thermo-regulatory failure, associated with nausea, seizures, disorientation, and possible unconsciousness or coma. It may occur suddenly without being preceded by any other clinical signs. The individual is usually unconscious with a high body temperature and a hot dry skin (heatstroke victims, contrary to popular belief, may sweat profusely).

It is believed that the above-mentioned heat stress problems can be controlled provided certain precautions are taken. The following practices and precautions are recommended:

1. Each athlete should have a physical exam with a medical history when first entering a program and an annual health history update. History of previous heat illness and type of training activities before organized practice begins should be included. State high school association’s recommendations should be followed.
2. It is clear that top physical performance can only be achieved by an athlete who is in top physical condition. Lack of physical fitness impairs the performance of an athlete who participates in high temperatures. Coaches should know the **physical condition** of their athletes and set practice schedules accordingly.
3. Along with physical conditioning, the factor of acclimatization to heat is important. Acclimatization is the process of becoming adjusted to heat and it is essential to provide for **gradual acclimatization to hot weather**. It is necessary for an athlete to exercise in the heat if he/she is to become acclimatized to it. It is suggested that a graduated physical conditioning program be used and that 80% acclimatization can be expected to occur after the first 7 to 10 days. Final stages of acclimatization to heat are marked by increased sweating and reduced salt concentration in the sweat.
4. The old idea that water should be withheld from athletes during workouts has **no scientific foundation**. The most important safeguard to the health of the athlete is the replacement of water. Water must be on the field and readily available to the athletes at all times. It is recommended that a minimum ten minute water break be scheduled for every twenty minutes of heavy exercise in the heat. Athletes should rest in a shaded area during the break. **Water should be available in unlimited quantities**. Check and be sure athletes are drinking the water.
5. Replacement by thirst alone is inadequate. Test the air prior to practice or game using a wet bulb, globe, temperature index (WBGT index) which is based on the combined effects of air temperature, relative humidity, radiant heat and air movement. The following precautions are recommended when using the WBGT Index: (ACSM’s Guidelines for the Team Physician, 1991)

Below 65 .....	Unlimited activity	73-82.....	High risk
65-73 .....	Moderate risk	82-plus.....	Very high risk

There is also a weather guide for activities that last 30 minutes or more (Fox and Mathews, 1981) which involves knowing the relative humidity and air temperature.

<u>Air Temp</u>	<u>Danger Zone</u>	<u>Critical Zone</u>	
70F	80% RH	100% RH	RH = Relative Humidity
75F	70% RH	100% RH	
80F	50% RH	80% RH	
85F	40% RH	68% RH	
90F	30% RH	55% RH	
95F	20% RH	40% RH	
100F	10% RH	30% RH	

One other method of measuring the relative humidity is the use of a sling psychrometer, which measures wet bulb temperature. The wet bulb temperature should be measured prior to practice and the intensity and duration of practice adjusted accordingly. Recommendations are as follows:

Under 60F	Safe but always observe athletes
61-65F	Observe players carefully
66-70F	Caution
71-75F	Shorter practice sessions and more frequent water and rest breaks
75 plus F	Danger level and extreme caution

6. Cooling by evaporation is proportional to the area of the skin exposed. In extremely hot and humid weather reduce the amount of clothing covering the body as much as possible. **Never use rubberized clothing.**
7. Athletes should be weighed each day before and after practice and **weight charts checked**. Generally a three percent weight loss through sweating is safe and over a three percent weight loss is in the danger zone. Over a three percent weight loss the athlete should not be allowed to practice in hot and humid conditions. Observe the athletes closely under all conditions. **Do not allow athletes to return to practice until they have adequately replaced their weight from fluid loss.**
8. Observe athletes carefully for signs of trouble, particularly athletes who lose significant weight and the eager athlete who constantly competes at his/her capacity. Some trouble signs are nausea, incoherence, fatigue, weakness, vomiting, cramps, weak rapid pulse, visual disturbance and unsteadiness.
9. Teams that encounter hot weather during the season through travel or following an unseasonably cool period, should be physically fit, but will not be environmentally fit. Coaches in this situation should follow the above recommendations and substitute more frequently during games.
10. Know what to do in case of an emergency and have your emergency plans written with copies to all your staff. Be familiar with immediate first aid practice and prearranged procedures for obtaining medical care, including ambulance service.
11. Parents and Coaches Guide to Dehydration and Other Heat Illnesses in Children  
<http://www.nata.org/consumer/docs/parentandcoachesguide.pdf>

**HEAT STROKE – THIS IS A MEDICAL EMERGENCY – DELAY COULD BE FATAL. ACTIVATE YOUR EMERGENCY ACTION PLAN BY CALLING – 911.**

**A RECTAL TEMPERATURE NOT ORAL, AURAL, OR TEMPORAL IS DIAGNOSTIC OF HEATSTROKE.** Other methods of temperature have given false core body temperatures and caused delay in care. If you are unable to obtain a rectal temperature it is safer to cool the athlete then delay. **Immediately cool the athlete while waiting for transfer to a hospital.** Remove equipment and immerse body in ice cold water and keep cooling athlete.

Despite the many ways athletes can be cooled, immersion therapy has the best cooling rates. Ice water immersion should be your choice of cooling. A plastic kiddie pool or large plastic tub filled with water and with ice on standby should be available at all practices and games. Continue cooling efforts until EMS arrives. Recommendation is to continue cooling the athlete until core temperature is <100 degrees Fahrenheit.

**Heat Exhaustion – Contact licensed health care provider.** Cool body as you would for heat stroke while waiting for medical personnel. Activate your emergency action plan.

**Summary** – The main problem associated with exercising in the hot weather is water loss through sweating. Water loss is best replaced by allowing the athlete unrestricted access to water. Water breaks two or three times every hour are better than one break an hour. Probably the best method is to have water available at all times and to allow the athlete to drink water whenever he/she needs it. Never restrict the amount of water an athlete drinks, and be sure the athletes are drinking the water. The small amount of salt lost in sweat is adequately replaced by salting food at meals. Talk to your medical personnel concerning emergency treatment plans. Athletes that appear to have heat stroke or heat exhaustion should be cooled by ice water immersion.