



*International Association of Athletics Federations
The Medical & AntiDoping Commission*

**Recommendations regarding weather conditions at the road events
in the IAAF World Championships 2011 in Daegu**

Athletes must be very careful when competing in Daegu, especially in the road events. Marathon races and 20 Km walk races in Daegu are scheduled to start at 9:00 am. Records kept over the past 5 years show an average temperature at this time of day of 24.8° C, rising to 27.0 ° C at the times anticipated for the race finish. High humidity readings were also observed (70 to 90%). Such weather falls well above the ideal racing conditions for road races (10~12°C and 40% humidity).

Why are hot, humid conditions so stressful? The answer is fairly simple. When we exercise, only about 30% of this energy is available for movement. The other 70% of the energy produced is in the form of heat - and the faster the pace, the greater the heat production. Our resting body temperature is fixed around 37°C. Metabolic enzymes work best at about 39°C; this is a major reason for doing our "warm up" before exercise. However, body function starts to deteriorate beyond 40.5°C and the temperature margin between optimum cellular function and death from hyperthermia is very narrow. Luckily, we have developed ways to keep our body temperature within a safe range, including ways to get rid of the excess body heat produced by exercise. In hot environments, the evaporation of sweat from our skin is the major method of dissipating heat from the body. As the temperature rises, so does our sweat rate. In fact, it can increase above the rate at which evaporation can provide a cooling effect. This is particularly the case in humid conditions where the capacity for evaporation of sweat into already moist air is limited. If sweat evaporation can't keep pace with our cooling needs, the heat generated by exercise will not be dissipated and our body temperature will rise. This cannot be tolerated for very long.

Progressive adaptation to hot and humid conditions is of utmost importance and is called acclimatization. Acclimatization to heat takes 1-2 weeks and the first training sessions in increased heat and humidity should be undertaken at a reduced intensity and duration compared to the athlete's normal program. After a few days of such acclimatization, heat dissipation and sweat losses will progressively adapt to the changing conditions, allowing athletes to practice at their intended race pace. There are some other issues that can hinder the sweating/cooling response which should be avoided - these include getting sunburned and lathering yourself with too much sunscreen. These should be avoided and may involve a careful balance of the time spent in the sun.

During the World Championships, weather information will be provided at the Technical Information Centers (TIC). A Heat Index called Web Bulb Globe Temperature (WBGT), which provides an accurate calculation of the combined risk of temperature and humidity, will be used in Daegu. The Heat Index is converted in a colored flag showing the heat stroke risk in four levels will be placed. This information will be also available at warm-up area and road races final lines.

Colour	Heat index	Risk
Black	28°C and more	Extreme
Red	23 – 28°C	High
Yellow	18 – 23°C	Moderate
Green	Lower than 18°C	Low

Hydration

A good hydration strategy is an essential part of every athlete's preparation for competition. It is important to start the race well-hydrated. Commercial sports drinks (carbohydrate-electrolyte drinks) have been developed on sound scientific principles and athletes can turn this science into optimal performance and well-being by learning the practical aspects of what to consume during their event. They also need to look at the timing of consumption and the amounts needed for optimal performance. Just as general training and competition strategies should be tailored for individual athletes in accordance with their unique needs and preferences, so should their drinking and eating choices before and during exercise. Athletes, coaches and support staff should 'fine tune' these recommendations to identify their own winning formula, and to know how to manipulate this in hot or cold environments.

How much and when to drink?

- Limit dehydration during training and competition by drinking water or a sports drink. Other drinks may also be appropriate but it would be wise to check how these fit into your overall hydration and nutrition plan.
- Being thirsty can be a useful signal of fluid loss and some scientists suggest that drinking when you are thirsty is all that is needed to guide fluid intake during exercise. However, in stressful situations as in Daegu you may drink not enough at a single time point to prevent ongoing thirst. In these situations, the athlete might develop a fluid plan which helps them to spread their fluid intake across the available drinking times so that it keeps pace with total needs (see next point).
- Get a feel for sweat rates during exercise so that drink practices can be adjusted accordingly (see inset box). It is not necessary to drink enough to prevent loss of body weight, but the amount of dehydration should normally be limited to a loss of less than approximately 2% of body weight (i.e., 1.0 kg for 50 kg person, 1.5 kg for a 75 kg person, and 2 kg for a 100 kg person).
- Since the negative effects of dehydration on high-intensity performance are generally greater in warm environments as in Daegu, upgrade drinking practices in these conditions to minimize the overall fluid deficit. This may mean drinking before and during longer events such as distance running and walking, but may also include drinking between attempts in jumps and throws and between rounds where there is more than one event in a day.
- Don't drink at rates that are greater than sweat losses so that you actually gain weight during the competition period. (Unless for some unavoidable reason, you were dehydrated when the event started.)

