

## VHSL Heat Guidelines

### **HEAT INJURIES CAUSE MULTIPLE DEATHS EACH YEAR IN HIGH SCHOOL SPORTS.**

Heat illness and injury can range from a simple muscle cramp to life threatening heat stroke. Catastrophic heat injuries are preventable. Following the recommendations found in this document, the risk of heat injuries can be reduced significantly. The most important components in preventing heat injury are the prevention of dehydration and limiting activity when temperature and humidity make it near impossible for the body to cool through evaporation of sweat.

The body produces heat at rest; this heat production increases 10 to 20 times with exercise. Evaporation is the major method of cooling the body during exercise. Evaporation of sweat dissipates the heat from the core of the body, keeping the internal organs cool. Exercising in a dehydrated state reduces the ability to sweat, therefore compromising the ability to cool. Dehydration also causes a reduction in blood volume, compromising cardiac output. The air temperature and humidity have a direct effect on the efficiency of this cooling process. Based on the effects of dehydration and exercising in the heat and humidity, the following guidelines have been established to provide administrators, coaches, and athletic training staff, with a sound plan to prevent heat injury. It is strongly recommended that each school system develops and adheres to specific heat guidelines appropriate for their student activity population and facilities based on scientific research. Guidelines should also apply to activities such as marching band and for gyms and indoor facilities without air conditioning.

### **Signs and Symptoms of Heat Problems:**

The following are common signs and symptoms related to heat illness, but are not intended to represent a complete

list. In the event an athlete is suffering from one or more of the following, the athlete should be referred to appropriate allied health care or medical professional for full evaluation.

- Muscle spasms/cramps
- Heavy or profuse sweating
- Skin is flushed or cool and pale
- Headache
- Dizziness
- Rapid pulse, nausea, weakness
- Disoriented, confusion
- Elevated body core temperature
- Cessation of sweating
- Red, dry skin
- Shallow breathing and rapid pulse
- Loss of consciousness

### **Heat Illness/Injury Facts:**

- Adolescents take longer to acclimatize to the heat than adults
- Weight loss of water greater than 3% of body weight significantly increases the risk of heat related illness.
- 1.5 times the amount of water lost must be consumed to replace lost weight.
- Unrelated illnesses causing vomiting and/or diarrhea will increase risk of heat related illnesses. These conditions should be brought to the attention of the ATC and/or coaching staff prior to participation and close monitoring of these individuals should take place during practice sessions and competition.
- Athletes taking certain medications including diuretics, antihistamines, beta blockers and anti-cholinergics are at higher risk for heat illnesses.

- Light colored breathable clothing can assist the body in cooling.
- Athletes who are overweight, poorly conditioned, recovering from illness, lacking in sleep, or taking medications are at added risk for heat illnesses and should be monitored closely and/or have their participation level modified.

### **Recommendations for Fluid Replacement:**

- All schools should establish a Fluid Replacement Protocol for their facility. (see recommendations below)
- All athletes should inform their coaches and/or athletic training staff of any pre-existing heat illness, gastrointestinal condition and/or medical complication prior to exercising in the heat.
- Weigh athletes before and after each practice during hot weather. Athletes should conform to a restricted activity schedule if not within 1% of the previous day PRE-EXERCISE weight.
- Replace fluids at a rate of 24 fluid ounces for every pound of body weight lost after exercise
- Athletes should be educated in the process of hydrating themselves as a 24 hour a day process.
- Athletes should begin every athletic activity well hydrated.
- During exercise, the average person should drink 8 – 12 oz of fluid every 20 to 30 minutes.
- Urine color is an easy method to determine hydration status. Light yellow to clear urine indicates a well-hydrated athlete.
- Water should be available to athletes at all times and never be withheld from exercising individuals.

### **Environmental factors:**

Ambient air temperature and humidity have a direct effect on the ability for a body to cool itself through the evaporation of sweat. When the air temperature is above 90, and/or the relative humidity is high, the body is at a higher risk to not effectively stay cool, which may be compounded by the level of dehydration of the body's fluids.

The following chart is a simple method to determine the amount of increased risk with variations of heat and humidity, and subsequent suggestions to modify participation in physical activities.

This chart can be used by inputting the temperature and humidity available via local radio stations, Internet locations, etc. Simply cross-reference the relative humidity (top row) with the temperature (first column) to determine the humidity. Follow the guidelines outlined below.

