HEAT ILLNESS & HYDRATION

Heat illness in athletes is a serious situation, and if not handled properly can have catastrophic consequences. Because of the wide variance of situations in which heat illness and hydration becomes an issue, and because of the need for local individualized judgment, absolute wide ranging rules regarding heat illness related matters may not be the best or most effective approach. At the same time, heat illness is a very serious matter and the Kansas State High School Activities Association wishes to provide its member schools information that may be useful in establishing or refining an individualized heat acclimation plan or policy. One such piece of information is the Heat Acclimatization and Heat Prevention Position Statement authored by the National Federation of State High School Associations and its Sports Medicine Advisory Committee. The substance of the position statement provides as follows:

Heat Acclimatization and Heat Illness Prevention Position Statement

National Federation of State High School Associations (NFHS)
Sports Medicine Advisory Committee (SMAC)

Exertional Heatstroke (EHS) is the leading cause of preventable death in high school athletics. Students participating in high-intensity, long-duration or repeated same-day sports practices and training activities during the summer months or other hot-weather days are at greatest risk. Football has received the most attention because of the number and severity of exertional heat illnesses. Notably, the National Center for Catastrophic Sports Injury Research reports that 35 high school football players died of EHS between 1995 and 2010. EHS also results in thousands of emergency room visits and hospitalizations throughout the nation each year.

This NFHS Sports Medicine Advisory Committee (SMAC) position statement is the companion piece to the NFHS's online course A Guide to Heat Acclimatization and Heat Illness Prevention. This position statement provides an outline of "Fundamentals" and should be used as a guiding document. Further and more detailed information can be found within the NFHS online course, the 4th Edition of the NFHS Sports Medicine Handbook, the NFHS SMAC "Position Statement and Recommendations for Hydration to Minimize the Risk for Dehydration and Heat Illness" and the resources listed.

Following the recommended guidelines in this position statement and A Guide to Heat Acclimatization and Heat Illness Prevention can reduce the risk and incidence of EHS and the resulting deaths and injuries in high school athletics. The NFHS recognizes that various states and regions of the country have unique climates and variable resources, and that there is no "one-size-fits-all" optimal acclimatization plan. However, it is recommended that all of the "Fundamentals" be incorporated into any heat acclimatization plan to improve athlete safety. In addition, A Guide to Heat Acclimatization and Heat Illness Prevention should be required viewing for all coaches.

Heat Acclimatization and Safety Priorities:

- Recognize that EHS is the leading preventable cause of death among high school athletes.
- Know the importance of a formal pre-season heat acclimatization plan.
- Know the importance of having and implementing a specific hydration plan, keeping your athletes well-hydrated, and encouraging and providing ample opportunity for regular fluid replacement.
- Know the importance of appropriately modifying activities in relation to the environmental heat and stress and contributing individual risk factors (e.g., illness, obesity) to keep your athletes safe and performing well.
- Know the importance for all members of the coaching staff to closely monitor all athletes during practice and training in the heat, and recognize the signs and symptoms of developing heat illnesses.
- Know the importance of, and resources for, establishing an emergency action plan and promptly implementing it in case of suspected EHS or another medical emergency.

Fundamentals of a Heat Acclimatization Program

1. Physical exertion and training activities should begin slowly and continue progressively. An athlete cannot be "conditioned" in a period of only two to three weeks.
    a. Begin with shorter, less intense practices and training activities, with longer recovery intervals between bouts of activity.
    b. Minimize protective gear (helmets only, no shoulder pads) during the first several practices, and introduce additional uniform and protective gear progressively over successive days.
    c. Emphasize instruction over conditioning during the first several practices.

    Rationale: The majority of heat-related deaths happen during the first few days of practice, usually prompted by doing too much, too soon, and in some cases with too much protective gear on too early in the season (wearing helmet, shoulder pads, pants and other protective gear). Players must be allowed the time to adapt safely to the environment, intensity, duration and uniform/equipment.

2. Keep each athlete's individual level of conditioning and medical status in mind and adjust activity accordingly. These factors directly affect exertional heat illness risk. Rationale: Athletes begin each season's practices and training activities at varying levels of physical fitness and varying levels of risk for exertional heat illness. For example, there is an increased risk if the athlete is obese, unfit, has been recently ill, has a previous history of exertional heat illness or has Sickle Cell Trait.

