
LIGHTNING AND HEAT SAFETY INFORMATION

LIGHTNING SAFETY National Athletic Trainers' Association Guidelines



1. Formalize and implement a comprehensive, proactive lightning-safety policy or emergency action plan specific to lightning safety. The components of this policy should include the following:
 - An established chain of command that identifies who is to make the call to remove individuals from the field or an activity.
 - A designated weather watcher (i.e., a person who actively looks for the signs of threatening weather and notifies the chain of command if severe weather becomes dangerous).
 - A means of monitoring local weather forecasts and warnings.
 - A listing of specific safe locations (for each field or site) from the lightning hazard.
 - The use of specific criteria for suspension and resumption of activities (refer to recommendations 4, 5, and 6).
 - The use of the recommended lightning-safety strategies (refer to recommendations 7, 8, and 9).
2. The primary choice for a safe location from the lightning hazard is any substantial, frequently inhabited building. The electrical and telephone wiring and plumbing pathways aid in grounding a building. This is the reason it is safer to remain indoors during thunderstorms. It is important not to be connected to these pathways while inside the structure during ongoing thunderstorms.
3. The secondary choice for a safer location from the lightning hazard is a fully enclosed vehicle with a metal roof and the windows closed. Convertible cars and golf carts do not provide protection from lightning danger. It is important not to touch any part of the metal framework of the vehicle while inside it during ongoing thunderstorms.
4. Seeking a safe structure or location at the first sign of lightning or thunder activity is highly recommended. By the time the flash-to-bang count approaches 30 seconds (or is less than 30 seconds), all individuals should already be inside or should immediately seek a safe structure or location. To use the flash-to-bang method, the observer begins counting when a lightning flash is sighted. Counting is stopped when the associated bang (thunder) is heard. Divide this count by 5 to determine the distance to the lightning flash (in miles). For example, a flash-to-bang count of 30 seconds equates to a distance of 6 miles (9.66 km).
5. Postpone or suspend activity if a thunderstorm appears imminent before or during an activity or contest (regardless of whether lightning is seen or thunder heard) until the hazard has passed. Signs of imminent thunderstorm activity are darkening clouds, high winds, and thunder or lightning activity.
6. Once activities have been suspended, wait at least 30 minutes after the last sound of thunder or lightning flash before resuming an activity or returning outdoors. A message should be read over the public address system and lightning-safety tips should be placed in game programs alerting spectators and competitors about what to do and where to go to find a safer location during thunderstorm activity.

7. Extremely large athletic events are of particular concern with regard to lightning safety. Consider using a multidisciplinary approach to lessen lightning danger, such as integrating weather forecasts, real-time thunderstorm data, a weather watcher, and the flash-to-bang count to aid in decision making.
8. Avoid being in contact with, or in proximity to, the highest point of an open field or on the open water. Do not take shelter under or near trees, flag poles, or light poles.
9. Avoid taking showers and using plumbing facilities (including indoor and outdoor pools) and land-line telephones during thunderstorm activity. Cordless or cellular telephones are safer to use when emergency help is needed.
10. Individuals who feel their hair stand on end or skin tingle or hear crackling noises should assume the lightning-safe position (i.e., crouched on the ground, weight on the balls of the feet, feet together, head lowered, and ears covered). Do not lie flat on the ground.
11. Observe the following basic first-aid procedures, in order, to manage victims of lightning strike:
 - Survey the scene for safety. Ongoing thunderstorms may still pose a threat to emergency personnel responding to the situation.
 - Activate the local emergency management system.
 - Move the victim carefully to a safer location, if needed.
 - Evaluate and treat for apnea and a systole.
 - Evaluate and treat for hypothermia and shock.
 - Evaluate and treat for fractures.
 - Evaluate and treat for burns.
12. All persons should maintain current cardiopulmonary resuscitation (CPR) and first-aid certification.
13. All individuals should have the right to leave an athletic site or activity, without fear of repercussion or penalty, in order to seek a safe structure or location if they feel they are in danger from impending lightning activity.

LIGHTNING SAFETY

National Federation of High School Associations Guidelines

The purpose of these guidelines is to provide a default policy to those responsible for making decisions concerning the suspension and restarting of contests based on the presence of lightning. The preferred sources from which to request such a policy for your facility would include your state high school association and the nearest office of the National Weather Service.

1. Assign staff to monitor local weather conditions before and during events.
2. Develop and evacuation plan, including identification of appropriate nearby shelters.
3. Develop criteria for suspension and resumption of play.
 - When thunder is heard or a cloud-to-ground lightning bolt is seen, the thunderstorm is close enough to strike your location with lightning. Suspend play and take shelter immediately.
 - 30-Minute Rule: Once play has been suspended, wait at least 30 minutes after the last thunder is heard or flash of lightning is witnessed prior to resuming play.
 - If there is thunder or lightning after the beginning of the 30-minute count, the clock should be reset, and another 30-minute count should begin.
 - Hold periodic reviews for appropriate personnel.

