GSSI

2002 GSSI Guidelines on Heat Safety in Football ATTACKING HEAT-RELATED DEATH AND ILLNESS IN FOOTBALL PLAYERS

According to the listed cause of death, each year since 1995 an average of three football players?high school, college, or pro?died because of heat stroke. Other heat-stroke deaths may have been misdiagnosed because heat stroke often kills by damaging hearts, livers, and kidneys that fail many hours or even days after the heat exposure. Therefore, it is likely that the actual number of heat-related deaths in football exceeds three players per year.

But heat stroke doesn?t always kill; it can incapacitate by permanently injuring the brain and other organs. Unfortunately, it is unclear how many football players are injured by non-fatal heat stroke each year. We also don?t know how many of the 1.5 million players at all levels of competition are afflicted by more common but less serious forms of heat-related illness?heat exhaustion and severe heat cramps for instance?that can impair performance and the ability to practice effectively. It seems likely that there are hundreds of these cases each year.

Can heat illness in football players be prevented entirely? If not, what can be done to minimize it? To answer these questions, eminent scientists, physicians, coaches, athletic trainers, nutritionists, and other fitness and health experts met at a recent three-day conference?The Science and Practice of American Football?to catalog the scientific and clinical evidence available on the causes and prevention of heat-related illness in football players. The conference was one of an annual series of scientific meetings sponsored by the Gatorade Sports Science Institute. At the end of the conference the participants, including those who represented teams at high school, NCAA, and NFL levels, developed a list of important principles and recommended actions that will increase the safety and enhance the performance of football players exposed to hot environments.

The most important findings were that heat-related deaths in football are preventable and that the incidence of heat illness and related impairments in performance can be dramatically reduced if coaches, medical personnel, players, team administrators, and/or parents take the recommended actions.

The science-based principles and the consensus recommendations generated by the conference participants are presented below.

PRINCIPLES

Heat Acclimation

- A lack of acclimation to the heat and poor cardiovascular fitness, especially in large and excessively fat players, are prominent contributors to heat illness in football players.

- Optimal heat acclimation and cardiovascular fitness can be achieved only when the athlete is well hydrated and properly fed, including enough salt intake to help expand blood volume.
- The first 2-3 days of preseason football practice present the greatest danger for serious heat illness because players often report for practice insufficiently acclimated to the heat and/or in a poor state of cardiovascular fitness and because coaches may demand intense exercise in hot weather too soon.

Dehydration

- In hot weather, large football players can lose more than 15 pounds of sweat?almost two gallons?in a single practice session. During the course of a practice or game, players rarely replace all the fluids and electrolytes that they lose.
- Dehydration is dangerous. Even mild dehydration (as little as 2% of body weight?3 lbs. for a 150 lb. player, 6 pounds in a 300 lb. player) can contribute to potential heat illness and impair football performance.
- Players cannot be trained to require less fluid, and players cannot adapt to dehydration.
- The football uniform drastically impedes the evaporation of sweat, which in hot weather may be the only means the player has to dissipate body heat.

Electrolyte Balance

- Players can lose large amounts of electrolytes, especially sodium, in their sweat. Sodium helps sustain thirst, reduce fluid loss in the urine, and maintain blood volume. Unless sodium is replenished, body fluid balance can be disrupted so that heat illness?especially heat cramps?becomes more likely.
- In most cases, whole-body cramping stems from muscle fatigue, dehydration, and salt loss. Prevention hinges on more salt and salty foods in meals and snacks and more fluids, including sodium-containing sports drinks, before, during, and after practices and games.
- Rarely, players may drink such large quantities of water that they dilute the concentration of sodium in their body fluids. This low blood sodium or "hyponatremia" can lead to brain damage and even death.

Other Risk Factors

- A prior history of heat-related illness is an important risk factor for future heat illness. However, players with no prior history can also succumb to heat-related illness.
- The intensity of the practice contributes to heat illness. No matter how hot the weather, heat illness can be prevented if the intensity of the practice is sufficiently low. It is the combination of a high rate of heat production by the muscles and inadequate dissipation of that heat because of the uniform and environment that leads to potentially catastrophic heat illness in football players.
- Twice-daily preseason practices ("two-a-days" or "doubles"), especially during the first two days, can contribute to heat illness if adequate precautions are not taken to allow the body to cool down between practices. However, two-a-days can be safe if conducted appropriately.

- The first two days of practice are a potential 1-2 punch for heat illness. Players who suffer any type of heat illness on Day 1 are highly susceptible to further illness on Day 2.
- Dietary supplements that contain ephedra or other stimulants and prescription drugs that contain stimulants can increase the body?s heat production and thereby increase the risk of heat illness.
- The commonly used Heat Index is a good measure of how hot the environment feels, but it is an inadequate indicator of the risk of heat stroke and other heat-related illnesses in football players. There is no absolute environmental measurement that can be applied to precisely predict potential heat illness, so it is vital to be alert to signs of impending heat illness in all players at all practices and games.

RECOMMENDED ACTIONS?BEFORE THE FIRST PRESEASON PRACTICE

- At the scholastic level, team physicians and/or certified athletic trainers should conduct mandatory education programs for football coaches, booster clubs, and parents that focus on heat illness and hydration. At NCAA and NFL levels, these programs should be directed to coaches and players.
- Players should be strongly encouraged to achieve heat acclimation and cardiovascular fitness in the days and weeks **immediately before** preseason practices begin. For example, during the 2 weeks preceding formal practices they might be asked to jog 30-45 minutes in the heat daily while dressed in shirts, shorts, socks, and running shoes.
- Preseason physical exams should include questions about the player?s history of heat-related problems, and players should be advised about the importance to their health of answering these questions truthfully. Players with a previous history of heat illness should be carefully monitored during practice and competition.

