Heat Illness Protocol

Introduction

This protocol provides physiotherapists working at ITF World Tennis Tour events with a practical guide to the recognition and management of exertional heat illnesses. Quick identification and appropriate intervention are critical to prevent serious complications and to promote player safety.

Understanding & Recognising Exertional Heat Illnesses

Key Principles

1. **Be prepared**. Maintain communication with the Supervisor so you are kept informed of playing conditions, including temperature, humidity and/or Wet Bulb Globe Temperature (WBGT) readings. Is there a risk that the Extreme Weather Conditions (EWC) rule will come into effect during the event? If so, educate the players on hydration and cooling strategies pre-match and on court.
2. **Early Recognition of Exertional Heat Illness Signs and Symptoms is Key**
3. **Temperature Monitoring.** Rectal temperature is the gold standard for accurate core temperature assessment in suspected Exertional Heat Stroke (EHS) and should only be performed by specialists trained in this technique. If rectal temperature monitoring is not feasible, tympanic (aural) temperature monitoring may be utilised. It is important to recognise that aural temperature may underestimate true core temperature by 0.5-3°C.
4. **Cool First, Transport Second:** Prioritise rapid cooling on-site before transport for EHS.

Exertional Heat Illnesses – What are they?

1. **Exercise-Associated Muscle Cramps (EAMC):** Painful, involuntary skeletal muscle contractions during or after exercise in the heat, linked to neuromuscular fatigue and high sweat loss/dehydration.
2. **Heat Syncope**: Brief fainting or near-fainting during or after heat exposure from peripheral vasodilation and reduced venous return causing transient cerebral hypoperfusion.
3. **Heat Exhaustion**: Inability to sustain adequate cardiovascular output and thermoregulation under heat stress, with heavy sweating, weakness, dizziness, nausea; core (rectal) temperature typically under 40.0°C/104°F; no central nervous system (CNS) dysfunction.
4. **Exertional Heat Injury (EHI):** Heat-related systemic illness defined by core temperature typically ≥ 40.0°C/104°F, with objective organ/tissue injury (e.g., rhabdomyolysis, kidney or liver injury) during/after exertion, without the severe CNS dysfunction that defines EHS.
5. **Exertional Heat Stroke (EHS):** Life-threatening heat illness defined by core temperature typically ≥ 40.0°C/104°F plus CNS dysfunction (confusion, ataxia, seizures, coma), with risk of systemic inflammatory response and multi-organ failure.

<u>1. Exercise-Associated Muscle Cramps (EAMC)</u>

Recognition:

- Intense, involuntary muscle contractions/spasms during or shortly after exercise.
- Often affects muscles that work over two joints (e.g., quadriceps, gastrocnemius).

- Often associated with dehydration and/or electrolyte imbalance but may also result from neuromuscular fatigue.

On-Court Treatment:

- Passive static stretching of the affected muscle.
- Ice massage with ice bags to the cramping muscle.
- Rehydration with sports drink with added salt.
- Encourage player to change into dry clothes at set breaks.
- Increased risk in a hot, humid environment.

Important Notes: for full details please refer to the Medical Time-Out (MTO) rule.

- If a player is cramping only and there are no other signs of heat illness, then a MTO is not permitted. Cramping can be treated during two complete change-of-ends.

2. Heat Syncope

Recognition:

- Fainting or near-fainting due to orthostatic hypotension.
- Usually accompanied by dehydration – player potentially drinking less than would be expected.
- Dizziness, weakness, light-headedness.
- Hot, humid environment.

On-Court Treatment:

- Call for assistance from the Tournament Doctor, if on-site.
- Monitor vital signs – blood pressure (BP), heart rate (HR) and temperature. Typically, standing systolic pressure is < 20 mmHg than supine BP, and standing heart rate is > 20-30 bpm than supine HR. The goal is to reduce these differences through cooling and rehydration.
- Shade player with an umbrella.
- Elevate legs above the level of the heart; do not lie the player directly on the hot ground; use a towel on the ground.
- Cool skin with ice bag and/or ice towels.
- Rehydration with sports drink and added salt.
- Enact the Emergency Action Plan (EAP) as needed.

Important Notes: for full details please refer to the MTO rule.

- Players presenting with symptoms of heat syncope can receive an MTO.

3. Heat Exhaustion

Recognition:

- Inability to effectively exercise in the heat.
- Symptoms: heavy sweating, dehydration, energy depletion, headache, rapid breathing, dizziness, weakness, light-headedness.
- Core body temperature may be elevated (< 40.0°C/104°F core temperature).
- Blood pressure may be low with a weak pulse.
- Hot, humid environment.

On-Court Treatment:

- Call for assistance from the Tournament Doctor, if on-site.

