



INFORMATION PAPER

MOTOR SPORT PARTICIPATION IN HOT WEATHER CONDITIONS

1. Introduction:

Australian conditions in summer months can and often do, see the thermometer climb to high temperatures. Motor sport often sees participants, be they drivers, crews or officials exposed to the elements and therefore the familiar “slip, slop, slap, sunscreen, shade and drink adequate amounts of water to remain hydrated” mantra is well impregnated in our culture. The practice should be encouraged for all persons and be adapted as appropriate for motor sport participants.

2. Objective:

This paper provides a general guideline for all participants involved in motor sport during ‘extreme heat’ conditions.

3. What is Heat Illness?

Heat illness in sport manifests itself as heat exhaustion, or the more severe heat stroke, both of which have possible dire consequences due to the loss of normal functioning and skill. Symptoms for both are characterised by:

- High heat rate,
- Light headedness, dizziness
- Headaches
- Loss of endurance, skill/clumsiness or unsteadiness,
- Confusion,
- Nausea,
- Aggressive or irrational behaviour,
- Collapse
- Ashen pale grey skin

Any driver or official showing signs of confusion, loss of skill, co-ordination etc. should be stopped and removed from the event and medical attention should be sought immediately.

4. Hydration & Diet

Plain water is generally considered to be the most appropriate fluid to drink however in the unlikely event of extreme or chronic dehydration, some sodium based drinks may be beneficial.

Insufficient hydration before, during and after an event can lead to dehydration which can make a driver more susceptible to fatigue and reduction in performance which highlights not only a safety risk to the driver but to all other competitors and officials at the event.

Therefore adequate hydration PRIOR TO COMPETITION is the easiest and simplest manner in which a person can overcome dehydration.

Do not wait until you feel thirsty before you drink as thirst is an indicator that you are already becoming dehydrated.

5. Expert Information.

Please note: these are direct quotes from the organisations noted. They may not be entirely appropriate for your particular area of participation in motor sport and should be considered to be used as a guide.

FIA	SPORTS MEDICINE AUSTRALIA – SA BRANCH	AUSTRALIAN INSTITUTE OF SPORT
<p><i>NB: these recommendations, originally intended for F1 drivers taking part in Grands Prix (2 hours of intense physical & mental stress in high temperatures), should be adapted to the type of activity concerned.</i></p> <p>“The loss of liquid through sweating can reach between 0.5 & 1 ltr per hr of driving, depending on the subject & the outside temperature. This loss may lead to a notable reduction in the performances of drivers & greatly jeopardise their safety”.</p>	<p><i>NB: these recommendations were prepared based on ‘athletic’ based sports. Consideration must also be given to cabin temperatures and climatic conditions inclusive of environmental i.e. location – say Indy 500 factors include enclosed track – concrete buildings on all sides, bitumen etc. exacerbates heat.</i></p> <p>Dehydration will make an athlete more susceptible to fatigue & muscle cramps. Inadequate fluid replacement before, during & after exercise will lead to excessive dehydration, which may lead to heat exhaustion &/or heat stroke.</p> <p>Even small degrees of dehydration can cause a decrease in exercise performance:</p> <ul style="list-style-type: none"> ○ Physical & mental performance deteriorates at even 2% of body weight loss (e.g. 1.5kg for a 75kg person). ○ If you lose 5% of your body weight (e.g. 3.5kg for a 70kg person) then serious heat injury can occur. 	<p><i>A document was put together in 2004 by a AIS Dietician, CAMS Senior Sports Development Officer & Sports Dieticians Australia based on V8 Supercars (as I understand it for the development camps held in Canberra).</i></p> <p>“Dehydration of 1.5-2% (1.1-1.5kg for a 75kg driver) can significantly affect both physical & mental performance. Hot cabin conditions are exacerbated by the triple layered fire-proof suit, fireproof underwear, gloves, socks, helmet and boots that drivers must wear. In long races, fluid losses are likely to be very high. Studies of relatively short races with Supercar drivers in hot conditions show cabin temperatures above 50° C, with average sweat losses resulting in a 3% loss of bodyweight. To offset large losses of fluid that are likely to occur in the race, drivers need to have a plan for hydration.”</p> <ul style="list-style-type: none"> ○ Drink sufficiently in the days leading up to the race to maintain hydration. Aim to drink with all meals & snacks throughout the day. In hotter conditions, additional drinks between meals may be required.