3. Adjust intensity (lower) and rest breaks (increase frequency/duration), and consider reducing uniform and protective equipment, while being sure to monitor all players more closely as conditions are increasingly warm/humid, especially if there is a change in weather from the previous few years.
    Rationale: Coaches must be prepared to immediately adjust for changing weather conditions, while recognizing that tolerance to physical activity decreases and exertional heat illness risk increases, as the heat and/or humidity rise. Accordingly, it is imperative to adjust practices to maintain safety and performance.

Use the heat index chart on the following page as a general guide in determining when activity modifications are necessary.

4. Athletes must begin practices and training activities adequately hydrated. Rationale: While proper hydration alone will not necessarily prevent exertional heat illness, it will decrease risk. See the hydration strategies in this document to use as a guide for hydrating your athletes.

5. Recognize early signed of distress and developing exertional heat illness and promptly adjust activity and treat appropriately**. First aid should not be delayed!**
    Rationale: An athlete will often show early signs and/or symptoms of developing exertional heat illness. If these signs and symptoms are promptly recognized and the athlete is appropriately treated, serious injury can be averted and the athlete can often be treated, rested and returned to activity when the signs and symptoms have resolved.

6. Recognize more serious signs of exertional heat illness (clumsiness, stumbling, collapse, obvious behavioral changes and/or other central nervous system problems), immediately stop activity and promptly seek medical attention by activation the Emergency Medical System. **On-site rapid cooling begin immediately.**
    Rationale: Immediate medical treatment and prompt rapid cooling can prevent death or minimize further injury in the athlete with EHS. Ideally, pools or tubs of ice water to be used for rapid cooling of athletes should be available on-site and personnel should be trained and practiced in using these facilities for rapid cooling. Ice water baths are the preferred method for rapid cooling, however, if ice water pools or tubs are not available, then applying ice packs to the neck, axillae and groin and rotating ice water-soaked towels to all other areas of the body can be effective in cooling an affected athlete. Review the heat illness signs and symptoms information in this document.

7. An Emergency Action Plan (EAP) with clearly defined written and practiced protocols should be developed and in place ahead of time.
    Rationale: An effective emergency action plan (EAP)should be in place in case of any emergency, as a prompt and appropriate response in any emergency situation can save a life. The EAP should be designed and practiced to address all teams (freshman, junior varsity, varsity) and all practice and game sites.

HEAT INDEX CHART

Use the chart below to assess the potential severity of heat stress. The chart should be used as a guideline only - individual reactions to the heat will vary among your athletes!

1. Across the top of the chart, locate the ENVIROMENTAL TEMPERATURE, i.e. the air temperature
2. Down the left side of the chart, locate the RELATIVE HUMIDITY
3. Follow across and down to find the APPARENT TEMPERATURE (HEAT INDEX). The apparent temperature is the combined index of heat and humidity. It is an index of the body sensation of heat caused by the temperature and humidity (the reverse of the "wind chill factor").

HEAT INDEX											
	ENVIRONMENTAL TEMPERATURE (F°)										
	70°	75°	80°	85°	90°	95°	100°	105°	110°	115°	120°
Relative Humidity	**Apparent Temperature ***										
0%	64°	69°	73°	78°	83°	87°	91°	95°	99°	103°	107°
10%	65°	70°	75°	80°	85°	90°	95°	100°	105°	111°	116°
20%	66°	72°	77°	82°	87°	93°	99°	105°	112°	120°	
30%	67°	73°	78°	84°	90°	96°	104°	113°	123°		
40%	68°	74°	79°	86°	93°	101°	110°	123°			
50%	69°	75°	81°	88°	96°	107°	120°				
60%	70°	76°	82°	90°	100°	114°					
70%	70°	77°	85°	93°	106°	124°					
80%	71°	78°	86°	97°	113°						
90%	71°	79°	88°	102°	122°						
100%	72°	80°	91°	108°							

* Combined index of heat and humidity ... what it "feels like" to the body. Source: National Oceanic and Atmospheric Administration

