



## HEAT ILLNESS & HYDRATION

Heat illness, sometimes called exertional heat illness (EHI), in athletes is a common and serious condition, but one that is preventable. High temperatures and humidity can put athletes at risk for heat illness and may have catastrophic consequences if not properly recognized and treated. Heat illness can present in several different ways, from muscle cramps to heat exhaustion and heat stroke. The Kansas State High School Activities Association wishes to provide its member schools recommended guidelines that can be useful in establishing or refining an individualized heat acclimatization plan or policy, as well as guidelines to help prevent, recognize and treat heat illness.

### **Heat Acclimatization and Heat Illness Prevention Position Statement**

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

The following is the **Heat Acclimatization and Heat Illness 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:

**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, as well as those with sickle cell trait, 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 **42 high school football players died of EHS between 1995 and 2014**. 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 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, *Heat Illness Prevention* at [www.nfhslearn.com](http://www.nfhslearn.com) **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 preseason 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., sickle cell trait, 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 other 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 days.**

**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 signs 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 activating the Emergency Medical System. Onsite rapid cooling should 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 onsite 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 helpful in cooling an affected athlete. **Remember, cool first, transport later.**

Review the heat illness signs and symptoms information in this document.

**7. An Emergency Action Plan 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 (middle school, 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 **ENVIRONMENTAL 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's 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. Reproduced from the National Weather Service.

### Sources where heat and relative humidity information can be obtained:

KSHSAA website ([www.kshsaa.org](http://www.kshsaa.org))

National Weather Service website ([www.weather.gov](http://www.weather.gov))

Various weather websites and mobile applications

Use of a heat index monitor or sling psychrometer

### RECOMMENDED MODIFICATIONS TO ATHLETIC PARTICIPATION BASED ON THE HEAT INDEX

HEAT INDEX	HEAT STRESS RISK WITH PHYSICAL ACTIVITY AND/OR PROLONGED EXPOSURE
80°-89°	Fatigue possible with prolonged exposure and/or physical activity. Monitor at-risk athletes closely.
90°- 103°	Heat cramps or heat exhaustion possible <i>Modify practice; take water breaks every 15 to 20 minutes.</i>
103°- 124°	Heat cramps or heat exhaustion likely, heatstroke possible <i>Modify practice, NO HELMET OR SHOULDER PADS, t-shirt and shorts only; frequent (every 15 minutes) water and rest breaks.</i>
>124°	Heatstroke highly likely <i>Recommend NO PRACTICE!</i>

Note: This Heat Index chart is designed to provide general guidelines for assessing the potential severity of heat stress. Individual reactions to heat will vary. It should be remembered that heat illness can occur at lower temperatures than indicated on the chart. In addition, studies indicate that susceptibility to heat disorders tends to increase with age.

These modifications are not specific to football. All sports taking place in hot/humid environments should be prepared to make activity modifications based on the heat index, including indoor sports taking place in un-air-conditioned facilities. Factors such as surface (artificial turf vs. natural grass) need to also be considered as air temperature on artificial turf will typically be higher than on natural grass.

## **KSHSAA RECOMMENDED HEAT ILLNESS PREVENTION STRATEGIES**

- + **HAVE AN EMERGENCY ACTION PLAN IN PLACE to deal with heat emergencies.** Call 911 and activate your emergency action plan when heat exhaustion or heat stroke is suspected. **When rapid onsite cooling is necessary, ALWAYS COOL THE ATHLETE FIRST AND TRANSPORT SECOND!** Be sure this protocol is rehearsed and reviewed with your coaches and local EMS personnel before practices begin each August.

Click [HERE](#) to download a template you can use to create an emergency action plan. You can also go to <http://www.kshsaa.org/Public/General/EmergencyActionPlanning.cfm> for additional information on emergency action planning. A sample plan is also available at the end of this document.

- + **Coaches MUST ensure their athletes have unrestricted access to water.**
- + **A cooling area should be established and available at all times.**
  - This could be an area of shade, a tent or immediate access to an air conditioned facility.
  - A cold tub should be located in the cooling area. The water temperature should be 35-58 degrees and the tub should be large enough to submerge someone up to their torso in a seated position. An old whirlpool tub, a large children's swimming pool or a livestock tank could be used.
  - If a tub is not available, rotating wet ice towels over the entire body or dousing the person with cold water through a hose or shower could be other rapid cooling options.
- + **Coaches MUST know their at-risk athletes and modify their activity accordingly.**
  - Student athletes who have sickle cell trait, a previous history of exertional heat illness, are obese, are unfit or are recovering from a recent illness are all more susceptible to heat illness.
- + **NEVER allow student-athletes to consume nutritional supplements unless prescribed by a physician. Energy drinks should also NEVER be consumed by your student-athletes.** These substances create an even higher risk to athletes exercising in the heat.