	<p>How Much Fluid do I Need? You can assess how much fluid you need by weighing your self before & after an event.</p>	<p>How much fluid do I need? Drink 400-600ml of fluid 2-3 hrs before the race, providing adequate time to urinate any excess.</p>
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	<ul style="list-style-type: none"> o 1kg lost = 1 ltr fluid deficit o 2kg lost = 2 ltrs fluid deficit etc. o Sweating & fluid loss continues after exercise. Aim to replace at least 1.5 times the amount of fluid deficit, measured at the end of exercise. 	
<p>What to Drink For races of 2 hrs or less, non-aerated water is recommended. With water, fruit juice may also be drunk.</p> <p>Hydration Routine: Up to 5 ltrs of liquid may be consumed on the day of the race, depending on climatic conditions: - 1ltr in the morning before the race - 2 ltrs during the race - 2 ltrs after the race</p>	<p>What to Drink Although water replaces fluids, sports drinks (containing 4-8% carbohydrate & small amounts of electrolytes) provide:</p> <ul style="list-style-type: none"> o Additional energy from carbohydrate which can delay fatigue & enhance performance, especially during prolonged events o Salts (electrolytes) which aid the rehydration process. o Even if you do not need the extra fuel, flavoured drinks such as sports drinks encourage fluid consumption more than plain water, and therefore lead to improved fluid balance. <p>Hydration Routine:</p> <ul style="list-style-type: none"> o Athletes drink approx. 500ml (2 glasses) in the 2 hrs prior to exercise. o Athletes exercising for more than 60mins 500-700ml (2-3 glasses) of cool water or sports drink. This should be sufficient for most types of exercise. o After exercise, fluid deficits should be replenished to ensure athlete is rehydrated and not over-hydrated. <p>However "Drink Up" Brochure says:</p> <ul style="list-style-type: none"> o Drink at least 500ml (2-3 glasses) ½ to 1 hr prior to exercise. o Drink at least 200ml (1 glass) every 10-15mins during exercise. o After exercise drink 1^{1/2} times your fluid deficit to ensure you are fully rehydrated. 	<p>What to Drink Ideally, choose a fluid that contains sodium (sports drink) or consume this drink with some food.</p> <p>Hydration Routine:</p> <ul style="list-style-type: none"> o Drink 400-600ml of fluid 2-3hrs before the race, providing adequate time to urinate any excess. o Drink 200-300ml of fluid immediately before the race. o Use a fluid delivery system to drink regularly throughout the race. Ideally you should determine a plan based on your usual fluid losses. <p>Fluid loss can usually be determined by pre and post event body weight. Each kg of weight loss is equivalent to 1 ltr of fluid loss.</p> <p>Begin drinking early in the race and in small amounts, to ensure your fluid intake matches your fluid loss.</p> <ul style="list-style-type: none"> o Using the pre & post body weight rationale will help determine quantity – however generally drivers will need to drink 150% of any post race fluid deficit.
<p>To be Avoided</p> <ul style="list-style-type: none"> - Aerated drinks - Coffee, tea, depending on the sensitivity of the individual. - Large quantities of fruits - Large amounts of confectionary. 		
<p>Recommended:</p> <ul style="list-style-type: none"> - Non-aerated water, fruit juice energy drinks - Sugars absorbed slowly (pasta, rice, bread) 		<p>Recommended: A drink which contains sodium e.g. sports drink.</p>

<p>- Food absorbed quickly & with a high calorific value (dried fruit)</p>		
<p>Suggested Menu for the Day of the Race</p> <p>Breakfast: Large. Drink as much as desired, in small quantities.</p> <p>Before the Race: a small meal if necessary, e.g. bread, cheese, ham, mixed salad or even pasta, 1 piece of fruit, include a few biscuits.</p> <p>Drinks: about 1 ltr, in split quantities (2/3 water, max. 1/3 fruit juice), spread over the 2 hrs before the race.</p> <p>During the Race: it is desirable, depending on the duration of the race, to fit a liquid dispensing device, the quantity of liquid to be consumed during the race being 1 ltr of water which can be mixed with low-sugar fruit juice (less than 25gr. per ltr), or an energy drink.</p> <p>After the Race: drink plenty of liquid. The addition of a little salt to food to compensate for any loss. A quarter ltr of fruit juice replaces the quantity of mineral salts lost in 2 to 3 ltrs of perspiration, that is to say, the maximum lost during the race. Tomato juice has the same properties.</p>	<p>Suggested selections Prior to an Event</p> <ul style="list-style-type: none"> ○ To ensure food is digested prior to competition, eat a meal 2-4hrs before or a lighter snack 1-2hrs before competing. ○ Choose carbohydrate-rich foods that are low in fat to avoid abdominal discomfort .e.g. Plain pasta& tomatoe sauce, white toast & jam, low fat creamed rice, plain breakfast cereal & skim milk. ○ Choose foods you are familiar with & plan ahead. <p>After an Event Consume a carbohydrate-rich drink or snack immediately after exercise particularly if there is a short recovery time between sessions.</p> <p>Nutritious carbohydrate foods that also contain moderate amounts of protein may help recovery by speeding muscle repair & assisting immune function.</p> <p>Continue to drink until fluid deficit is replaced.</p> <p><i>There is an example of snack foods for recovery listed if feels necessary.</i> Generally, a meal that is carbohydrate based, with moderate protein and provides additional nutrients is recommended.</p>	<p>Suggested Selections:</p> <p>2-3 hrs prior to race: Generally, a meal that is carbohydrate based, with moderate protein and provides additional nutrients is recommended.</p> <p>1-2 hrs prior to race: A light snack can be consumed prior to race based on individual choices. Drivers who suffer from nerves or poor appetite prior to racing may find liquid meals or a series of smaller snacks more suitable than a meal.</p> <p>Breakfast: Cereal, toast & juice, Baked beans on toast & juice, Fruit salad & yoghurt, poached or scrambled eggs on toast plus fruit, crumpets and a banana smoothie, pancakes with fruit & yoghurt.</p> <p>Lunch: Sandwiches & juice, pasta with low-fat sauce & fruit, home made pizza with low-fat toppings, rice or noodle dishes, home made burgers.</p> <p>Snacks: Sports drink, juice, fruit, sandwiches, yoghurt, cereal bars, packer soup & bread, hot chocolate & marshmallows in hot environs.</p> <p>Suggestions for those who can't eat a Solid Meal Pre-Race: Smoothie with your favourite fruit, liquid meal drink (PowerBar Protein Plus, Sustagen Sport), a banana juice and a couple of cereal bars, sports bar (PowerBar Performance Bar) and sports drink.</p>

