

## **WAXAHACHIE INDEPENDENT SCHOOL DISTRICT**

### **ATHLETIC GUIDELINES FOR PRACTICING IN HEAT ENVIROMENTS**

#### **PREVENTION OF HEAT ILLNESS IS THE KEY!**

- 1. PROVIDE UNRESTRICTED FLUIDS DURING PRACTICES AND GAMES.**
- 2. WORKOUT IN THE COOLER PARTS OF THE DAY. (EARLY AND LATE)**
- 3. ALLOW YOUR ATHLETES TIME TO BECOME ACCLIMATED TO THE HEAT. THIS USUALLY TAKES 7-12 DAYS. ENCOURAGE THEM TO WORK IN THE HEAT AND DO SOME FITNESS RELATED ACTIVITY DURING THE SUMMER.**
- 4. WEAR LIGHT COLORED AND LOOSE FITTING CLOTHING.**
- 5. WEAR LIGHT WEIGHT, AND POROUS CLOTHING WITH SHORT SLEEVES.**
- 6. WEAR LOWER SOCKS.**
- 7. CHANGE PERSPIRATION SOAKED UNIFORMS TO INCREASE COOLING BY EVAPORATION PROCESSES.**
- 8. EXPOSE AS MUCH SKIN AS POSSIBLE TO THE AIR.**
- 9. REPLACE 1 PINT OF WATER FOR EACH POUND LOST OR 10 OZ. OF WATER EVERY THIRTY MINUTES.**
- 10. ALLOW YOUR ATHLETES TO REMOVE EXCESS PADS AND HELMETS BEFORE CONDITIONING. ALLOW A COOL DOWN PERIOD.**
- 11. PROVIDE WATER BREAKS IN THE SHADE IF POSSIBLE.**
- 12. DURING BREAKS, ALLOW ATHLETES TO REMOVE THEIR HELMETS AND SIT DOWN.**
- 13. STRESS PREHYDRATION TO YOUR ATHLETES. DRINK AT LEAST 20 OZ. OF WATER OR FLUID BEFORE A PRACTICE OR GAME. ATHLETES WILL DRINK ONLY TO SATISFY THEIR THIRST, NOT TO REPLACE FLUID LOST.**
- 14. RESTRICT, IF POSSIBLE, SOFT DRINKS AND ICED TEA OR PRODUCTS WITH CAFFEINE DURING HEAT STRESS TIMES OF THE YEAR. THESE PRODUCTS CAN LEAD TO INCREASED URINATION AND SLOWED GASTRIC ABSORBTION TIMES.**
- 15. DRINK COOL-COLD WATER. IT IS ABSORBED THE FASTEST.**
- 16. USE WEIGHT CHARTS TO MONITOR WEIGHT LOSS AND DEHYDRATION IF AT ALL POSSIBLE. IF AN ATHLETE LOSES MORE THAN TO 5 TO 8 PERCENT ONE DAY AND DOES NOT GAIN IT BACK, THEN THEY SHOULD NOT BE ALLOWED TO RETURN TO ACTIVITY UNTIL THE WEIGHT IS REGAINED.**
- 17. KNOW WHAT MEDICATIONS YOUR ATHLETES ARE TAKING. SOME CAN DEHYDRATE THE BODY.**
- 18. SCHEDULE WATER BREAKS EVERY 45 MINUTES. DURING SUMMER MONTHS OF AUGUST AND SEPTEMBER ADJUST YOUR BREAK SCHEDULE TO EVERY 30 MINUTES. (BREAK TIME SHOULD BE A MINIMUM OF FIVE MINUTES).**
- 19. USE A SLING PSYCHROMETER TO CHECK THE TEMPERATURE AND HUMIDITY. IF THE ACTUAL TEMPERATURE AND HUMIDITY ADDED TOGETHER IS 150 OR MORE, THEN WATER BREAKS WILL BE SCHEDULED EVERY 30 MINUTES.**
- 20. ENCOURAGE CONSUMPTION OF FLUIDS AT HOME, GETTING ADEQUATE REST, AND MAINTAINING A NUTRIONAL DIET.**

## **HEAT RELATED DISORDERS**

**Heat Illness** is one of the most common causes of disability in sport. The consequences of a major heat related disorder can be catastrophic. The approach to prevention and care of heat illness has changed greatly and for the better in the last fifteen to twenty years.

