

“You can go to extremes to protect your kids on the outside, but you can still leave them unprotected on the inside.”

- Gatorade

Proper Hydration



Athletic Safety
Clovis Unified School District
Department of Co-Curricular Services

**WHAT IS
DEHYDRATION
AND HOW DOES
IT OCCUR?**

Dehydration, the Invisible Opponent

“Research shows that 2/3 of athletes are significantly dehydrated when they arrive at practice”

- Gatorade

Although the muscle machinery is extremely efficient in converting fuel to energy, it is not perfect. In general, about 60 percent of the energy released during exercise is wasted as heat rather than used to fuel muscle contractions. By comparison, a well-tuned engine is only about 30 percent efficient, which means 70 percent of the energy is lost as heat. In both cases, it is imperative that this excess heat be removed. As heat builds up, engine performance begins to decline. Even when the gas tank is full and the carburetor is delivering adequate amounts of fuel, the engine stops functioning if the cooling system fails. This is similar to what happens during exercise. When body temperature rises above a certain temperature, muscle contraction fails. For optimum exercise performance, body temperature must be controlled within fairly narrow limits.

The higher the intensity of exercise, the more heat is produced. Energy production from muscle contraction can theoretically increase the temperature of the body about 2°F every five minutes at high exercise intensities in a warm environment. Body temperature is normally 98.6°F. If it increases to 102.2°F, exercise performance is compromised. If it reaches 105.8°F, it can be life threatening and require medical attention.

There are several mechanisms that the body can use to maintain a stable temperature, one of which is direct transfer to the environment. For example, during running or cycling, excess body heat can be dissipated as cool air moves over the surface of the body. During swimming, excess body heat can be transferred to the cooler water. Direct transfer to the environment, however, is generally not an efficient means of dissipating heat. During intense exercise, the primary cooling mechanism is sweat evaporation, which accounts for about 80 percent of total heat loss.

To rapidly dissipate heat generated by the muscles, it must be transferred to the blood vessels surrounding the muscles and carried by the bloodstream to vessels just below the surface of the skin. As the skin temperature rises, sweat glands are activated and release sweat, which then evaporates, cooling both the skin and the blood just below. The cooled blood can then be returned to the muscles to help dissipate additional heat.

The need to move blood from the muscles to the skin to dissipate heat can put a strain on the heart and cardiovascular system because of the requirement to pump blood to the skin as well as to the working muscles. The warmer and more humid the environment, the

greater the sweat rate and skin blood flow required to dissipate the heat generated by the muscles. As body water is lost, blood volume declines. This decline limits the capacity of the circulatory system to carry oxygen and nutrients to, and remove metabolic byproducts (such as lactic acid) as well as heat from, the exercising muscles. This results in a rise in body temperature, causing fatigue.

The effect of dehydration on the cardiovascular system is immediately evident. For each 1 percent loss in body weight due to sweating, heart rate increases five to eight beats per minute and the amount of blood pumped declines. When dehydration occurs in a hot environment, it has a more adverse effect on performance because direct transfer of heat to the environment is less effective, putting additional pressure on sweating to cool the body.

The loss of body fluid equal to as little as 2 percent body weight (approximately 3.5 pounds for a 175-pound athlete) can significantly reduce blood volume, putting stress on the cardiovascular system and limiting physical performance. As dehydration increases, performance continues to decrease (see Table below). Reduction in performance can occur in the form of reduced stamina and deterioration of fine motor skills such as eye-hand coordination and mental alertness. When dehydration approaches 4 percent, athletes can experience heat cramps (cramps in skeletal muscles accompanied by profuse sweating) and heat exhaustion (dizziness, weakness, nausea, and possibly collapse). When dehydration approaches 6 percent, it can result in heatstroke. Symptoms of heatstroke are severe headache, cessation of sweating, a rapid rise in body temperature, collapse, and unconsciousness. Heatstroke is a life-threatening condition that requires immediate medical attention.

