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Exercise Induced Heat illness

By Wakefield Sports Clinic

Normal core body temperature is around 36.5-37.5 degrees Celsius. Maintaining this temperature range is important for normal physiological functions. To do this the body needs to maintain a balance between heat production and heat loss. If heat production exceeds heat loss, then body core temperature will rise, and hyperthermia may result.

Heat Production: Body heat is produced by both internal and external sources. Exercise can produce large amounts of heat; in fact during maximal exercise up to 90% of body heat can be generated by exercising muscles. This fact is extremely important. Other factors which contribute to heat production include air temp, normal metabolic processes, thermal and solar radiation to mention a few.

Heat Loss: There are several mechanisms by which the body can lose heat. These include radiation, conduction/convection and most importantly (especially during exercise) evaporation. With this latter mechanism there is evaporation of sweat produced to provide body cooling. In warm environments evaporation is the main mechanism for heat loss, and when temperatures rise above 36 degrees it is the only effective mechanism. High air temp and in particular high humidity levels impede heat loss from the body, and the combination of the two is extremely dangerous.



Exposure to heat can be dangerous unless adequately prepared

Characteristics an individual may possess that puts them at greater risk of developing hyperthermia (heat illness) include:

- obesity
- being unfit/unconditioned
- being young (Children have lower sweat rates and cardiac rates than adults = reduced heat loss ability. Additionally they have greater surface area to body mass ratio than adults, and as a consequence absorb more radiant heat = increased heat production)
- being old
- hypohydration or dehydration
- being unacclimatised to heat
- the presence of medical conditions e.g diabetes, hyperthyroidism etc
- the presence of a fever (e.g. from a gastro or a chest viral infection)
- being spinally injured

Heat related illnesses exist on a continuum, with heat exhaustion being an early form and heat stroke being an advanced form of heat illness. In both conditions people may experience nausea, vomiting, headache, weakness, shortness of breath, low blood pressure, increased heart rate and clinical dehydration. In heat stroke however, neurological features are much more pronounced. They can be characterized by loss of coordination, bizarre behaviour, confusion, coma and even seizures.

The treatment of any athlete with heat related illness involves cessation of activity; rest in shade; physical assessment; immediate cooling (e.g. ice packs to the arm pit, groin, neck or fan and water spray etc); rehydration (via oral or I.V. fluids); transfer for appropriate medical attention. Rapid cooling, without causing hypothermia (low core body temp), improves the clinical outcome.



Obviously, prevention is better than cure. So all athletes (especially individuals at greater risk of heat illness - as per list) need to take precautions. Some simple techniques involve remaining well hydrated before, during (by drinking at least 250mL of water every 15min during exercise), and after exercise; exercise in lightweight, light coloured breathable clothes; exercise at the coolest times of the day; avoid strenuous, prolonged exercise in very humid and hot conditions; acclimatize; avoid alcohol; be aware of the mechanisms and early features of heat illness.

Hopefully this brief and simplistic review will make you more aware of the mechanisms of heat illness, some of its features, and ways to avoid it.

Fluid & hydration:

Drinking adequate fluid before, during and after exercise is important to minimize dehydration and promote optimal performance. Dehydration has many negative outcomes for athletes' health and performance. The consequences of dehydration can be fatal if not treated. The first symptom of dehydration is usually thirst; however thirst is a very poor indicator of dehydration. By the time you begin to experience thirst sensations you are usually at least 2% dehydrated. As dehydration progresses you may begin to feel nauseas, fatigued, and a lack concentration all of which are detrimental to sports performance.

Fluid is a very important competition strategy, however there are many factors to consider when choosing the optimal fluids to maximize performance as well as prevent dehydration. To prevent dehydration athletes need to ensure they are adequately hydrated before, during and after training or competition. As thirst is a poor indicator of fluid needs drinking opportunities should be maximized and fluids made readily available at training and competition. Athletes also need to ensure they match their sweat losses. **A good way to determine the amount individual athlete sweats is to compare their body weights pre and post-training, for each 1Kg of weight lost replace it with 1.5 litres of fluid.**



General guidelines for fluid intake during sport are 500ml during the 30-60mins prior to exercise 200ml every 15 minutes during exercise 500-1000ml in the first 30 minutes following exercise. The most suitable choice of fluid replacement for athletes is dependent on the intensity and duration of exercise, as well as fluid and energy requirements of the athlete. Water is a suitable choice for most recreational athletes, athletes who are restricting their caloric intake and for low-moderate intensity exercise lasting < 60minutes.

Sports drinks have a role in enhancing hydration, delaying fatigue and refuelling glycogen stores. Sports drinks are formulated at the optimal concentration so after consumption they are quickly absorbed into the blood stream therefore improving performance by sparing muscle glycogen. Consuming adequate fluids is often a challenge for athletes. Studies have demonstrated that fluid consumption in athletes is maximized if the fluids are flavoured, non-carbonated and served cool.

Cordial, juice and soft drinks have a higher carbohydrate and lower sodium content than sports drinks; this slows gastric emptying and therefore delays the refueling process. They can also cause gastrointestinal upset during exercise because of the increased carbohydrate concentration as well as carbonation. Hence they are not a suitable replacement for sports drinks.

By drinking regularly during exercise athletes will benefit by preventing declines in concentration and skill level; promote energy preservation. Therefore enabling longer and more intense exercise, resulting in improved performance. Fluid replacement is an essential training and competition strategy that all athletes should take very seriously.

For more individualized information consult on of the Wakefield Sports Clinic's sports dietitian.

Nutrition workshop: Tuesday, June 27, 2006. Learn more about hydration, diet and the latest recovery techniques employed by the world's elite athletes.

Email wsc@wakefieldsports.com.au for enrolment.

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