In the United States, 39 deaths were documented to have occurred from heat illness in the years 1964-1973 (3.9 deaths on average a year.). However, in the decade of 1974-1984 there were only 15 reported fatalities from the heat. Why did this decline happen? Imagine if in that first ten year period that all those deaths occurred in Texas. Then, in the second period they also occurred within the state of Texas. Why the decline? Could it have been that cooler on average temperatures were evident during that second period? It is not likely, since the summer of 1980 was one of the hottest ever recorded in many cities and towns across Texas. (113 degrees reported in Wichita Falls in July, 1980). The reasons for this decline are many and some of the most important are listed below:

- 1.) Education of coaches and athletic trainers about heat disorders.**
- 2.) Free availability of water and other fluids during practices and games.**
- 3.) Clothing changes. ( A change from a heavyweight, cotton practice jersey to a mesh jersey)**
- 4.) A more complete understanding of the water-electrolyte cycle in the body.**

Water is the life force of the human body, for without it our body cells would die and we would not survive. The average adult male has 60% of his body weight in water. The body requires an approximate intake of 2300 ml (2.4 qts) of water per day. He will eliminate approximately 1100 ml in the urine, and 900 – 1200 ml through the skin and lungs.

Certain changes take place in the cardiovascular system ( the heart and blood vessels ) in response to increased heat stress. These are:

- 1.) Increase in the cutaneous venous volume. (Increase in blood in veins close to skin) This enhances the heat loss from the skin but hampers the effective central blood volume.**
- 2.) A fall in blood pressure is avoided because of a reduction in the renal ( kidney ) and splanchnic (visceral) portions of the body. Is this serious? Yes, because this physiological change accounts for the complications involving the kidneys, liver, and other organs in severe heat illness cases.**
- 3.) Depending on how long the body is subjected to the high levels of increase core temperatures (internal body temperatures which are taking rectally) coupled**

**with the changes in the cardiovascular system expressed above, this system will begin to fail over time.**

The more **acclimatized and conditioned** the athlete, the greater his/her percentile of water to body weight. This is how the body fights the possibility of fluid dehydration.

Salt Depletion can also become a problem in the person subjected to heat stress. Because of low dietary NaCl (salt), and high losses of NaCl due to fluid loss, the level of extracellular fluid is reduced as well as cardiac output and blood pressure. This means that with heat stress placed upon a person for a vast amount of time (hours), the body will lose NaCl and fluid in the form of sweat and this results in fluids outside the body cells becoming less. The serious part of this problem is that this loss of salt effects cardiac output or the ability of your heart to forcefully pump blood through the body. With heat stress, Cardiac output is effected in that the heart has to work much harder to pump blood through the body creating stress on the heart. There is also a dropping in blood pressure due to lower cardiac outputs.

This condition is not characterized by thirst or relieved by ingesting salt free fluids. It can only be treated with intravenous (IV) fluids or the ingestion of a 10% saline solution.

Water dehydration is characterized by **thirst** and **oliguria** (decreased frequency of urination). This condition can be relieved by the ingestion of water. Water depletion with a normal decline in the total body water percentage does not produce peripheral vascular collapse because the plasma volume contributes only 1/12 of the total fluid deficit. Water depletion is more common than salt depletion, however differentiating between the two can be difficult because their symptoms are so closely matched.

**The athlete that is acclimatized may lose 3.5 ml of water per hour. This rate of loss over a 3-4 hour period may account for 4-6% of the athletes total body weight. The athlete may require 4000 ml plus of fluid intake to what is lost during practices or competitions and continue in daily body metabolism.**

The health acclimatized person may have 10 grams NaCl per liter of fluid (in Blood serum).

The person with Heat Exhaustion may still have 6 grams NaCl per liter.

**How does this happen?** The athlete will conserve salt by decreasing urinary excretion. Furthermore, the patient with Heat Cramps will also not show dramatic changes in their serum sodium levels.