RECOMMENDED MODIFICATIONS TO THE ATHLETE PARTICIPATION BASED ON THE HEAT INDEX HEAT

APPARENT TEMPERATURE	HEAT STRESS RISK WITH PHYSICAL ACTIVITY AND/OR PROLONGED EXPOSURE
90° - 104°	Heat cramps or heat exhaustion possible **Modify practice, take water breaks every 15-20 minutes**
105° - 124°	Heat cramps or heat exhaustion likely, Heatstroke possible. **Modify practice, NO HELMET OR SHOULDER PADS, t-shirt and shorts only. Water breaks every 15 minutes with rest breaks.**
>125°	Heatstroke likely. **Recommend: NO PRACTICE!**

HYDRATION STRATEGIES TO PREVENT BEAT ILLNESS

Proper HYDRATION and ACLLIMATIZATION practices stand out as two primary prevention methods for decreasing the risk of heat illness. The following are some basic hydration principles to follow:

Appropriate hydration before, during and after exercise is important for maintaining peak athletic performance. Fluid losses of as little as 2% of body weight (less than 4 pounds in a 200-pound athlete) can impair performance by increasing fatigue. This is important because it's common for some athletes to lose between 5-8 pounds of sweat during a game or intense practice. So it's easy for athletes to become dehydrated if they do not drink enough to replace what is lost in sweat.

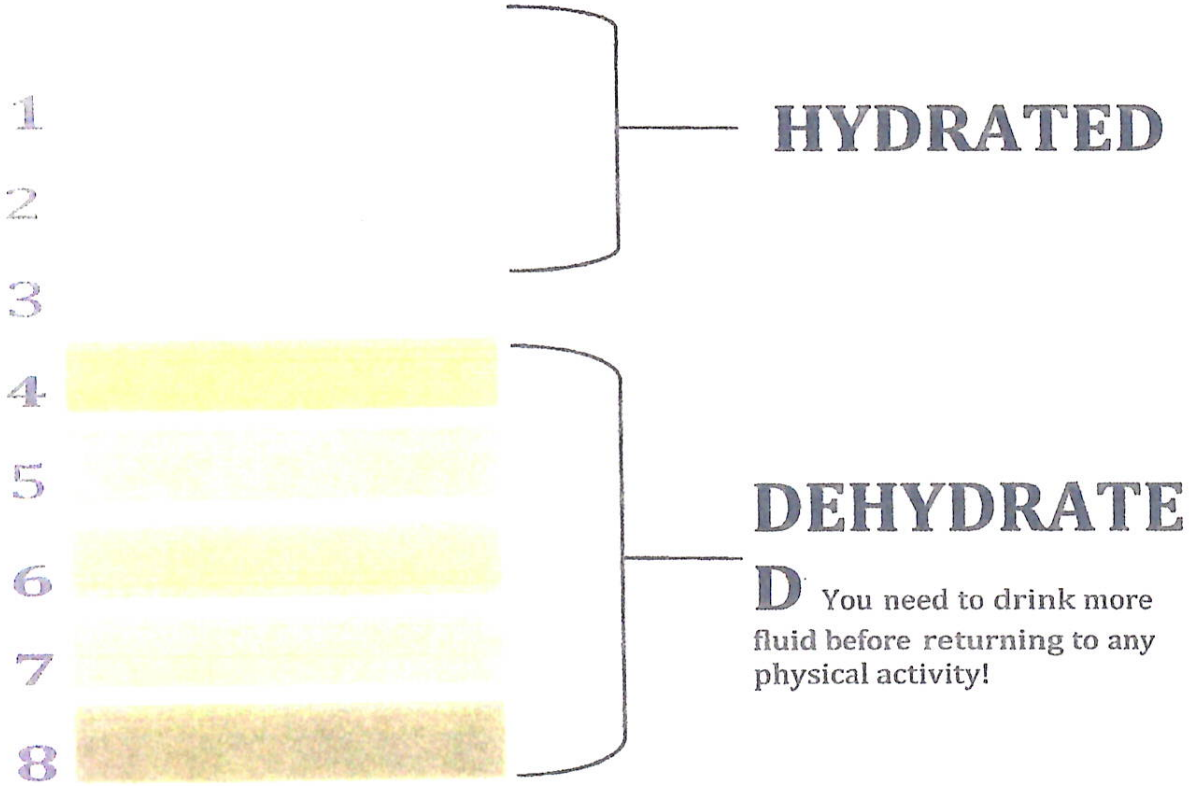
- Recognize and respond to early warning signs of dehydration
- Drink early and drink often during activity. Do not let athletes rely on thirst. Schedule frequent fluid breaks for re-hydrating. If athletes wait until they are thirsty they it may be too late.
- Athletes should be weight before and after warm weather practices. They need to drink appropriate amounts of fluid for the amount of weight lost. Also, use a urine color weight (see back page) to determine hydration levels for activity.
- Encourage hydration choices: water, sport drinks with low sodium and carbohydrates: Avoid: soda, fruit juices, carbonated beverages and caffeine.
- Encourage drinking fluids, not pouring them. Dumping fluids over the head won't help restore body fluids or lower body temperature.
- Provide easily accessible fluids