A consequence of sweating is the loss of electrolytes, including sodium, potassium, and chloride, which are necessary for many metabolic functions such as muscle contraction and nerve transmission. Generally, the composition of sodium and chloride in sweat is about one-third that found in blood. It is not uncommon for athletes to lose up to 9 pounds of fluid by sweating during an extended workout or long race. With such a fluid loss, the electrolyte losses would be roughly 5 to 6 percent of the body's total sodium and chloride content. Potassium losses would be significant, as well. Some of the symptoms resulting from sodium loss are reduced performance, dizziness, and fainting. Some of the symptoms resulting from potassium loss are nausea, diminished reflexes, fluctuation in heart rate, muscular fatigue, and weakness.

Be aware of the warning signs of dehydration: headache, dizziness, nausea, cramps, vomiting, confusion, red hot skin, high temperature, rapid, weak pulse, seizure, rapid, shallow breathing, loss of consciousness, dry cough, fatigue, urine color (deep yellow). The most serious sign is **hot/dry** skin.

Stages of Dehydration:

- Heat exhaustion – decreased blood volume due to dehydration. Symptoms: dizziness, headache, nausea, profound sweating, body temperature at or slightly below normal.

- Heat cramps – painful spasms of the skeletal muscle caused by dehydration.
- Heatstroke – most serious, even fatal. The body’s cooling system has completely shut off and blood volume is so low that the person stops sweating and goes into shock.

**EFFECT OF INCREASING DEHYDRATION
ON PHYSICAL PERFORMANCE**

<i>Body Water Loss</i>	<i>Effects</i>
0.5%	Increased strain on the heart
1%	Reduced aerobic endurance
3%	Reduced muscular endurance
4%	Reduced muscle strength; reduced fine motor skills; heat cramps
5%	Heat exhaustion; cramping; fatigue; reduced mental capacity
6%	Physical exhaustion; heatstroke; coma

**THE ROLE OF
THE PARENT AND
ATHLETE IN
PROPER
HYDRATION**

The Role of the Parent and Athlete in Proper Hydration

How can the athlete protect himself/herself from dehydration?

- Make sure you are properly hydrated. Make sure you drink at regular intervals; don't wait until you are thirsty.
- Don't drink liquids that contain caffeine or large amounts of sugar; these actually cause you to lose more body fluid. Also avoid very cold drinks, because they can cause stomach cramps. Don't eat a heavy meal and then participate in an activity.
- Drink fluids before, during and after an activity.

Fluid Examples for Athletes:

1 hour before activity –

Athletes under 90 lbs should drink 3-6 oz.

Athletes over 90 lbs should drink 6-12 oz.

During activity, every 20 minutes –

Athletes under 90 lbs should drink 3-5 oz. every 20 minutes

Athletes over 90 lbs should drink 6-9 oz. every 20 minutes

After activity to replace fluids lost through sweat –

Athletes under 90 lbs should drink up to 8 oz.

Athletes over 90 lbs should drink up to 12 oz.

**THE ROLE OF
THE ATHLETIC
TRAINER AND
COACH IN
PROPER
HYDRATION**

The Role of the Athletic Trainer and Coach in Proper Hydration

Education

- Teach all athletes and parents what proper hydration is and the symptoms of dehydration. Give diet recommendations to replace sodium which helps proper hydration
- Have the athlete use the buddy system to recognize signs of heat illness in each other. Refer to “Stages of Dehydration” for specific examples
- Due to the loss of sodium through perspiration eat a balanced diet. Popular foods rich in sodium include tomato juice, canned baked beans, dill pickles, pretzels, canned soup and cheese pizza
- Pace yourself in extreme heat

Coach and trainer daily check list

- Calculate the Apparent Temperature
- Check air quality index
- Review the reading of the posted Apparent Temperature
- Prepare to have open water available
- Prepare to have breaks every 5 or 10 minutes
- Assign a coach to make sure the athletes are consuming water
- Have water conveniently located
- Have shade area ready and available
- Plan to vary the pace of the activity
- Have a coach assigned to weigh athletes before and after practice when the Apparent Temperature is 90° - 104° or above
- Plan on gradually adapting athletes to exercise in the heat
- Be ready if needed to reschedule practice to before 11:00am or after 7:00pm
- Minimize the amount of equipment and clothing worn by the athlete in hot or humid conditions
- If an athlete is on medication, he/she needs to check in each day with the trainer to determine how hard to practice
- If possible, have the strenuous work done during cooler parts of the day