## HEAT ILLNESS RECOGNITION AND MANAGEMENT

There are four main types of exertional heat illness, but it's important to recognize these don't necessarily run on a continuum. A person could suffer from heat stroke without showing less severe heat illness conditions such as heat cramps. Below are the different types of heat illness, special risk factors, symptoms and management strategies.

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### HEAT CRAMPS

Typically painful, involuntary muscle contractions of active muscles. These can occur in muscles throughout the body including those in the lower extremities, upper extremities and abdomen. Muscle cramps can be caused by dehydration or electrolyte imbalances.

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#### SPECIAL RISK FACTORS

Sickle cell trait – Heat cramps and exertional sickling can mimic each other. Be aware if an athlete has sickle cell trait.

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#### SIGNS & SYMPTOMS

- \* Painful muscle cramps that can limit mobility
- \* Tightness in the muscle can typically be felt by another person
- \* Most common in abdominals and legs
- \* Usually last a brief amount of time and are self-limiting

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#### MANAGEMENT

- ▶ Remove athlete from play
- ▶ Can provide food high in salt or salt replacement solution (1/2 teaspoon salt dissolved in 16-20 oz. water)
- ▶ Stretch and massage the muscle with the nearest joints in full extension
- ▶ Drink **WATER** or a sports drink
- ▶ Athlete can typically return to play when the muscle cramp stops

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### HEAT SYNCOPE

A fainting episode associated with high heat and humidity. This typically occurs because adequate blood flow does not return to the brain and will cause a loss of consciousness.

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#### SPECIAL RISK FACTORS

Prolonged standing in high temperature and humidity can increase the risk of heat syncope.

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#### SIGNS & SYMPTOMS

- \* Loss of consciousness or fainting
- \* Lightheadedness
- \* Weakness and fatigue
- \* Pale, clammy skin

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#### MANAGEMENT

- ▶ Move athlete to a cool area/shade
  - ▶ Have athlete lie down/elevate legs
  - ▶ Instruct athlete to drink **WATER** or a sports drink.
  - ▶ Monitor and maintain airway, breathing and circulation. If any concern about ABC's, call 911.
  - ▶ Athlete can return to play once evaluated by a medical professional and other complications and medical conditions have been ruled out.
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# HEAT ILLNESS RECOGNITION AND MANAGEMENT

## HEAT EXHAUSTION

Occurs when an athlete cannot effectively exercise in high heat and humidity conditions due to an elevated core body temperature. It can cause heavy sweating, rapid pulse and the athlete may feel tired and be unable to perform athletically.

### SPECIAL RISK FACTORS

Risk factors are the same as those listed for general heat illness. These include lack of acclimatization, dehydration, obesity, illness, certain medications and low fitness levels.

### SIGNS & SYMPTOMS

- |                    |                             |                            |
|--------------------|-----------------------------|----------------------------|
| * Heavy sweating   | * Fast and weak pulse       | * Headache/nausea/vomiting |
| * Cool/clammy skin | * Dizziness/lightheadedness | * Fatigue/weakness         |
| * Poor performance |                             |                            |

### MANAGEMENT

- |   |   |
|---|---|
| ▶ Remove excess clothing/equipment  | ▶ Move to a cool shaded area  |
| ▶ If conscious give WATER or a sports drink slowly.   | ▶ Cover the extremities and trunk with ice towels or ice bags   |
| ▶ Based on symptoms it may be recommended the athlete waits 24-48 hours before returning to play. | ▶ If medical professionals are onsite, core body temperature should be obtained with a rectal thermometer (only accurate method). The lack of an accurate core body temperature can lead to poor treatment decisions. |

It can sometimes be difficult to tell the difference between heat exhaustion and heat stroke. If there is any concern for heat stroke, a medical professional should check the core body temperature with a rectal thermometer (only accurate method.). If a medical professional is not available onsite, cold tub immersion (35-58 deg.) should be initiated and the heat stroke treatment protocol should be followed until medical professionals arrive and can determine the appropriate treatment steps.

## HEAT STROKE

A life threatening condition with two main components – core body temperature greater than 104 degrees (measured by rectal thermometer) and central nervous system dysfunction which usually presents in behavior changes and altered levels of consciousness. Heat stroke can result in death so it is critical to recognize and manage this condition immediately.

**Death from heat stroke is 100% preventable when proper cooling is initiated within 10 minutes of collapse.**

### SPECIAL RISK FACTORS

Risk factors are the same as those listed for general heat illness. These include lack of acclimatization, dehydration, obesity, illness, certain medications and low fitness levels. It is important to note that heat stroke can occur even when temperature and humidity are not elevated.

