

HEAT STRESS AND ATHLETIC PARTICIPATION

by Dr. Frederick Mueller

The following article was originally published in "From the Gym to the Jury" in September, 2001. We believe that its recommendations are as timely and valuable as ever...especially since practices for fall sports are beginning soon.

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. Due to the equipment and uniforms needed in football, as well as practice beginning during the summer, most of the heat problems have been associated with football. From 1995 through the 2000 football season there have been 17 heat stroke deaths in football. This is not acceptable. There are no excuses for heat stroke deaths and they are completely avoidable if the proper precautions are taken. During hot weather, athletes are subjected to the following:

HEAT CRAMPS Painful cramps involving abdominal muscles and extremities caused by intense, prolonged exercise in the heat and depletion of salt and water due to profuse sweating.

HEAT SYNCOPE Weakness, fatigue and fainting that is due to loss of salt and water in sweat and exercise in the heat. This condition predisposes athletes to heat stroke.

HEAT EXHAUSTION (WATER DEPLETION) Excessive weight loss, reduced sweating, elevated skin and core body temperature, excessive thirst, weakness, headache and sometimes unconsciousness.

HEAT EXHAUSTION (SALT DEPLETION) Exhaustion, nausea, vomiting, muscle cramps and dizziness due to profuse sweating and inadequate replacement of body salts.

HEAT STROKE An acute medical emergency related to thermoregulatory failure. It is 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 hot, dry skin (heat stroke victims, contrary to popular belief, may sweat profusely).

PRACTICES AND PRECAUTIONS:

It is believed that the above mentioned heat stress problems can be controlled provided certain precautions are taken. According to the American Academy of Pediatrics Committee on Sports Medicine, heat related illnesses are all preventable. (*Sports Medicine: Health Care for Young Athletes, American Academy of Pediatrics, July 2000*). The following practices and precautions are recommended:

1. Each athlete should have a physical examination 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 Associations 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 seven-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. It is the coach's responsibility to educate the athletes as to the importance of drinking water or sports drinks in order to replace lost bodily fluids. Water must be on the field and readily available to the athletes at all times. It is recommended that a minimum 10-minute water break be scheduled for every half hour of heavy exercise in the heat. Athletes should rest in a shaded area during the break. WATER SHOULD BE AVAILABLE IN UNLIMITED QUANTITIES.

5. Coach's should check to be sure athletes are drinking the water. Replacement by thirst alone is inadequate. The cold water, wet bulb,

globe, temperature index (WBGT index) is based on the combined effects of air temperature, relative humidity, radiant heat and air movement. The following precautions (see chart below) are recommended when using the WBGT

THE WBGT INDEX	
Below 64° F	Unlimited Activity
65° – 72° F	Moderate Risk
72° – 82° F	High Risk
Over 82° F	Very High Risk

Index: (ACSM'S Guidelines for The Team Physician, 1991.)

There is also a weather guide for activities that last 30 minutes or more (Fox and Mathews, 1981)

Air Temp	Danger Zone	Critical Zone
70° F	80% RH	100% RH
75° F	70% RH	100% RH
80° F	50% RH	80% RH
85° F	40% RH	68% RH
90° F	30% RH	55% RH
95° F	20% RH	40% RH
100° F	10% RH	30% RH

RH = Relative Humidity

which involves knowing the relative humidity and air temperature.

One other method of measuring the relative humidity is the use of a sling psychomotor, which measures wet bulb temperature.

The wet bulb temperature should be measured prior to practice and the intensity and duration

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

of practice adjusted accordingly. Recommendations are as follows:

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 weigh each day before and after practice and charted daily. Generally a 3% weight loss through sweating is safe. Weight loss in excess of 3% is in the danger zone. If there is over a 3% 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 practice until they have adequately replaced their water weight.

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 to watch for include 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, could be physically fit but may 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 establish prearranged procedures for obtaining medical care including ambulance service.

EMERGENCY TREATMENT HEAT STROKE:

This is a Medic2 Emergency — Delay Could Be Fatal! Immediately

cool the body and transfer to a hospital as soon as possible. Remove clothing and place ice bags on the neck, in the oxilla (armpit), and on the groin areas. Fan athlete and spray with cold water to enhance evaporation.

HEAT EXHAUSTION:

Obtain Medical Care at Once!

Cool the body as you would for heat stroke while waiting for transfer to the hospital. Give fluids if athlete is able to swallow and is conscious.

In 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 and sports drinks. Water breaks two or three times every hour are better than one break an hour. Athletes must be educated in the need to drink in order to replace lost fluids. They must understand that if they wait until they are thirsty, it may be too late. 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 check to be sure that the athletes are drinking. The small amount of salt lost in sweat is adequately replaced by salting food at meals. Talk to medical personnel concerning emergency treatment plans.

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