Before Exercise	Drink 16 oz. of fluid before activity/exercise (2 hours) Drink another 8-16 oz of fluid 10-15 minutes before exercise
During Exercise	Drink 4-16 oz. of fluid every 15-20 minutes
After Exercise	Drink 24 oz. of fluid every (one) pound lost during exercise within 6 hours of stopping the activity. This is to achieve normal fluid state and not begin the next practice dehydrated.
Fluid counter	24 oz. of fluid = 100% of water bottle 16 oz. of fluid = 1 full water bottle 7 oz. of fluid = ½ full water bottle or 10 big gulps of water 4 oz. of fluid = ¼ full water bottle or 5 big gulps of water

Binkley HM, Beckett J, Casa DJ, et al. National Athletic Trainers' Association position statement: Exertional heat illnesses.

How Hydrated Are You?

This urine color chart is a simple tool you can use to assess if you are drinking enough fluids throughout day to stay hydrated.



Be Aware! If you are taking single vitamin supplements some of the vitamins can change the color of your urine for a few hours, making it bright yellow or discolored.

Dangers of Heat Illness Reduced by Following Proper Guidelines

By David Csillan, MS, LAT, ATC

Outside temperatures are on the rise and will be in full force just in time for athletes to participate in their summer and preseason practices. For this reason, it's important for athletic trainers, coaches and school administrators to get a tune-up on potentially what lies ahead. With a little advance planning, the risk of your athletes experiencing a catastrophic event due to exertional heat illness will be significantly decreased.

There are various degrees of exertional heat illness with exertional heat stroke (EHS) being the most serious. Many athletic injuries are a result of bad luck or overtraining; however, EHS is 100 percent preventable if the nationally recommended heat acclimatization guidelines are followed and schools are prepared to initiate appropriate care if an emergency occurs.

The EHS death of Minnesota Vikings' offensive tackle Korey Stringer during football camp in August 2001 elevated the discussion and action with regard to physical exertion in the heat.

The NFHS Sports Medicine Advisory Committee wrote a position statement and created an online course entitled A Guide to Heat Acclimatization and Heat Illness Prevention. The National Athletic Trainers' Association (NATA) developed several position statements and published Preseason Heat Acclimatization Guidelines for Secondary School Athletics. The Korey Stringer Institute (KSI) was established to provide research, education, advocacy and consultation to maximize performance, optimize safety and prevent sudden death in athletes. The University of Georgia's Climatology Research Laboratory released heat safety thresholds for specific regions throughout the country. These thresholds are currently being applied in the Georgia High School Association's heat illness policy.

Now that we have the evidence-based data, we may ask ourselves "Why and how do we apply it"? In order to acquire a better understanding of EHS and its management, we must first debunk a few common myths.

Myth Busters 101

Myth #1: EHS can only occur when ambient temperatures reach 100 degrees F.

Truth: Evidence suggests that the wet bulb globe temperature (WBGT) should be the measurement of choice to determine safe environmental conditions for physical activity. The WBGT provides a reading of ambient temperature, relative humidity, wind speed and radiant heat (from the sun). Why is wind speed important? It allows for better evaporation of sweat leading to more effective cooling. Environmental conditions are constantly changing over the course of practice. As opposed to listening to the weather report prior to practice, the athletic trainer should monitor environmental conditions on site in real time. Utilizing a WBGT device and establishing activity modification guidelines such as work-rest ratios, hydration breaks, equipment worn and length of practice significantly decreases the risk of EHS.