### SIGNS & SYMPTOMS

- |  |                                      |   |
|--|--------------------------------------|---|
| * Rectal temperature > 104 deg.          | * Irritability/emotional instability | * Nausea/vomiting/diarrhea                        |
| * Altered level or loss of consciousness | * Dizzy                              | * Headache  |
| * Profuse sweating or hot,red,dry skin   | * Stagger/inability to walk          | * Fast pulse, quick breathing, low blood pressure |
| * Dry mouth                              | * Poor performance                   |   |

### MANAGEMENT

- |   |   |
|---|---|
| ▶ Heatstroke is <i>life-threatening</i> , activate EMS, call 911 and maintain the ABC's (airway, breathing and circulation). Continue to monitor vital signs. | ▶ If medical professionals are onsite, core body temperature should be obtained with a rectal thermometer (most accurate method). The lack of an accurate core body temperature can lead to poor treatment decisions.   |
| ▶ Remove excess clothing/equipment  | ▶ <b>COOL FIRST, TRANSPORT SECOND.</b> Move athlete to the cooling area and immerse in cold tub (35-58 deg.) until core (rectal) temperature is 101-102 degrees. If a cold tub is not available rotate wet ice towels over the entire body, douse with cold water or move to a cold shower. |


**HEAT STROKE HAS A 100% SURVIVAL RATE  
IF PROPER COOLING IS INITIATED WITHIN 10 MINUTES OF COLLAPSE.**

## HYDRATION STRATEGIES TO PREVENT HEAT ILLNESS

Proper **HYDRATION** and **ACCLIMATIZATION** practices stand out as the 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 don't 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 it may be too late.
- Athletes should be weighed before and after warm weather practices. They need to drink appropriate amounts of fluid for the amount of weight lost. **An athlete should not be allowed to participate if they are at a 2% or greater weight deficit from the beginning of their previous practice.** Also, use a urine color chart (see back page) to determine hydration levels before activity.
- Encourage GOOD hydration choices: **water, sport drinks with low sodium and carbohydrates,** *AVOID: energy drinks, soda, fruit juices, carbonated beverage, and caffeine.*
- Encourage drinking fluids, not pouring them. Dumping fluid over the head won't help restore body fluids or lower body temperature.
- Provide easily accessible fluids.

<b>Before</b> Exercise	<p>Drink 16 oz. of fluid before activity/exercise (2 hours)                  Drink another 8-16 oz. of fluid 10-15 minutes before exercise</p>
<b>During</b> Exercise	<p>Drink 4 - 8 oz. of fluid every 15-20 minutes</p>
<b>After</b> Exercise	<p>Drink 16-20 oz. of fluid for every (one) pound lost during exercise to achieve normal fluid state and not begin the next practice dehydrated. Rehydration should take place over a safe and comfortable period of time. Excessive fluid intake over a short amount of time can be dangerous (see hyponatremia information below).</p>
Fluid counter	<div style="display: flex; align-items: center;">  <p>                     24 oz. of fluid = 1 ½ 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                 </p> </div>

**Hyponatremia** is a rare, but potentially deadly disorder resulting from the over-consumption of water or other low-sodium fluid (including most sports drinks). It is most commonly seen during endurance events, such as marathons, when participants consume large amounts of water or other beverages over several hours, far exceeding fluid lost through sweating. The water in the blood and the sodium content of the blood is consequently diluted to dangerous levels. Affected individuals may exhibit disorientation, altered mental status, headache, lethargy and seizures. A confirmed diagnosis can only be made by testing blood sodium levels. Suspected hyponatremia is a medical emergency and EMS (Emergency Medical Services) must be activated. It is treated by administering intravenous fluids containing high levels of sodium.

## REFERENCES

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**The information in this document is provided by the Kansas State High School Activities Association's Sports Medicine Advisory Committee. The information is meant to provide general information and guidelines for schools to consider when creating or updating their school's heat/hydration policy.**

***Disclaimer: The information provided by the Kansas State High School Activities Association regarding heat illness and hydration is not intended to be exhaustive or all of the relevant information on the subjects. The KSHSAA 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.***