**What fluid is best to use for practice, games, etc? What is the best sports drink on the market that will combat heat related illness?** Research has shown that fluids consumed should be cold with concentrations under these amounts. Sodium (218 mg), Chloride (337 mg), and Potassium (183 mg). Research has also suggested the sucrose and glucose (the sugars) levels in sports drinks not exceed 2.5%. Levels larger than this have shown to increase the gastric emptying times or the amount of time needed for a fluid to be absorbed by the gastrointestinal tract. In heat environments, we would want the gastric emptying rate to decrease thus faster fluid absorption, faster hydration, and faster energy for the body cells.

The emphasis placed on the gastric emptying time is very important because very little water is absorbed by the stomach. The majority of fluid is absorbed in the intestine. Cold fluids empty

faster than do warm fluids. **The myth that cold fluids cause gastric distress are unfounded, gastric distress is caused by the volume of fluid consumed.**

**So what drink is best?** The author feels that there are a variety of good sport drinks on the market today. In talking with other high school trainers, some use Gatorade, some use Powerade, and some use All Sport. There is a new product on the market called Propel by Gatorade. **Is a sport drink necessary at all times?** No, it is my belief that water is essential in combating heat illness. It is economical and can aid in the rehydration of the body. However, sport drinks can provide necessary electrolytes to help fight the heat illness problem.

The cellular changes that occur from heat illness must be understood to better combat the problem. The osmolarity or the regulation of water balance is controlled by the ADH hormone (antidiuretic hormone). **Sodium** levels are maintained by aldosterone which is a substance found in the adrenal cortex ( top of kidney ). Extracellular changes include increasing the permeability of the cell to the sodium ions and the stimulation of the sodium pump. However, this further depletes the energy level of the cell. The sodium pump increases the intracellular activity ( inside cell ) which stimulates the Na ion, hydrogen ion exchange. It increases the frequency of neural stimulation which increases the sodium-potassium flux across the nerves.

**Potassium** is responsible for the intracellular fluid ion levels, and the regulation of intracellular osmolarity. Potassium also promotes nerve impulses, muscle function, and heart muscle function. **It should be noted that Potassium moves out of the cell under conditions of heavy work or exercise.**

The body tends to conserve Na ions at the expense of losing potassium ions. Losses of Potassium ions are often increased by **diarrhea, vomiting, and poor dietary replacement. (all are key components and symptoms of heat illness. )**

**Calcium** maintenance depends upon the proper intake of dietary calcium, the availability of vitamin D, and the level of blood phosphorus. Changes in the levels of calcium in the body are noted with increased nerve irritability, decreased blood clotting times, and changes in membrane permeability (loss increases the permeability).

**Magnesium** also is an important electrolyte with functions of maintaining nerve irritability, carbohydrate metabolism, and helps in the regulation of blood phosphorus.

It should be noted that all four of these electrolytes are essential in the body. They all are directly linked to nerve irritability, muscle function, or some other metabolic function. The functions that they are linked to are what makes the body move. Naturally, through exercise these electrolyte levels are lost (mainly through the sweating mechanism). Furthermore, their levels drop more rapidly when the athlete is placed under heavy workloads in a heated environment. **Therefore, the maintenance of the proper levels of these four electrolytes is essential.**

With that in mind, Heat Illness can be divided into four types, they are in order of occurrence and severity: **Heat Cramps, Heat Syncope (fainting or weakness), Heat Exhaustion, and Heat Stroke.**

## HEAT ILLNESS – HEAT RELATED DISORDERS

### \*\*\*\* HEAT CRAMPS\*\*\*\*

**SYMPTOMS-** Muscular spasm that affects any or all parts of the body. Generally, affects the gastrocnemius (calf muscle). Quadriceps (thigh), and hamstrings, and muscles of the lower back and lumbar region (lower mid back).

**TREATMENT-** rest, Ice packs to the affect muscle group (s), application of mild counter pressure to the affected group, application of cold compresses to head, shoulders, hands, and feet (places where body loses the most heat), **FLUID REPLACEMENT.**

### \*\*\*\*HEAT SYNCOPE\*\*\*\*

**SYMPTOMS-** Muscular spasms progressing to a weak sensation coming over the body to a total fatigue of one area or all areas. Weakness, Tiredness, Dizziness, Faintness, Motor control and coordination impaired, Weak-rapid pulse, Decreased blood pressure.

