Fluid Replacement for Athletes

2002 • Revised 2008

SIGNIFICANCE

A loss of just one to two percent of body weight (1½ to 3 pounds for a 150-pound athlete) can negatively impact performance. A loss of three percent or more can increase the risk for exertional heat-related illness (See Section on Heat-related Illness). In general, athletes do not voluntarily drink sufficient water to prevent dehydration during physical activity. However, drinking behavior can be modified by education and implementation of a hydration protocol to prevent dehydration.

RECOGNITION

Dehydration is common in sports and can occur within an hour of exercise. It can occur even more rapidly if the athlete begins the session less than fully hydrated.

Signs and Symptoms of Dehydration:

- Thirst (however, one can be dehydrated without feeling thirsty)
- Irritability
- Headache
- Weakness
- Dizziness
- Cramps
- Chills
- Nausea and vomiting
- Heat sensations in the head or neck
- Decreased performance

PREVENTION OF DEHYDRATION

Implementation of a hydration protocol is the key to the prevention of dehydration. Athletes, coaches, athletic trainers, team physicians, officials and parents must realize the importance of maintaining proper hydration status (not only during, but prior to and following activity) and the steps required to accomplish this goal.

Body weight changes during exercise provide the best indication of hydration status, thus obtaining a body weight before and after practice is recommended. The athlete should be dressed in only a T-shirt and shorts for each weigh-in.

General Guidelines and Strategies

- Educate athletes regarding the risks of dehydration and overhydration on health and physical performance.
- Inform athletes, coaches and parents how to monitor hydration status.
- Establish individual and team hydration protocols, based on athlete sweat rate, sport dynamics (rest breaks, exercise intensity and duration, fluid access), environmental factors (heat and humidity), state of acclimatization and training, and individual needs.
- Implement a hydration protocol during all practices and games, and adapt as needed.
- Encourage coaches to mandate rehydration during practices and competitions.
- Provide the optimal oral rehydration solutions (water, carbohydrates [CHO], electrolytes) before, during and after exercise. For intense or sustained activity (longer than 45 minutes), access to a sports drink with six to eight percent CHO concentration is recommended.
- Closely monitor weight changes and hydration status in hot and humid environments and adapt hydration protocols accordingly.

Fluid Guidelines: Dehydration is largely preventable when proper strategies are employed to optimize hydration before, during and after exercise. The following guidelines are provided to assist in the development of these strategies:

Before Exercise

Athletes should begin all sessions well hydrated. To ensure proper pre-exercise hydration:

- Confirm adequate rehydration following previous exercise session by pre-exercise, body-weight monitoring. Assuming proper hydration, pre-exercise body weights should be consistent across exercise sessions.
- Drink 16 ounces of water two hours before exercise.
- Drink another 8-16 ounces of water 15 minutes before exercise.

During Exercise

Fluid replacement during exercise should approximate loss of fluids through sweat and urine output, with the goal of minimizing dehydration to less than two percent loss of body weight.

- Drink early and often. Do not let thirst guide fluid intake.
- Allow unrestricted fluid replacement.
- In general, drink 4-16 ounces of water every 15-20 minutes.
- Modify protocol as necessary for athletes with a high sweat rate, in sports where breaks or fluid access is limited, and during high intensity training.
- Ideally, individual fluid containers should be readily available and flavored to athlete preference (individual containers allow monitoring of individual's fluid intake).

After Exercise

Post exercise hydration strategies should be aimed at correcting any fluid loss occurring during practice or competition.

- Ideally, lost fluids should be replaced within two hours following completion of exercise.
- Rehydration should consist of water to restore hydration status, CHO to replenish glycogen stores and electrolytes to speed rehydration as appropriate.
- Drink 24 ounces of an appropriate sports drink or water, as indicated, for every pound of weight lost due to exercise.
- Weigh athletes before and after activity to monitor body water loss from the activity and to ensure adequate rehydration has occurred prior to next session. If there is a significant decrease in body weight, athletes should not be allowed to participate, especially in hot weather, until they are rehydrated back to previous weight.