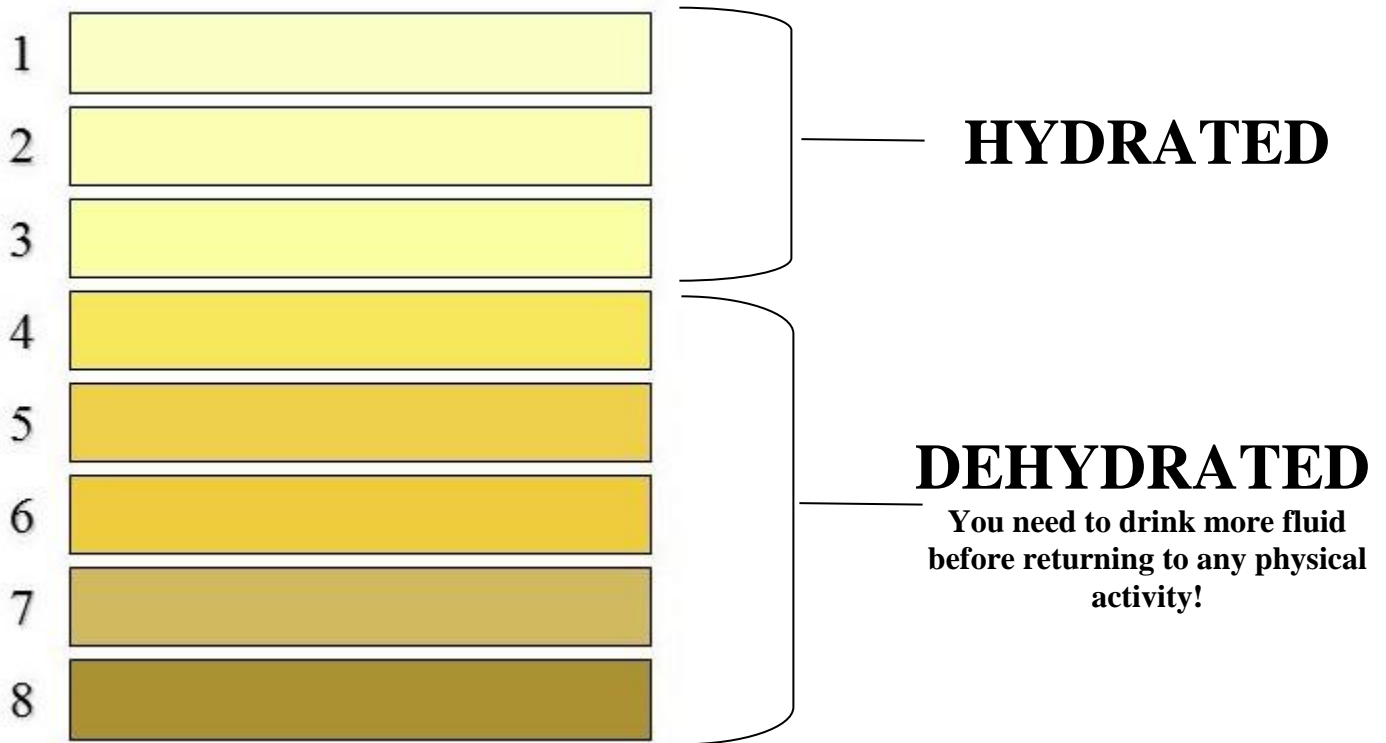
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# How Hydrated Are You?

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



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

# EMERGENCY ACTION PLAN

SPORT & VENUE:

PRIMARY PHONE:

VENUE ADDRESS:

AMBULANCE ACCESS TO VENUE:

AED ONSITE & AVAILABLE FOR IMMEDIATE ACCESS

AED LOCATION:

STORM SHELTER LOCATION FOR ATHLETES & COACHES:

## EMERGENCY RESPONSE PERSONNEL/CONTACTS

Identify personnel who will be involved in an emergency medical response. **The person present with the highest level of medical training should be designated to lead and coordinate the emergency response until emergency medical personnel arrive on the scene.**

	<u>NAME</u>	<u>PHONE</u>
<b>EMS</b>		<b>911 or</b>
Athletic Trainer	_____	_____
Team Physician	_____	_____
Coach	_____	_____
Coach	_____	_____
Principal	_____	_____
Athletic Director	_____	_____
Other	_____	_____
Hospital	_____	_____

### 1. Person(s) responsible to activate EMS (call 911):

\_\_\_\_\_

#### PERSON CALLING SHOULD:

- Explain the type of emergency
- Provide exact location of emergency
- Provide exact location of where ambulance can access the facility
- Provide condition of patient and type of care being administered
- Provide caller name and contact information
- DO NOT HANG UP until instructed by dispatcher

### 2. Person(s) responsible to retrieve any emergency medical equipment:

\_\_\_\_\_

Location of emergency/first aid equipment: \_\_\_\_\_

Location of the nearest AED: \_\_\_\_\_

Person(s) responsible to prepare cold tub: \_\_\_\_\_

### 3. Person(s) responsible to meet/escort EMS to the scene:

\_\_\_\_\_

#### PERSON MEETING AMBULANCE SHOULD:

- Meet the emergency personnel as they arrive at the site
- Have keys to any potentially locked doors, gates etc.

Emergency Action Plan updated on:

**EMERGENCY ACTION PLANS SHOULD BE REVIEWED & REHEARSED ANNUALLY**