Risk Management for Preventing Heat Illness in Athletes

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Much of the risk for developing a heat illness depends on the level of heat stress (external factors) as well as on personal factors. Therefore, the prevention of heat illness will depend on managing the risks associated with both. Of the external factors, metabolic rate plays the greatest role. Environmental conditions are most influenced by humidity along with air temperature and radiant heat from the sun or intense lighting. The wearing of any special sports gear is likely to interfere with the evaporation of sweat.

With all of these demands on athletes to lose heat, preventing overexposure to heat stressors is critical, but the ability to tolerate heat stress differs between individual athletes.

Where heat illness is concerned, there are two approaches to managing risk factors: controlling external factors and making allowances for individual differences.

Controlling External Factors

Metabolic Rate

As athletes work harder, their metabolic rate increases to meet the demands. Most metabolic energy is transformed into heat that must be dissipated from the body. This places extra demands on the cardiac system in that it must both support the metabolic rate and facilitate blood flow to the skin. In hot environments the body stores some heat since it cannot dissipate all of it; this elevates body temperature.

We have all seen this effect when performance drops during warm weather. Lowering the work demands will in turn lower the cardiovascular demands as well as the speed at which body temperature will increase. Controlling exposures to heat stress by lowering the metabolic rate is effective—when it can be accomplished. Some strategies for lowering metabolic rate include rotating the players on a team more often, taking more breaks, and having shorter workout times.

Environmental Conditions

Environmental risks of heat illness are determined by air temperature, humidity, air motion, and the amount of radiant heat from the sun or other sources. Air temperature, because of its simplicity, is the most referred-to index of environmental heat. While it does have some value in predicting heat stress, it is not the whole story. Humidity is a more important consideration.

Humidity refers to the amount of water vapor in the air. The lower the humidity, the faster that evaporative cooling can take place. Humidity is commonly reported as relative humidity. Unfortunately, the utility of relative humidity in explaining heat stress is very weak. It must be judged in light of the air temperature at the same time. The relative humidity is often high in the morning but lower at noon when the air is warmer. Yet during this time the actual humidity remains the same.

A good way to use air temperature and relative humidity together is through the Heat Index, which was developed by the Weather Service as a “feels like” scale. Tables and charts for the Heat Index are readily available from sports drink vendors and in various texts. Typically these charts and tables contain advice about the risks of heat disorders. These should be interpreted with caution, however, since they do not necessarily apply to every situation.

An alternative measure of humidity is the dew point temperature, which is available from the Weather Service. The dew point temperature is reported on cable weather channels and sometimes in the newspaper or broadcast media.

Another good measure of the combination of environmental
factors is the wet bulb globe temperature, called WBGT. It depends on air temperature and humidity, air movement, and radiant heat. Many industrial safety vendors carry electronic devices that measure this index.

It is difficult to prescribe humidity limits or other environmental limits for sports activities. The best use of these measures is through outcomes tracking.

**Outcomes Tracking**

Outcomes are events that can be noted and tracked, such as heat related disorders. Other outcomes are measures of performance, errors, injuries, and physiological responses. These can be tracked for individuals or teams. If an athlete has a pattern of heat related disorders, this suggests he or she may be less heat tolerant than others.

The best way to track outcomes in the overall management of heat stress risk is to track one or more outcomes measures along with an environmental measure. For instance, the incidence of injury can be tracked along with the Heat Index. It is likely that there will be a threshold value of Heat Index, where the number of injuries begins to increase slightly. And there will be another value of Heat Index above which the rate of injuries will climb dramatically. This information can be used to initiate special precautions.

**Personal Protection**

Personal protection practices are actions one can take to reduce the risk of heat related disorders, for example:

- Taking responsibility for oneself;
- Replacing lost fluids (rehydration);
- Maintaining a healthy lifestyle;
- Lowering expectations during acclimatization;
- Personal monitoring.

To practice good personal protection, athletes must know what the different practices are and that athletic therapists and coaches support and encourage these practices.

**Taking Responsibility**

There is so much inter-individual variation in tolerance for heat stress that the individual is really the principal source of limitation. If an athlete reports extreme discomfort or what appear to be the early symptoms of a heat related disorder, it is likely he or she has been overexposed to heat stress. Under these circumstances the athlete should take a break to recover from the exposure. To the extent that he or she can set the pace of the effort, this should be allowed; it will better control the amount of heat gain.

The major problem with taking control is motivation. The athlete may be internally motivated to push to the limit, or externally motivated by the expectations of others. Athletes must remember that the surest way to a heat stroke is to ignore the early warning signs. Athletic therapists and coaches can encourage self-responsibility by readily accepting an athlete’s decision to take a break or manage heat stress in some other way.

**Fluid Replacement**

Rehydration is crucial. The importance of replacing lost fluids cannot be overstated. Both performance and health are well served by replacing lost fluids. When and what the athlete drinks will influence how well fluid replacement works. Generally the athlete should drink small amounts often so that it becomes a habit and the amount is easily digested.