- Monitor vital signs – blood pressure, heart rate, and temperature.
- Shade player with an umbrella.
- Elevate legs above the level of the heart; do not lie the player directly on the hot ground; use a towel on the ground.
- Cool skin with ice bag and/or ice towels.
- Rehydration with sports drink and added salt.
- Enact the Emergency Action Plan (EAP) as needed.

Important Notes: for full details please refer to the MTO rule and Incapacity rule.

Players presenting with symptoms of heat exhaustion are unlikely to be able to continue to compete and will almost always retire from the match. Note that, if the player wishes to continue to play against the advice of the Sports Physiotherapist and/or Tournament Doctor, the Tournament Supervisor or Referee, acting on this advice, can enact the Incapacity rule.

Emergency Management & Ice Bath Protocol

4. Exertional Heat Injury (EHI) & Exertional Heat Stroke (EHS) – **MEDICAL EMERGENCIES**

Recognition (EHI):

- Inability to effectively exercise in the heat.
- Extended high intensity/strenuous exercise and heat exposure.
- Core temperature ≥ 40.0 °C/104°F.
- Symptoms: heavy sweating, energy depletion, rapid breathing, dizziness, weakness, light-headedness, nausea, vomiting, collapse.

Recognition (EHS): **Potentially life-threatening.**

- Core temperature ≥ 40°C (104°F).
- **Critical Sign:** Central nervous system dysfunction (altered mental status, confusion, disorientation, irritability, impaired judgment, or diminished neuromotor control).
- Other signs: hypotension, hyperventilation, weak pulse, collapse.

On-Court Emergency Response (EHI & **EHS**)

1. Activate Emergency Action Plan (Call for Emergency Assistance Immediately).
2. Ensure rapid transportation of the player to the treatment room/ice bath – use wheelchair and stretcher as necessary.
3. Ensure enough assistance from appropriate medical team and staff members.
4. Immediately lower core temperature. The gold standard treatment is full-body immersion in cold water (1.7°C/35°F to 15°C/59°F) in either an ice bath or zippered tarp/emergency cooling bag. If an ice bath or zippered tarp/emergency cooling bag is not available, other cooling methods should be utilised, including the use of a tarp (detailed below), application of ice bags to the neck/armpits/groin, pouring cold water over the player with fanning, or cold-water towel soaking draped over the player. Goal temperature is less than 38.9°C/102°F (rectal temperature) within 30 minutes of collapse.
5. **Transport should not occur before this temperature threshold has been reached (unless cooling can continue during transport).**

NOTE: If the target core (rectal) temperature cannot be obtained, it is important to recognise that aural temperature may underestimate true core temperature by 0.5-3°C. Therefore, when exertional heat stroke is suspected, rapid cooling should begin immediately, and release for transport should occur only once the athlete is clinically improving and presumed core

temperature has reached the equivalent of ≤ 38.9°C (≤ 102°F) based on time in cold-water immersion and observed clinical recovery, rather than solely on aural temperature values (unless cooling can continue during transport).

Ice Bath Procedure

Preparation:

Fill the ice bath with water and ice to achieve a temperature of 1.7°C/35°F to 15°C/59°F.

Procedure:

1. Remove excess clothing (maintain modesty where possible).
2. Immerse the player up to the neck in the ice bath.
3. Ensure enough assistance from appropriate medical team and staff members.
4. Continuously monitor body temperature (core or aural) every 5 minutes.
5. Stir the water continuously to maximise cooling.
6. Hold the player up with towel under both arms in case the player loses consciousness.
7. Remove player when core temperature reaches 38.9°C/102°F (see note above if core temperature cannot be measured) to prevent overcooling.
8. Assist the player into dry clothing and prepare for transport to the hospital.

Alternative Cooling Procedures

If an ice bath is not available for urgent cooling, an emergency cooling bag can be used. Cooling bags can be used and should be provided at all tournaments in which there is a reasonable chance of EWC thresholds being met, where an ice bath is not available, or where the ice bath is too far from the tennis courts.

Emergency Cooling bags

https://www.amazon.com/gp/product/B001BX7YQS/ref=ox_sc_act_title_1?smid=A2Q1LRYTXHYQ2K&th=1

1. The cooling bag is placed on the ground, and the player is placed within, with their head elevated.
2. The bag is zipped up to the player's chest.
3. Cold water and ice are poured over the player to simulate an ice bath, helping to cool the body rapidly.
4. Oscillate the water, by picking up the handles of the bag, moving them back and forth, allowing the cold water to circulate around the player's body.
5. This full-body cooling method works much like an ice bath to reduce the core temperature quickly and efficiently.

Last updated: April 2026

If an ice bath or emergency cooling bag is not available, the TACO (Tarp Assisted Cooling with Oscillation) method is an effective alternate strategy.