**TREATMENT-**Stop all activity for all day, Remove the athlete from direct sunlight, Application of cold towels, Can have athlete take cool shower, Use of a fan to help cool the athlete, **WATER REPLACEMENT** ( as much as they can drink).

\*\*\*\***Dunking a person into a tank of cold icy water may drive the heat into the core of the body and damage internal body organs**\*\*\*\*

### \*\*\*\*HEAT EXHAUSTION\*\*\*\*

**SYMPTOMS-** Extreme weakness and fatigue, Exhaustion intense, Very difficult time stay awake, Sweating profusely, Pale faced, Skill will start to take on a red glow, Slightly elevated body temperature, Athlete will have an unquenchable thirst, Oliguria (reduced frequency of urination) , Delirium, and In latter stages, Periods of time of unconsciousness.

\*\*\*\* **The HEAT EXHAUSTION patient will probably require hospitalization.**\*\*\*\*

**TREATMENT-**Cool body down (however you can), Fluid Replacement (as long as not unconscious, electrolyte Replacement, Remove from sun and outside heat, Possible Intravenous Fluid Replacement (physician will do this), Extended rest, Use of fans to help cool the body, **DOCTOR**

### \*\*\*\*HEAT STROKE\*\*\*\*

**SYMPTOMS-** Faintness, Exhaustion, Staggering, Intense Headache, Nausea, Elevated Body Temperature, Possible Unconsciousness, Strong Rapid Pulse, Low Blood Pressure, Hot and Dry Skin, Lack of Sweating.

**\*\*\*\*THE SWEATING MECHANISM HAS STOPPED!!! THE BODY CAN DO LONGER COOL ITSELF BY NATURAL SWEATING PROCESSES!!! THE BODY WILL BEGIN TO SHUTS ITS ORGAN AND BODY SYSTEMS DOWN !!! THIS IS A MEDICAL EMERGENCY!!!**

**TREATMENT-**Seek advanced medical help immediately, Call the Paramedics, Cool the body, Rapid replacement of fluids (usually intravenous), Transport to the nearest Emergency Room –**FAST!**

\*\*\*\*\*Recent literature suggest that the temperature for the water in the case of total body immersion should be between 60-70 degrees. This does not cause shivering or drive the temperature higher in an attempt to heat the body. If ice baths are used, there must be attendants to constantly massage the body.\*\*\*\*\*

## WEIGHT LOSS-FLUID LOSS

Athletic trainers, coaches and parents should monitor student athletes and their potential weight loss from exercising in the heat.

If the athlete loses more than 5% of their total body weight over the course of the days practice, he/she should be held out until that weight returns.

Beware of the athlete that loses 1 or 2lbs each day. This athlete is slowly becoming dehydrated and will be a problem in the 3<sup>rd</sup> or 4<sup>th</sup> day of practice.

NOTE- A GALLON OF WATER WEIGHS 8 LBS. THAT IS A SIGNIFICANT AMOUNT OF FLUID, IF LOSSED. 4 QUARTS=1 GALLON.

Encourage pre-hydrating by drinking 32 oz. of fluids before practices and games. The athlete should consume approximately 16 oz. every 30 minutes of activity.

### DEHYDRATION AND ATHLETIC PERFORMANCE

#### 2% LOSS:

{ 150 LB MAN = 3 LBS OR 1 ½ QTS OF FLUID }  
Causes impaired thermoregulatory ability-Ability to regulate heat.

#### 3% LOSS:

{ 150 LB MAN= 4.5 LBS OR 2 ¼ QTS OF FLUID }  
Reduces muscular endurance time and thermoregulatory activity.

#### 4% LOSS:

{ 150 LB MAN= 6 LBS OR 3 QTS OF FLUID }  
Reduces muscular endurance, reduced endurance time, Heat Syncope, Heat Cramps.

#### 6% LOSS:

{ 150 LB MAN = 9 LBS OR 4 ½ QTS OF FLUID }

\*\* 1 qt= .94 Liters, 1 Fluid ounce= 29.57 ml. 1 ml= .001 L \*\*