When do you need more than water?

- In events lasting longer than approximately ~ 1 hour, consuming carbohydrate can enhance performance by providing additional fuel to the muscle or brain.
- Consuming carbohydrate during distance running and walking races is likely to promote faster race times. New studies show that carbohydrate needs during exercise differ according to the duration of the event/session. Each athlete should practice their strategies in training or less important races to develop their own specific plan. Sports drinks, with a typical carbohydrate content of 4-8% (4-8 g/100 ml), can provide fuel and fluid needs to be met simultaneously in most events, but some individuals may benefit from lower or higher carbohydrate concentrations. Sports gels or confectionery can be used for an extra carbohydrate boost
- Consuming a carbohydrate-containing drink (or light foods) may help to maintain skills and judgment in prolonged competitions where athletes become fatigued. The last throw or the last jump is often the most important.
- Sodium should probably be included in fluids consumed during events lasting longer than 1-2 hours or by individuals who are “salty sweaters” (Salty sweat usually leaves a white crust on the skin or clothes when it evaporates).
- Caffeine is present in many commonly available beverages and sports foods, and can enhance both physical and mental performance. This benefit can be obtained with the relatively small doses of caffeine that are commonly consumed by people of various cultures (e.g. about 2-3 mg/kg bodyweight).

Final Remark

During road race events, Daegu organizers will provide plenty of water and sports drinks at the feeding stations. Daegu organizers are concerned of the medical consequences of competing at high level under extreme weather conditions. As result, they have strengthened the medical care and athletes should rest assure that the best medical services will be available. However, athletes and their entourage should be prepared for competing under stressful weather conditions. We strongly recommend that you carefully read this document.

Take Home Message

1. Weather conditions in Daegu 2001 IAAF Championships road races events can be extreme and very stressful. Prepare yourself in advance.
2. Progressive adaptation to hot and humid conditions is of utmost importance. To adequately acclimatize, train at reduced intensity and duration when you first encounter the hot and humid conditions, then gradually move towards your intended race pace.
3. Upgrade your drinking practices in Daegu to minimize the overall fluid deficit during your workout or event. This may mean you need to reassess your sweat losses and fluid needs during exercise.
4. Drinking when you are thirsty may be all that is needed to guide fluid intake while competing in Daegu. However, it would be wise to develop a fluid plan which helps you to spread your fluid intake across the available drinking times.
5. Choose sports drink or water according to your needs for fluid and fuel intake before, during and after sessions.
6. Don't drink at rates that are greater than sweat losses so that you actually gain weight during the competition period.

Inset box: Estimating fluid balance over an exercise session

STEPS

1. Weigh yourself before training, using reliable digital scales. This should be done wearing minimal clothing (underwear only if possible) and after going to the toilet
2. Weigh in again after training in the same clothing, and after towel dry
3. Weigh your drink bottle before and after your workout to find out how much fluid you consumed. Or just estimate the amount of fluid consumed and convert ml of fluid into grams
4. Note the weight of any foods or sports products consumed during the session (e.g. gels, lollies, bars)

CALCULATIONS (with illustration from a typical road runner)

Your fluid intake (ml) = drink bottle before - drink bottle after (g)

e.g. 700 g – 100 g = 600 g or 600 ml (contained 6% carbohydrate sports drink)

Your fluid deficit (ml) = body mass pre-session - body mass post-session (kg) x 1000

e.g. 60.50 – 59.05 = 1.45 kg = 1450 ml

Your fluid deficit (% body weight) = (Fluid deficit [in kg] X 100)/ pre-session body mass (kg)

e.g. (1.45 x 100)/(60.50) = 2.4%

Total sweat losses over session = Fluid deficit (g) + fluid intake (g) + food intake (g) *e.g. 1450 + 600 + 40 g (sports gel) = 1840 ml*

Sweat rate over the session = sweat losses converted to ml per hour

e.g. Session lasted for 90 min: sweat rate = 1840 x 60/90 = 1227 ml or 1.2 L/hour