TACO method

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1. The player is placed in the middle of the provided tarp.
2. The edges of the tarp are held up by clinicians to create a “taco” with the player encased inside.
3. A combination of ice and cold water are added to the tarp to cover the player’s body, while ensuring the athlete’s head and upper chest are above water.
4. Water is oscillated in the tarp by moving the sides of the tarp up and down by those individuals designated to hold the sides of the tarp.

In the absence of an ice bath, cooling bag or tarp – initiate alternative cooling methods including application of cold, wet towels over the largest possible skin surface area; cold-water dousing; placement of ice bags or ice “sausages” in the groin and both axillae; and ice massage of active muscles, as cooling reduces muscle metabolic rate.

Important Considerations:

- Continuous monitoring of the player's condition (vitals, mental status).
- Prevent overcooling (remove from ice bath at target temperature).
- Transport to appropriate medical facility for further evaluation and management.

During the Heat Break

The Chair Umpire will notify the players if EWC: Modification of Play applies (often referred to as the Heat Rule) and offer them a 10-minute break prior to the start of the third set. Encourage players to take the break, leave the court and go to a cool area. For players to get the maximum effectiveness of the 10-minute break, physios must be attentive and fast-acting. Physios should constantly monitor the status of matches and when players take the heat break. Physios should be informed by the Tournament Supervisor when EWC: Modification of Play (or the Heat Rule) is in effect and when players have taken the break, Physios should be ready to assist players and to provide further education on interventions to utilise during the 10-minute break.

Interventions include:

- Begin cooling immediately; put the ice towel on as soon as you leave the court and while walking to cooling area, and throughout the break.
- Change into dry clothing including changing socks.

- Take a cool shower.
- Get into the ice bath.
- Re-tape (because wet tape loses its support characteristics).
- Cool down with ice towels or bags on your lap/groin area and in your arm pits, over your head, and around your neck.
- Continue to hydrate with cool/cold and salted sports drinks, or sport drink slurries (slushies).

Hydration, Fuelling, and Cooling Strategies

	Pre-Match	During Match	Post-Match
Hydration	Begin and maintain proper hydration practices 5-6 days prior to competition. Upon waking, drink 350-470 ml (12-16 oz) of water to begin the hydration process. About 1-1.5 hours before going on court, drink 350-470 ml (12-16 oz) of water, electrolyte drink, or juice. Add salt to your food or on-court sports drink (2-3 salt sachets per 500 ml in warm/hot conditions). 10 minutes prior to going on court, consume 235 ml (8 oz) of water or sport drink.	Drink up to 6-8 gulps on every change of ends to help maintain fluid levels during play. Drink 1-1.5 L of total fluid volume per hour (up to 2 L/hour; generally 1:1 ratio of sports drink to water).	Drink 1.0-1.25 L per kg (16-20 oz per 1 lb) of remaining weight loss incurred during play (1.0-1.25 L of fluid per 1 kg/2.2 lbs) over the course of the evening and before playing the next day – that is, spread it out (not all at once). Continue to drink sports drink with added salt for adequate recovery post-match.
Fuelling	**2-4 hours before play**: Have a meal high in carbs: pasta, bread, fruit, and vegetables with moderate protein and low fat. **30-60 minutes prior to play**: Have a snack including sports drink, gels, pretzels, jellybeans, bars, fruit, chews and water.	Consume 30-60 grams of carbs per hour including sports drink, gels, chews, pretzels with water. This can increase to up to 90 grams of carbs per hour in long matches or hot and humid matches.	High carbohydrate (≥ 30 grams), moderate protein (15-25 grams), low fat (< 7 grams) snack within 30 minutes after play (low fat chocolate milk is an ideal recovery drink). Consume a meal within 2 hours of play with ≥ 30 grams carbs and 15-25 grams protein.
Cooling	**External**: Stay in air-conditioned room. Immerse in cool-pool or cold shower for 5 minutes 30-40 minutes prior to match. Use ice vest, ice blanket, or ice towels for 15 minutes 1 hour prior to play. **Internal**: Consume 235-470 ml (8-16 oz) of slushy slowly 30 minutes prior to match. **Maximise Benefits:** combine internal and external cooling	Use the umbrella and fan (with skin wetting if able) on court. Use ice sausages around the neck, ice towels in the lap, and ice vests around the back. Place ice packs under arms and in groin. Wear light coloured, wicking material. Wear a breathable hat. Change clothing, including socks, at set break. TAKE THE 10-MINUTE HEAT BREAK IF EXTREME WEATHER CONDITIONS APPLY!	Use the ice bath for 5-10 minutes. Ice flush performed by physios when ice bath not available. Cold shower 5-10 minutes. Cool down in an air-conditioned area. Consume 235-470 ml (8-16 oz) of slushy slowly within 30 minutes after match.

Last updated: April 2026