**RELATIVE HUMIDITY (%)**

<b>Tem↓p</b>	<b>10%</b>	<b>20%</b>	<b>30%</b>	<b>40%</b>	<b>50%</b>	<b>60%</b>	<b>70%</b>	<b>80%</b>	<b>90%</b>	<b>100%</b>
<b>105°</b>	100	105	113	123	135	149				
<b>104°</b>	98	104	110	120	132	143				
<b>102°</b>	97	101	108	117	125	139				
<b>100°</b>	95	99	105	110	120	132	144			
<b>98°</b>	93	97	101	106	110	125	132			
<b>96°</b>	91	95	98	104	108	120	128			
<b>94°</b>	89	93	95	100	105	111	122	128		
<b>92°</b>	87	90	92	96	100	106	115	122		
<b>90°</b>	85	88	90	92	93	100	106	114	122	130
<b>88°</b>	82	86	87	89	93	95	100	106	115	125
<b>86°</b>	80	84	85	87	90	92	96	100	109	111
<b>84°</b>	78	81	83	85	86	89	91	95	99	105
<b>82°</b>	77	79	80	81	84	86	89	91	95	96
<b>80°</b>	75	77	78	79	81	83	85	86	89	91
<b>78°</b>	72	75	77	78	79	80	81	83	85	86
<b>76°</b>	70	72	75	76	77	77	77	78	79	80

**HUMITURE****105° and up:****95° to 104°:****90° to 94°:****Below 89°:****VHSL RECOMMENDATION**

Recommend no outside activities.

Recommend no equipment (helmets, pads, etc) be used during activity.

Recommend equipment be removed as often as possible (during rest breaks, on sideline, etc). Careful monitoring of all athletes for signs of heat problems.

Recommend adequate water supply at all practices and competitions with breaks every 20 to 30 minutes for rehydration.

Fluid replacement should meet sweat rate for each individual. During prolonged intense exercise in high heat stress conditions, sweat rates may exceed the body's ability to rehydrate through ingestion of fluids. Net fluid loss experienced in these conditions must be regained within 24 hours, prior to the next practice session. Daily weigh in and weigh out is recommended to maintain awareness of overall cumulative fluid losses and appropriate rehydration or restriction of activity can be implemented.

**Heat Stress Practice and Equipment Modifications**

<b>Level</b>	<b>Humiture</b>	<b>WBT</b>	<b>Equipment Restrictions</b>	<b>Work/Rest Ratio</b>
<b>Green – 1</b>	<87	<75°	Full uniform	
<b>Yellow – 2</b>	87 – 89	75° - 76.9°	Remove helmet when not active in drill	50 min work / 10 min rest per hour
<b>Orange – 3</b>	90 – 94	77° - 78.9°	Remove Helmet and Shoulder Pads when not active in drill	45 min work / 15 min rest per hour
<b>Red – 4</b>	95 – 104	79° - 80.9°	No Equipment*	45 min work / 15 min rest per hour
<b>Black - 5</b>	105 +	81° +	No Outside Practice	

\* Field Hockey Goalies may wear full protective equipment not to exceed 10 minute on – 20 minute off cycle for live goal tending drills.

## **National Athletic Trainers Association's Recommendations on Fluid Replacement:**

- Educate athletes on the effects of dehydration on physical performance.
- Inform athletes on how to monitor hydration status.
- Convince athletes to participate in their own hydration protocols based on sweat rate, drinking preferences, and personal responses to different fluid quantities.
- Encourage coaches to mandate rehydration during practices and competitions, just as they require other drills and conditioning activities.
- Have a scale accessible to assist athletes in monitoring weight before, during, and after activity.
- Provide the optimal oral rehydration solution (water, CHOs, electrolytes) before, during, and after exercise.
- Implement the hydration protocol during all practices and games, and adapt it as needed.
- Finally, encourage event scheduling and rule modifications to minimize the risks associated with exercise in the heat.