NFHS RECOMMENDATIONS FOR HYDRATION TO MINIMIZE THE RISK FOR DEHYDRATION AND HEAT ILLNESS

- Appropriate hydration before, during, and after exercise is an important ingredient to healthy and successful sports participation.
- Rapid weight loss represents a loss of body water. A loss of just 1-2% of body weight can negatively impact performance. A loss of 3% or more of body weight can increase the risk for exertional heat-related illness.
- Athletes should be weighed before and after warm weather practice sessions and contests to assess fluid losses.
- Athletes with high body fat percentages can become dehydrated faster than athletes with lower body fat percentages while working out under the same environmental conditions.
- All athletes have different sweating rates and some lose much more salt through their sweat than others.
- Poor acclimatization/fitness levels can greatly contribute to an athlete's dehydration problems.
- Medications and fevers can each greatly contribute to an athlete's dehydration problems and risk for heat illness.
- Environmental temperatures and humidity both contribute to dehydration and heat illness.
- Clothing, such as dark, bulky, or rubber protective equipment can drastically increase the chance of dehydration and heat illness.
- Wet bulb temperature measurements should be taken 10-15 minutes before practices or contests. The results should be used with a heat index to determine if practices or contests should be started, modified, or stopped.
- Even dry climates can have high humidity if sprinkler systems are scheduled to run before early morning practices start. This collection of water does not evaporate until environmental temperatures increase and dew points lower.
- A heat index chart should be followed to determine if practices/contests should be held. The National Weather Services chart (see next page) is located at: www.weather.gov/om/heat/index.shtml
- The heat index for your location can be determined by entering your postal zip code into the OSAA Heat Index Calculator at the Oregon School Activities Association's website found at: www.osaa.org/heatindex/
- A relative humidity of 35 percent and a temperature of 95 degrees Fahrenheit are likely to cause heat illness, with heat stroke likely.
- A relative humidity of 70 percent and a temperature of 95 degrees Fahrenheit are very likely to cause heat illness, with heat stroke very likely.

NATIONAL WEATHER SERVICE HEAT INDEX GUIDE

		Temperature (°F)															
		80	82	84	89	88	90	92	94	96	98	100	102	104	106	108	110
Relative Humidity(%)	40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
	45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
	50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
	55	81	84	86	89	93	97	101	106	112	117	124	130	137			
	60	82	84	88	91	95	100	105	110	116	123	129	137				
	65	82	85	89	93	98	103	108	114	121	128	136					
	70	83	86	90	95	100	105	112	119	126	134						
	75	84	88	92	97	103	109	116	124	132							
	80	84	89	94	100	106	113	121	129								
	85	85	90	96	102	110	117	126	135								
	90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127											
100	87	95	103	112	121	132											

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

“A” = Caution “B” = Extreme Caution “C” = Danger “D” = Extreme Danger

It is recommended that:

- If the heat index is between 95 and 105 degrees, practices and game conditions should be altered.
- If the heat index is over 105 degrees, a practice or contest should be postponed or rescheduled.

TYPES OF SPORTS DRINKS

- **Fluid Replacers**
 - Examples include: Water, Gatorade, 10K, Quickkick, Max
 - These drinks are absorbed as quickly as water and typically are used for activities lasting less than 2 hours.

- **Carbohydrate Loaders**
 - Examples include: Gatorlode, Exceed High, Carboplex
 - These drinks replace more muscle glycogen to enhance greater endurance.
 - They should be used after ultra-endurance events to increase muscle glycogen resynthesis after exercise.

- **Nutritional Supplements**
 - Examples include: Gatorpro, Exceed Sports, Ultra Energy
 - These supplements are fortified with vitamins and minerals, and they may help athletes maintain a balanced diet.
 - They can be used as a meal replacement supplement for athletes who wish to skip a high-fat meal or as extra calories for athletes who wish to gain weight.

WHAT TO DRINK DURING EXERCISE

- For most exercising athletes, the ideal fluid for pre-hydration and re-hydration is water. Water is quickly absorbed, well-tolerated, an excellent thirst quencher, and cost effective.
- The use of a sports drink with appropriate carbohydrates (CHO) and sodium as described below may prove beneficial in some general situations and for some individuals.
- Traditional sports drinks with appropriate CHO and sodium may provide additional benefit in the following general situations:
 - Prolonged continuous activity of greater than 45 minutes
 - Extremely intense activity with risk of heat injury
 - Extremely hot and humid conditions
- Traditional sports drinks with appropriate CHO and sodium may provide additional benefit for the following individual conditions:
 - Poor hydration prior to participation
 - Increased sweat rate
 - Poor caloric intake prior to participation
 - Poor acclimatization to heat and humidity
- A 6-8% addition of CHO to water is the maximum that should be utilized. Any greater concentration will produce slow emptying from the stomach and a bloated feeling to the athlete.
- The other ingredient that may be helpful is a low concentration (0.3 – 0.7 g/L) of sodium which may help with cramping.
- All fluids should be served cold to optimize gastric emptying.

