Heat Illness

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Financial Disclosure

Dr. Jorge Gomez has no relevant financial relationships with commercial interests to disclose.

Agenda

• Acclimatization
• Rehydration
• Muscle cramps
• Heat Illness
• Fulminant Rhabdomyolysis
16 y.o Football Player

Physiologic Adaptations to Heat - Acclimatization

Improved Fitness – Lower Risk of Heat Illness
Acclimatization Period - UIL

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 percent acclimatization can be expected to occur after the first seven to ten days.

Hydration - UIL

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 of ten minutes be scheduled for a water break every half hour of heavy exercise in the heat.

Monitoring Hydration in Athletes

Before & After weigh-ins, keep chart

≤ 3% wt loss safe

> 3% wt loss - danger

Replace 16 oz of water for every lb lost

Check urine color before bed

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Rehydration Fluids

- WATER
  - Main component of sweat
  - Most dehydration is isonatremic (no net loss of sodium)
  - Readily available
  - Less expensive than sport drink

- SPORT DRINK
  - Young athletes more likely to drink more if flavored (lemon-lime > orange > grape)
  - Contains sodium which some athletes may need
  - Carbohydrate may enhance fluid absorption

Exercise-Associated Muscle Cramps – EAMC (Heat Cramps)

- Cause – not clear (sodium loss? muscle fatigue?)
- OU Studies – FB players most at risk for cramping had higher sweat losses, greater sodium losses
- Factors – deconditioning, pre-dehydration, low sodium intake, chronic dehydration, fatigue
- Treatment – stretching is most effective
- Crampers – attention to hydration, supplement sodium, proper rest

EAMC – Treatment & Prevention

- Best Treatment
  - Passive stretching
  - Ice massage
  - Little evidence that ingestion of electrolyte solution or IV infusion significantly abates EAMC

- Prevention
  - Increase fluid and sodium intake
  - Improve conditioning
  - Ensure adequate rest
16 y.o. Football Player with Vomiting

- 102°F outside, full pads
- Unable to continue
- Severe HA, nausea, muscle cramps
- Appears flushed, skin is hot & clammy
- Listless, about to collapse

Heat Illness - Comparison

<table>
<thead>
<tr>
<th>Problem</th>
<th>Ambient</th>
<th>Core Temp</th>
<th>Mental</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Exhaustion</td>
<td>Dehydrated</td>
<td>Warm, humid</td>
<td>&lt;104°F (40°C) Dazed, listless, combative</td>
</tr>
<tr>
<td>Heat Stroke</td>
<td>Too hot</td>
<td>Hot</td>
<td>≥ 104°F Out-of-it, comatose, seizure</td>
</tr>
<tr>
<td>Hypo-natremic Dehydration</td>
<td>Dehydrated Low sodium</td>
<td>Warm, humid</td>
<td>&lt; 104°F Dazed, listless, seizure</td>
</tr>
</tbody>
</table>

Heat Exhaustion – Return to Play

- Minimum 24 hrs rest
- No HA, GI symptoms, muscle soreness
- Tolerating food & drink
- Normal electrolytes
- Normal appearing urine
Exertional Heat Stroke

- Rectal temperature most reliable
- Oral, skin, temporal, and axillary temperature measurements should not be used to distinguish EHS from heat exhaustion
- Treatment: delay may be fatal
  - Make supine, elevate legs
  - Aggressive cooling
  - EMS

Aggressive Cooling

- Most rapid whole body cooling rates have been observed with cold water & ice water immersion therapy
- Both have the lowest morbidity & mortality
- An aggressive combination of rapidly rotating ice water-soaked towels to the head, trunk, and extremities and ice packs to the neck, axillae, and groin, provides a reasonable rate of cooling

Marching Band Collapse

- Band member collapses in 98° heat
- Dazed, listless, cramping
- Has been drinking water all day
Hyponatremic Dehydration

• Abnormally low serum sodium due to excessive sodium losses, overhydration with plain water
• May lead to coma, seizures, death
• Risk factors include prolonged continuous exercise > 1 hr, low sodium intake, female, use of NSAIDs

Hyponatremic Dehydration - Diagnosis & Management

• Symptoms which worsen or do not improve with oral rehydration - irritability, disorientation, sleepiness, seizure activity, assoc/w bloated abdomen, urine production
• If no improvement after 30 minutes of oral rehydration, give salt tablets, oral electrolyte solution
• If no improvement or worsening, withhold fluid, activate EMS

19 y.o Collegiate Football Player

• Early am practice, running 100 repeats in shell
• Stops abruptly, c/o intense leg weakness, mild SOB
• Unable to continue
• No obvious muscle cramping
Sickle Cell Trait (SCT)

- Affected individuals have ≤ 40% sickle hemoglobin
- Sickle crisis initiated by dehydration, acidosis
- Sickled RBC's clog capillaries, block O2 to tissues

Sickle Crisis vs. Heat Illness

<table>
<thead>
<tr>
<th>Feature</th>
<th>SCT</th>
<th>Heat Illness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscles</td>
<td>Weak/pain, no spasm</td>
<td>Cramping, muscle spasm</td>
</tr>
<tr>
<td>Behavior</td>
<td>Alert, may become listless, rapid breathing</td>
<td>Lethargic, irritable, combative</td>
</tr>
<tr>
<td>Temperature</td>
<td>Normal</td>
<td>Normal or elevated</td>
</tr>
<tr>
<td>Timing in Exercise</td>
<td>Early</td>
<td>Usually Late</td>
</tr>
</tbody>
</table>

Response to Collapse Possibly due to Sickle Crisis

- Stop all athletic activity
- Begin oral rehydration
- Administer oxygen if available
- If sickle status is known (+), or if symptoms continue to worsen, activate EMS
Preventing Collapse due to SCT

• Athletes with SCT should set own pace
• Athletes with SCT should build-up training slowly, with more gradual progressions & longer rest periods
• Avoid extreme performance tests
• Should stop at once if they develop unusual weakness, fatigue, pain, cramping, SOB
• Avoid exercise if feeling sick
• Closely monitor hydration

Highlights

• Education – judging hydration, avoid pre-dehydration, danger signs
• Be prepared to respond quickly
• Know signs of sickle crisis
• Consider hypnatremia if hydration not working