Many coaches still refer to their area's heat index when determining how practices will be conducted. Heat index refers to the ambient temperature and relative humidity measured in the shade and was originally used to determine if outdoor conditions were safe for the young and elderly. Since athletes are exercising in the direct sun, heat index readings are deemed inappropriate.

Although dangerous conditions most commonly occur during the hot summer months, EHS can happen at any time and in the absence of high environmental temperatures. EHS is not a 100 degrees' issue. Geographical location plays an important role.

Generally speaking, athletes residing in the Northeast part of the country are accustomed to cooler temperatures compared to those in the Southeast or Midwest. As a result, participating in an environment of 85 degrees with high humidity for those living in the Northeast presents equal risk of EHS to those living in the Southeast and Midwest participating in temperatures reaching 100 degrees with high humidity. It is also important to understand that direct sun is not the sole contributor of heat deaths. Exercise intensity and environmental conditions are the primary factors associated with EHS.

Myth #2: An athlete must be severely dehydrated for EHS to occur.

Truth: While dehydration may predispose an athlete to, or exacerbate, EHS, dehydration does not always have to be present for EHS to occur. EHS can result in as little as 20 minutes after the beginning of exercise before severe fluid loss is prominent. The days of over-hydrating are gone as we've found this may put the athlete at risk for hyponatremia – another potentially catastrophic event.

During activity, athletes should be instructed to allow thirst to be their guide. Athletes should weigh themselves prior to, and immediately after, every practice. The weight should be recorded on a chart and strictly monitored by the athletic trainer or coach. A weight loss of two percent or more for any athlete should be made up prior to that athlete participating in the next practice. Otherwise, the athlete will be competing at a deficit and increasing their risk.

Myth #3: An athlete stops sweating during EHS.

Truth: We've been taught that heat stroke yields hot, dry skin on the victim. However, since EHS occurs during intense exercise in the heat, the athlete is almost always profusely sweating upon collapse. This is perhaps the most widely misunderstood sign of EHS and may lead to mistreatment and death. It's important to review the current literature published by the NFHS, NATA and KSI in order to be updated on EHS signs, symptoms and management.

Houston, We Have a Problem

If EHS is suspected, it's advised for the athletic trainer or coach to: remove the athlete's equipment and excess clothing, contact EMS, determine vital signs and initiate rapid cooling by immersing the athlete chest high in a tub of cold (39 – 59 degrees F) water. Core body temperature may elevate as high as 106 degrees F so it's important to lower that as fast as possible. The typical rate of cooling in an immersion tub is about ONE degree F every three minutes. On the average, it may take 15 minutes to cool the body five degrees. If an athlete is not cooled prior to transportation, the risk of developing complications or losing the athlete to EHS increases. Even though the EMS vehicle may be air conditioned, it's not sufficient enough to lower the athlete's core temperature during transport.

The Reality

Twenty athletes died as a result of EHS from 2010 to 2015. This five-year block was greater than any five-year block in the past 40 years. It's two times the five-year block average for EHS deaths since 1975. The five-year block average over 35 years is 10.5 deaths. We must ask ourselves, "Things are getting worse, but why"?

The warmer climate, coupled with the fact that today's youth spend more time than ever before in air conditioned facilities, sets them up as potential victims. Coaches need to remember that young athletes comprise this population and not everyone will be reporting to preseason camp acclimatized and in shape. The research and education is available but the application continues to lack. Unless we understand the nature of EHS and utilize best practices in emergency management, these statistics will continue to climb.

Exertional heat stroke is not exclusive to football. It is non-discriminatory. EHS can occur regardless of male/female, football/field hockey, varsity/freshman or outdoors/indoors. As athletic trainers, coaches and administrators, we owe it to our athletes to provide them with the safest environment to compete. And, we must start now.

Disclaimer: The information regarding heat illness and hydration is not intended to be exhaustive or all of the relevant information on the subjects. The CAA feels that the sources of the information provided above are very reputable and therefore will provide valuable source material to member schools. At the same time, schools may want to consider other available sources of relevant information and are encouraged to consult with health care professionals regarding these topics.

