Preparation for Competing in Heat + Humidity
2011 IAAF Athletics Championships
Daegu, South Korea

Introduction
The 2011 IAAF Outdoor Track & Field Championships will be held in Daegu, South Korea from August 26 to September 4. Environmental conditions in Daegu during this time are expected to be extremely hot and humid, to the point where performance can be negatively affected if athletes are not prepared for it. This handout is designed to help Team USA athletes and coaches prepare optimally for competing in heat and humidity. Several practical strategies are described below. In addition, we have provided information about heat and humidity preparation opportunities at the Team USA Pre-Worlds Training Camp in Daegu.

Daegu: Heat + Humidity
Historical data over the past 8 years for Daegu for late August and early September indicates that the average high temperature is 86°F (30°C) and average relative humidity is 79%. The combined effect of 86°F and 79% humidity will make it “feel like” it is 97°F (36°C).

Cooling Strategies
There are a number of practical strategies that athletes can use to prepare for competing in the heat and humidity. One of these strategies (A) can be done here in the US in the weeks prior to going to Daegu. The other strategies (B-D) can be used in Daegu at the Team USA Pre-Worlds Training Camp and on the day of competition.

A. Layered Clothing. The athlete uses multiple layers of clothing in conjunction with training over 2 to 3 weeks. For example, this week you train wearing two or three short-sleeve t-shirts and shorts. Next week, switch to one or two long-sleeve t-shirts and shorts. The following week, train in a cotton sweatshirt and eventually add on the sweat pants and a knit stocking cap to further increase the simulated heat load. We strongly advise against using “plastics” to acclimatize to heat and humidity because they prevent the evaporation of sweat and significantly reduce heat dissipation, and therefore have the potential for inducing serious heat illness. T-shirts and cotton sweatshirts are “breathable” and will allow for heat dissipation if used as outlined above.

Some of the beneficial physiological effects that will occur as a result of heat and humidity acclimatization via layered clothing include:
1. Increase in plasma volume and total blood volume . . . you will have more “coolant in your radiator.”
2. Earlier threshold for the onset of sweating . . . your body’s “air conditioner” will turn on at a lower temperature on the thermostat, thereby cooling you earlier.
3. Increased sweat output and a more-effective distribution of sweat over skin surface . . . greater dissipation of heat via sweat evaporation.
4. Your sweat will be more diluted . . . which preserves the electrolyte balance in your body’s fluids.

B. Cooling Vest. The athlete wears a lightweight vest over a t-shirt or next to the skin for a minimum of 30 min prior to a training session or competition, and for shorter intervals during competition breaks (e.g., decathlon/heptathlon). The vest contains individual sections or packets of pre-frozen liquid or gel, which produce a vest temperature of 35º to 50ºF. Depending on the model and ambient temperature, the cooling effect of the vest can last for 2 to 4 hours without having to be “re-charged”. A cooling vest is re-charged by placing it in a freezer or ice chest containing ice water. The benefit of a cooling vest is that it delays, and potentially prevents (depending on duration/intensity of event), core body temperature from rising to a point where it impairs performance. Also, it cools core body temperature without adversely chilling the arm and leg muscles. Cooling the arm and leg muscles may have a negative impact on performance by inhibiting the positive physiological and biomechanical effects of a “warmed up” muscle.

C. Neck Cooling. The athlete places an ice pack or ice-cold towel on the back of the neck for short intervals of 5 to 10 minutes. This has the effect of dissipating body heat from contact with the cold surface of the ice pack or towel. It also cools the blood flowing through the carotid artery to the brain, which has a positive effect on the athlete’s sensation of heat and makes him/her feel less hot. Neck cooling can be used in combination with a cooling vest to promote maximal cooling prior to a training session or competition. It can also be used effectively during multi-events, either alone or in combination with a cooling vest.

D. Ice Slurry / Slurpee®. Recent studies have shown that a very effective and easy way to cool the body’s core temperature prior to training or competing in a hot and humid environment is by ingestion of an ice slurry drink, better known as a Slurpee®. The ice slurry drink should be ingested slowly over a 30-minute period prior to training or competition. The volume of ice slurry drink should be about the size of a standard commercial Slurpee® (28 oz). Ice slurry ingestion can be done in conjunction with use of other cooling strategies, such as the cooling vest and/or neck cooling. Of course, the athlete can use a blender to make his/her own ice slurry to contain a carbohydrate-electrolyte drink or other nutritional ergogenic ingredients. Ingestion of an ice slurry drink has the dual benefit of cooling the body’s core temperature without cooling the arm and leg muscles, and it also cools the blood flowing to the brain via the carotid artery.
**Dehydration**
Regardless of which heat and humidity strategy is used, it is imperative to monitor hydration level on a daily basis. This will help ensure that you do not experience “creeping dehydration” during the heat and humidity acclimatization phase, and will prevent you from entering the competition in a partially dehydrated state. Monitoring hydration can be as simple as weighing yourself on a scale before and after each training session and replacing each pound lost with 8-10 oz of fluid. Another simple method of monitoring dehydration is via use of a Urine Color Chart.

**Team USA Pre-Worlds Training Camp**
USA Track and Field will conduct a Pre-Worlds Training Camp in Daegu from August 17-26. During this camp, athletes will have the opportunity to test out the cooling strategies outlined above, including the cooling vest, neck cooling and ice slurry drink (Slurpee®). USA Track and Field will have 16 cooling vests (Artic Heat®) available to Team USA athletes to test out in Daegu. This will include 3 XS, 6 S, 4 M, 2 L and 1 XL, which are uni-gendered to fit both female and male athletes. USA Track & Field staff (Dr. Iain Hunter, Dr. Randy Wilber) will be in place at the training camp to provide instruction on use of the cooling vests. Athletes are encouraged to test out the cooling vests in conjunction with one or two workouts during the training camp, and to feel free to use them on competition day. We anticipate the primary users of the cooling vest will be the MD and LD runners/walkers, as well as the decathletes and heptathletes who should find them beneficial between their multiple events.

In addition, USA Track and Field staff will be in place at the Pre-Worlds Training Camp to monitor athletes’ core body temperature and to monitor for dehydration. Core body temperature will be monitored using the CorTemp® system, which uses an ingestible pill and telemetry unit to monitor the athlete’s temperature and produces results real-time. Dehydration will be monitored using a small urine sample and an Atago® pen refractometer, with results produced real-time. Athletes are encouraged to take advantage of these services, either in conjunction with testing of the cooling vest, or without.

**Contacts**
Dr. Robert Chapman, PhD  
317-713-4669  
robert.chapman@usatf.org

Dr. Iain Hunter, PhD  
801-422-1434  
lain_hunter@byu.edu

Dr. Randy Wilber, PhD  
719-866-4528  
randy.wilber@usoc.org