**DISTRICT'S
GUIDE TO
PREVENTION OF
HEAT
EXHAUSTION &
HEATSTROKE OF
CUSD STUDENTS
AND ATHLETES**

CLOVIS UNIFIED SCHOOL DISTRICT'S GUIDE TO PREVENTION OF HEAT EXHAUSTION/HEAT STROKE OF CUSD STUDENTS AND ATHLETES

Revised January 30, 2006

- How does CUSD plan to prevent heatstroke?
 - **Heatstroke may result in death or serious brain or other organ damage.** To prevent heatstroke, it will be the responsibility of the coach/program supervisor to follow the guidelines/procedures identified below.
- How does CUSD identify Heat Stress Risk?
 - CUSD uses a Psychrometer that calculates the temperature and the Relative Humidity to determine the Apparent Temperature.
- Who is responsible for the calculations to determine the Apparent Temperature?
 - At the high schools, the Athletic Trainer will identify the Apparent Temperature each day 30 minutes prior to a practice.
 - At the intermediate schools the Athletic Director will identify the Apparent Temperature each day 30 minutes prior to a practice.
- How will coaches/program supervisors and athletes be notified of the Apparent Temperature?
 - The results of the reading will be posted in a convenient location for coaches and supervisors of co-curricular activities to view.
- Does the coach/program supervisor have any discretion in modifying the following guidelines?
 - Coaches, program supervisors and directors have discretion to increase the number of water breaks and to extend water breaks beyond the time limits listed. But they are not permitted to decrease water breaks or time limits.
- Daily Weigh In
 - Daily weigh in before and after practice will determine if an athlete's weight loss is within the safe zone when the Apparent Temperature is 90° - 104° or above. This will tell the athlete how much water he/she should consume during a work out. For example, suppose an athlete loses 2 pounds during a two-hour workout. Two pounds is equivalent to 32 ounces of water. The athlete should plan to replace about 32 ounces of water during this workout. This can be accomplished by consuming 4 ounces every fifteen minutes.

Guidelines/Procedures

Apparent Temperature	Heat Stress Risk with Physical Activity and/or Prolonged Exposure
80° – 89°	<ul style="list-style-type: none"> • Water break every 30 minutes • Have water located near practice area and convenient to drink <p><i>Heat Cramps or Heat Exhaustion Possible</i></p>
90° – 104°	<p><u>Light Activity (ex. Football walk through)</u></p> <ul style="list-style-type: none"> • Have water located near the practice area and available for athletes as needed • Water breaks every 15 minutes • Break lasting 5 minutes. Remove helmet and allow to cool • Coaches, supervisors and directors will check each player for signs and symptoms of Heat Exhaustion/Heatstroke <p><u>Strenuous Activity</u></p> <ul style="list-style-type: none"> • Have water located near practice area and available as needed • Water breaks every 10 minutes. Breaks lasting 5 minutes • Remove helmet and allow to cool • Coaches, supervisors and directors will check each player for signs and symptoms of Heat Exhaustion/Heatstroke <p><i>Possible Cramps or Heat Exhaustion</i></p>

105° – 114°	<p>Limited Activity</p> <ul style="list-style-type: none"> • Uniform for practice should be appropriate for the Apparent Temperature of the day • Have water available as needed • Water breaks every 10 minutes. Breaks lasting 10 minutes • Coaches, supervisors and directors will remove helmet and check for symptoms of Heat Exhaustion/Heat Stroke • Provide a shade area • Move practice, if possible, to a cooler time <p><i>Cramps or Heat Exhaustion Likely / Heatstroke Possible</i></p>
115° and up	<ul style="list-style-type: none"> • All practices will be conducted before 11:00AM or after 7:00PM • Appropriate steps should be followed per Apparent Temperature <p><i>Heatstroke Highly Likely</i></p>

IN THE EVENT AN ATHLETE HAS HEAT EXHAUSTION, HEAT CRAMPS OR HEATSTROKE

We will follow the Emergency First Aid Guidelines for California Schools Athletic Programs. This program was prepared by the California Emergency Medical Services Authority. Please refer to the following chart.

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