RECOMMENDED ACTIONS?DURING PRESEASON PRACTICES

Keeping Cool During Practice

- Players suffering from vomiting,diarrhea or fevers or taking diuretic drugs or stimulants are at great risk for heat illness and should be restricted from playing in hot conditions or, at the minimum, carefully monitored during practice (and games).
- Enhancing the players? levels of heat acclimation should be among the coaches? primary objectives for the first 3-5 days of preseason practice.
- Two-a-day practices should be held in the coolest parts of the day. Also, a long rest period between practices, preferably in an air-conditioned environment, helps to minimize the risk of heat illness. Coaches should give strong consideration to alternating days of single and double practices.
- Coaches should educate players about the need for cooling, refueling, and rehydrating to enhance recovery between two-a-day practices and how dietary supplements and medications that contain stimulants such as ephedra increase the risk of heat illness.
- Players who suffer widespread heat cramping should be held out of practice for at least 12 hours, whereas players who suffer mild to moderate heat exhaustion should be held out even longer. In all cases, body weight and temperature should be back to normal

before the player takes the field, and he should be watched closely and removed from practice at any sign of distress.

- Wearing a full uniform during the first few days of preseason practice in the heat should be avoided. Therefore, to reduce the risk of heat illness during preseason football practice, equipment should be gradually added over the first 3-5 days of practice. Players who are fat and/or unfit, or who have been ill require more time to become acclimated to the heat.
- Whenever possible during practice and games, players should remove their helmets and raise their jerseys to facilitate heat loss.
- When the weather is warm, coaches should reduce the intensity of the practice and give more frequent rest breaks.
- Coaches should never pressure or embarrass players into overexertion. Early in preseason training, "prove yourself" drills should never be done in hot weather.
- If wind sprints or "gassers" are done at the end of practice, helmets and pads should come off first, and all athletes, especially the larger players (typically linemen), should be carefully monitored for any signs of potential heat illness.

Hydration and Electrolyte Balance

- All players should be educated throughout the season about the dangers of heat illness and the performance advantages of proper hydration.
- Food and fluid intake should be monitored by parents, athletic trainers, and/or coaches during the first week of preseason training to help assure adequate consumption of energy and sample fluid to foster heat acclimation and player well being.
- Players should shun alcohol, which can contribute to dehydration and slow the acclimation process.
- During warm weather, practice sessions should include frequent breaks for all players to help lower body temperature. These breaks should provide shade, fans, and ready access to cold fluids.
- Sports drinks and water should be easily available to players at all times during practices and games. Players should be encouraged to drink frequently during practice, not only during planned rest periods.
- Although increasing sodium intake is important to prevent whole-body cramping, salt tablets can cause gastrointestinal discomfort and should be avoided in favor of sports drinks and increased salt intake at meals and snacks.
- Players should be weighed before and after every practice; those who lose significant weight, i.e., more than 1% of body weight, should be counseled to increase their fluid intake during practice. Individualized, prescribed fluid-intake regimens during practices and games should be used with players prone to dehydration. To fully rehydrate after practice or a game, players should drink about 24 ounces of fluid for every pound of weight lost.

Early Detection and Prevention of Heat Illness

- All football teams should have immediate access to a certified athletic trainer to help educate players about heat illness and dehydration, detect signs of impending heat illness, and initiate the emergency treatment of any heat illnesses that may arise.
- When present, the team physician or the athletic trainer?not the coach?should have the last word in removing players from practice if heat illness is suspected. When medical personnel are not available, the coach should be aware of and alert to signs of impending heat illness in players and should not hesitate to remove such players from practice.
- Certain players are at great risk for heat illness:

    - Those with a history of heat illness
    - Those who show signs of poor heat acclimation and/or poor cardiovascular fitness
    - Those who routinely lose more than 1% of their body weights during practice
    - Those with fever, diarrhea, or nausea
    - Those using supplements or medications with diuretic or stimulant properties

If players at risk for heat illness are allowed to practice or play in games, they should be closely monitored, preferably by a team physician or an athletic trainer. It is critical to identify and treat those with developing heat illness before the illness progresses to a dangerous level.

RECOMMENDED ACTIONS?WHEN A HEAT ILLNESS EMERGENCY OCCURS

- All football teams should have a posted and regularly discussed emergency care plan to guide their actions in the event of a heat-related medical emergency.
- Recognition of heat stroke should never rely on the old standard of hot, dry, red skin; heat stroke may be present when athletes are sweating profusely. Symptoms often but not always present in heat stroke include nausea, vomiting, diarrhea, extreme weakness, dizziness, staggering gait, delirium, and, if treatment is delayed, eventual loss of consciousness. If there is any doubt about the nature of an apparent heat illness, the player should be treated for heat stroke. If nausea, vomiting, and/or diarrhea are present, think of heat illness first, not nervousness.
- In cases of suspected heat illness, cool first and transport second. Heat-stricken players must be immediately cooled before being transported to an emergency-care facility. A tub or small pool suitable for immersing overheated players in cold water should be immediately available at every football practice.
- As long as they are fully conscious, players suffering from dehydration can be rehydrated with oral administration of fluids. Intravenous fluid replacement should be the last resort.