MANAGEMENT OF DEHYDRATION

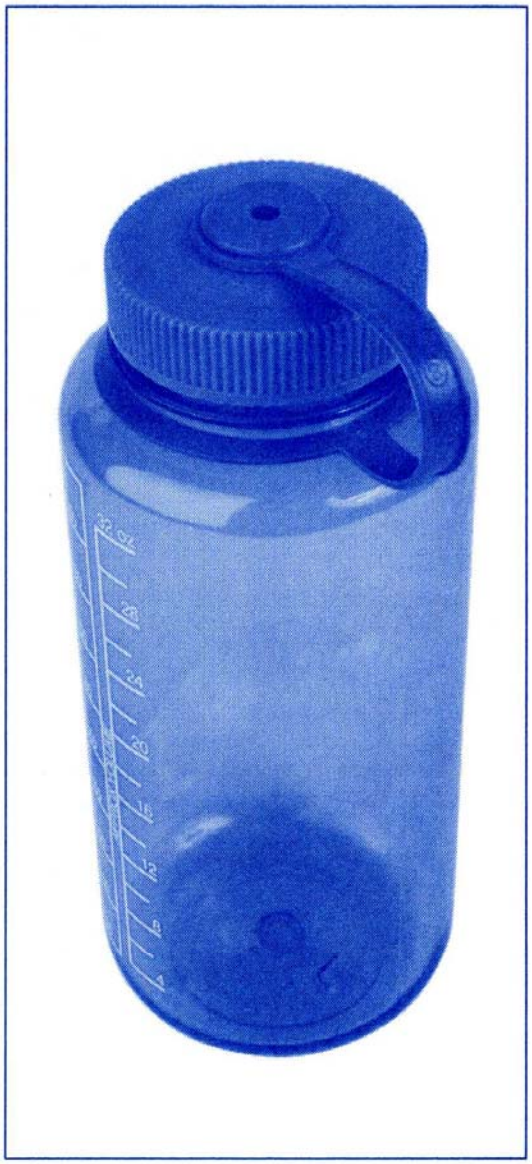
Dehydration of more than three percent loss of body weight dramatically increases an athlete's risk of heat illness (See Section on Heat-related Illness).

- The key to management is prevention.
- Those supervising athletes should be able to recognize signs of dehydration.
- If signs of dehydration are recognized:
  - Aggressively rehydrate through oral consumption of beverages if the athlete is conscious, coherent and without gastrointestinal distress.
  - Transport for medical care if the athlete shows signs of mental compromise, gastrointestinal distress (nausea, vomiting, etc.) or signs of heat-related illness (See section on Heat-related Illness).

More on Fluid Replacement

WHAT TO DRINK DURING EXERCISE

- Fluids are best consumed when beverages are cold.
- For most athletes, water is the best fluid for pre-hydration, maintaining hydration during exercise and for re-hydration.
- Some athletes may benefit from including CHO-containing beverages e.g., sports drinks, in their hydration protocol.
  - Include appropriate sports drinks with CHO and salt, if activity is intense or lasts longer than 45 minutes.
  - Appropriate sports drinks should contain CHO in the range of six to eight percent (Greater than eight percent will slow rate of gastric emptying and fluid absorption).
  - "Energy drinks," fruit juices, carbohydrate gels and sodas are not recommended as a beverage during an exercise session.
- A CHO-containing beverage will ideally also have a modest amount (0.3 to 0.7g/L) of salt to offset salt loss in sweat. This can minimize medical problems associated with electrolyte imbalances (e.g., muscle cramps) and can stimulate thirst to increase voluntary intake.
- Avoid carbonated beverages, which can cause one to feel full and may reduce voluntary intake.
- Athletes should be aware that nutritional supplements are not limited to pills and powders. Increasingly popular "energy drinks" contain large doses of caffeine, as well as other additives that may be dangerous during exercise. Like other supplements, these drinks are not regulated by the FDA and thus their purity and contents cannot be guaranteed.



Considerations for Heat Exposure and Acclimatization

- Sweat rate is generally greater after 10-14 days of heat exposure, requiring greater fluid intake for the same bout of activity.
- Closely monitor hydration during the first week of exercise in a warm environment. Moving from a cool to warm environment will increase overall sweat rate.
- Increases in dietary salt intake may be warranted during the first three to five days of heat exposure, particularly if athletes are prone to exercise-related muscle cramping. After 5-10 days, sodium concentration in sweat decreases, and normal sodium intake suffices.

Considerations for Tournaments and Large-scale Events

- Plan in advance to ensure adequate access and availability to water and appropriate sports drinks when indicated.
- For multiple day events, check hydration status daily to ensure adequate rehydration from previous day before allowing the athlete to continue.
- Modify events as environmental factors dictate (See section on Heat-related Illness).
- Recruit additional help to ensure hydration availability and that access is maintained at all venues and break stops throughout the competition.

References:

- Casa DJ, Armstrong LE, Hillman SK, Montain SJ, Reiff RV, Rich BSE, Roberts WO, Stone JA. National Athletic Trainers' Association Position Statement: Fluid Replacement for Athletes. Journal of Athletic Training. 35(2): 212-224, 2000.
- McKeag DB, Moeller JL. ACSM's Primary Care Sports Medicine. 2nd Ed. Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins, 2007.