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Full text can be found on NATA's website: [www.nata.org](http://www.nata.org)

## **Acclimatization to Heat:**

Another way to help prevent heat stress is to become acclimatized to the weather. Acclimatization means becoming adapted to the weather or climate. The process takes 7 to 12 days. Studies have shown adolescents take longer to acclimatize to heat than adults. As a result of acclimatization, the sweating mechanism of a person is enhanced:

- onset of perspiration occurs earlier
- perspiration increases
- increase in blood volume with the more training an individual does
- improves supply of oxygen to the muscles
- heart rate decreases
- core body temperature does not rise as high during exercise

## **Other facts about heat illnesses and exercising in the heat:**

- Dehydration of 1% to 2% of body weight begins to impact athletic performance
- Dehydration greater than 3% of body weight may increase an athlete's risk of heat illness.
- Sports drinks should contain 6% carbohydrate. Carbohydrate content greater than 6% compromises the rate of gastric emptying and should be avoided.
- Wear light weight and light colored clothing. Avoid wearing articles that prevent water absorption
- Early morning commonly produces a humid environment and lower temperatures. Usually, as the sun rises, the temperature will increase and the humidity decreases. As the evening hours approach, the temperature decreases and the humidity will rise. Often, the most critical times to monitor athletes ability to exercise in hot weather occurs when the temperature rises quickly during the early morning prior to the sun burning off the humidity; or during storms when the humidity remains high due to cloud cover, etc.

- A mild breeze can reduce the humidity on a particular field, as well as improve the evaporative process.
- Field watering after practice sessions are complete can help reduce the ambient humidity on or near an athletic field, thus reducing the heat stress on athletes.

### **EXTRACURRICULAR ACTIVITY DURING EXTREME HOT AND HUMID WEATHER POLICY USING WET BULB THERMOMETER Courtesy of Fairfax County Public Schools**

It should be noted that wet bulb readings represent the temperature including the effect of evaporative cooling. These readings are more commonly acquired using a digital psychrometer available through medical suppliers for under \$100. The use of these devices allow for more accurate monitoring of actual conditions found at an athletic facility.

Level	FWBT	Duration	Attire	Fluid Consumption	Comments
1	Less than 60°	3 hours maximum	Full gear	Insist that adequate fluid be ingested	Never restrict water consumption
2	60.1° - 65.9°	3 hours maximum	Full gear	Insist that adequate fluid be ingested	Provide minimum of 2 water breaks per hour
3	66° - 74.9°	3 hours maximum	Full gear	Insist that 4 – 6 oz minimum fluid be ingested every 20 minutes	Provide minimum of 3 water breaks per hour
4	75° - 76.9°	3 hours maximum	Remove helmets unless active in drill	Insist that 6 – 8 oz minimum fluid be ingested every 20 minutes	Monitor athletes, rest as needed.
5	77° - 78.9°	3 hours maximum, every 45 minutes of work > 15 minutes of rest each hour*	Protective equipment removed for non-contact drills	Insist that 8 – 10 oz fluid be ingested every 15 minutes	Removal of helmet unless active in drill, removal of pads (ie: shoulder pads) when teaching or non-contact portions of practice exceed 10 minutes in length
6	79° - 80.9°	3 hours maximum every 45 minutes of work > 15 minutes of rest each hour*	Shirt, shorts only No helmets or equipment	Insist that 8 – 10 oz fluid be ingested every 15 minutes.	Reduce intensity of activity, no equipment or helmets
7	81° - up	NO OUTDOOR PRACTICE		Re-hydrate 24 oz for every pound of body weight loss per day.	Practices conducted indoors must follow the Heat Policy

*The Heat Policy also applies to indoor practice*

#### **RECOMMENDATIONS:**

Fluid replacement should be at a rate of 24 oz for every pound of body weight lost after exercise.

- Light colored, loose clothing is suggested during activity in hot weather.
- Athletes are encouraged to wear sunscreen on exposed skin during hot, sunny conditions.
- Adequate fluid supply should be readily available at all times during activity in hot weather.
- Individuals poorly acclimatized, or poorly conditioned are at increased risk for heat related illness/injury and should be monitored closely or placed on a modified participation schedule.
- Athletes having a pre-existing dehydrated state (recent fever or gastro-intestinal illness) or pre-existing heat injury are at a much higher risk for heat related illness/injury and should be monitored closely or placed on a

modified participation schedule.

- Medications including diuretics, antihistamines, beta blockers and anti-cholinergics increase the risk of heat illness/injury.
- Overweight athletes are at increased risk for heat illness/injury and should be monitored closely.
- Energy, ergogenic, and dietary supplements such as Creatine may cause an increase in dehydration and heat related illness and/or injury.