ADDITIONAL RESOURCES

NFHS HEAT ILLNESS PREVENTION COURSE

BEAT THE HEAT

Summer's high temperatures put student athletes at increased risk of heat illness. There are several types of heat illness. They range in severity, from heat cramps and heat exhaustion, which are common but not severe, to heat stroke, which can be deadly. Although heat illnesses can be fatal, death is preventable if they're quickly recognized and properly treated.

DEHYDRATION AND HEAT ILLNESSES

As a rule-of-thumb, most athletes should consume 200 to 300 milliliters of fluid every **15 MINUTES OF EXERCISE.**

It takes only **30 MINUTES** for cell damage to occur with a core body temperature of 105 degrees.

Currently, 13 states have heat-acclimatization policies, for secondary school athletics with New Jersey being the first.

Exertional heat stroke is one of the top three killers of athletes and soldiers in training.

- From 2010-15, 20 athletic heat stroke fatalities were reported.
- It takes seven to 14 days for a body to adapt to exercising in the heat.
- Dehydration at levels of 3 to 4 percent body mass loss can reduce muscle strength by an estimated 2 percent.

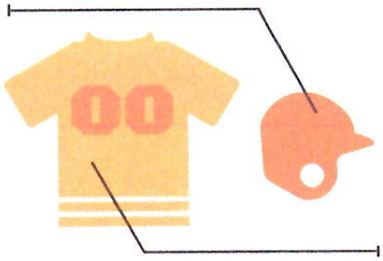
SAFETY TIPS

Have sports drinks on hand for workout sessions lasting longer than an hour.

Keep beverages cold – cold beverages are consumed 50 percent more than warm beverages.

Hydrate before, during and after activity.

Remove unnecessary equipment, such as helmets and padding, when environmental conditions become extreme.



Clothing worn by athletes should be light colored, lightweight and protect against the sun.

- For the first week or so, hold shorter practices with lighter equipment so players can acclimate to the heat.
- Follow a work-to-rest ratio, such as 10-minute breaks after 40 minutes of exercise.
- Get an accurate measurement of heat stress using a wet-bulb globe temperature, which accounts for ambient temperature, relative humidity and radiation from the sun.
- If someone is suffering from exertional heat stroke, remember to cool first and transport second.
- Have large cold tubs ready before all practices and games in case cold water immersion is needed to treat exertional heat stroke.

Infographic courtesy of the National Athletic Trainers' Association, www.nata.org

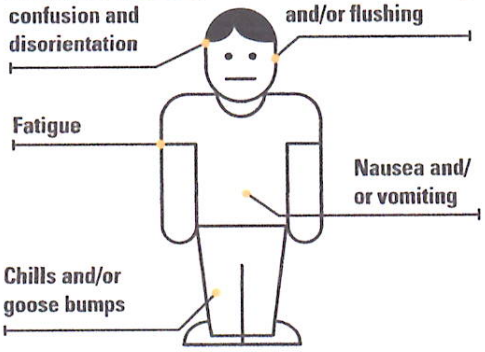
SIGNS OF MINOR HEAT ILLNESS

Dizziness

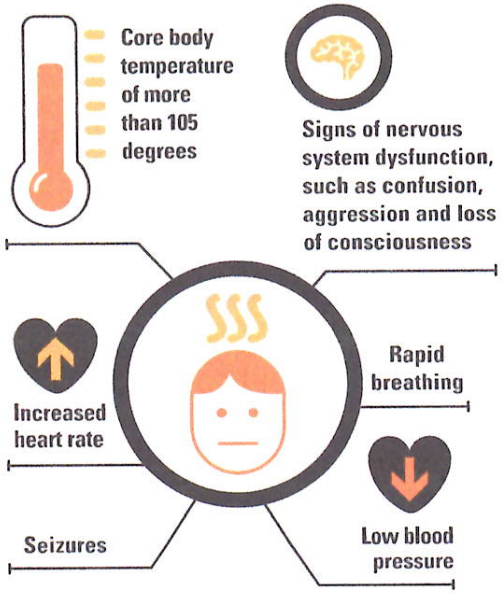
Cramps, muscular tightening and spasms

Lightheadedness, when not associated with other symptoms

EARLY WARNING SIGNS OF EXERTIONAL HEAT STROKE



SIGNS OF EXERTIONAL HEAT STROKE



Sources: Korey Stringer Institute, American Medical Society for Sports Medicine, NATA