WHAT NOT TO DRINK DURING EXERCISE

- Fruit juices with greater than 8 percent carbohydrate content and soda can both result in a bloated feeling and abdominal cramping.
- Beverages containing caffeine, alcohol, and carbonation are not to be used because of the high risk of dehydration associated with excess urine production, or decreased voluntary fluid intake.
- Athletes should be aware that nutritional supplements are not limited to pills and powders; many of these new fluids contain stimulants such as caffeine and/or ephedrine.
 - These stimulants may increase the risk of heart or heat illness problems when exercising.
 - Many of these drinks are being produced by traditional water, soft drink, and sports drink companies and may provide confusion to the sports community. As is true with other forms of supplements, these “power drinks” or “fluid supplements” are not regulated by the FDA. Thus, the purity and accuracy of contents on the label are not guaranteed.
 - Many of these beverages, which claim to provide additional power, energy, etc., have additional ingredients that are not necessary, some that are potentially harmful, and some that actually include substances banned by such governing bodies as the NCAA and the USOC.

HYDRATION TIPS AND FLUID GUIDELINES

- In general, athletes do not voluntarily drink sufficient water to prevent dehydration during physical activity.
- Drink early, by the time you are thirsty, you are already dehydrated.
- Drink before, during, and after practices and games. Specifically, the *American College of Sports Medicine* recommends the following:
 - Drink 16 ounces of fluid 2 hours before exercise.
 - Drink another 8 to 16 ounces 15 minutes before exercise.
 - During exercise, drink 4 to 16 ounces of fluid every 15 to 20 minutes.
 - After exercise, drink 24 ounces of fluid for every pound lost during exercise to achieve normal fluid status within 6 hours.
- The volume and color of your urine is an excellent way of determining if you're well hydrated. Large amounts of clear urine mean you're hydrated, small amounts of dark urine mean that you need to drink more. A Urine Color Chart can be accessed at:
<http://at.uwa.edu/admin/UM/urinecolorchart.doc>
- The NFHS SMAC strongly recommends that coaches, certified athletic trainers, physicians, and other school personnel working with athletes not provide or encourage use of any beverages for hydration of these youngsters other than water and appropriate sports drinks that meet the above criteria. They should also make information on the potential harm and lack of benefit associated with many of these other beverages available to parents and athletes.

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. Due to the equipment and uniform needed in football, most of the heat problems have been associated with football. From 1995 through the 2002 football season there have been 15 high school heat stroke deaths in football. This is not acceptable. There are no excuses for heatstroke deaths, if the proper precautions are taken. During hot weather conditions the athlete is subject to the following:

HEAT CRAMPS – Symptoms include 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 – Symptoms include weakness fatigue and fainting due to loss of salt and water in sweat and exercise in the heat; predisposes to heat stroke.

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

HEAT EXHAUSTION (SALT DEPLETION) – Symptoms include 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 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 (heat stroke 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. 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:

- 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.
- 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.
- 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 7-10 days. Final stages of acclimatization to heat are marked by increased sweating and reduced salt concentration in the sweat.
- 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 10-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**.
- Athletes should weigh each day before and after practice and **WEIGHT CHARTS CHECKED**. Generally a 3 percent weight loss through sweating is safe and over a 3 percent weight loss is in the danger zone. Over a 3 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 practice until they have adequately replaced their weight.

- 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.
- 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.
- 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.
- Warn your athletes about the use of any products that contain ephedra. Ephedra has been associated with two heat stroke deaths in athletes. Ephedra speeds metabolism and increases body heat, constricts the blood vessels in the skin preventing the body from cooling itself, and by making the user feel more energetic it keeps him/her exercising longer when they should stop. Do not use ephedra or ephedra products.

HEAT STROKE – THIS IS A MEDICAL EMERGENCY – DELAY COULD BE FATAL.

- Immediately cool body while waiting for transfer to a hospital. Remove clothing and immerse torso in ice/cold water. Immersion therapy has the best cooling rates. A plastic baby pool can be available at all practices and games, and can always be ready for immersion procedures. If not available apply ice packs in armpits, groin and neck areas. Continue cooling efforts until EMS arrives.

HEAT EXHAUSTION – OBTAIN MEDICAL CARE AT ONCE.

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

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.