6. Environmental Factors

Obvious as it may sound, the major factor which leads to heat illness is the temperature on the day! 'Normal' temperatures vary from state to state so therefore it is difficult to place arbitrary limits on what temperature should be chosen in order to undertake extra preparation for protection against the possibility of heat illness. It is suggested that if a persons duties will place them in a situation where their normal environmental temperature is increased significantly, then preparation against heat illness is recommended.

7. Duration & Intensity of an Event

The combination of extreme environmental conditions and sustained vigorous exercise is particularly hazardous. The greater the intensity and duration, the greater the risk.

By way of example, cabin temperatures in race and rally vehicles, in hot ambient conditions have been shown to reach up to 60 degrees C. Studies of relatively short races with V8 Supercar drivers in hot conditions show cabin temperatures above 50 degrees C, with average sweat losses resulting in 3% loss of bodyweight.

In such conditions, extra attention to the benefits of appropriate hydration is considered to be essential to the continued well being of participants.

8. Local Environment

Radiant heat from surfaces such as black asphalt and or concrete can exacerbate hot weather conditions. When such an external environment, together with a relatively 'enclosed environment', e.g. a street circuit such as the Clipsal 500, and also when coupled with the enclosed interior environment of a race or rally car, is considered, it is easy to see how the intensity of heat can be dramatically increased (over that which exists on a relatively cool day).

CAMS recommends as good practice that at all events, comments on hydration should form part of the drivers/officials briefing.

The FIA has recognised both the issue of dehydration as well as high temperatures in the cockpit as being worth of further comment.

On the issue of dehydration a document which was drawn up in 1982 by the French doctors Richelet and Bertrand has been adapted and included into the Drivers Safety Guide of the FIA Institute of Motor Sport Safety (exerts of which are shown in the table above (on pages 2,3 & 4), and are in draft format).

The issue of cabin temperatures has also been addressed by the FIA. Upon further investigation by the FIA Closed Car Research Group, concluded that in a hot environment, the maximum recommended body temperature (39° C) can be reached after only 40 minutes of racing but was not specifically related to the wearing of heat/ flame resistant long underwear. For events taking place in extreme heat, the FIA recommended that a cooling system be used (connected, for example, to the underwear designed for such purpose) which has been homologated to FIA Standard 8856-2000.

Substances which may circulate in any cooling system worn by a driver are restricted to water, or air at atmospheric pressure. Water systems must not require the saturation of a garment in order to function (as per Minutes of the FIA Safety Commission Meeting held on 19 October 2005).

Adequate airflow in cars should be considered as it decreases heat stress.

Any persons who may be affected by drugs or alcohol are also possibly at extreme risk of heat illness.

9. Specific information for Officials

Officials are often exposed to the possibility of heat illness not only by the temperature of the day but by factors such as:

- Length of exposure.
- Intensity of the sun (UV Index).
- Physical intensity required by their task.

There are a number of OH&S & Worksafe guidelines for employees working outdoors and in hot conditions which it is considered are appropriate for officials who perform 'trackside' or 'stage side' duties.

The following suggestions may assist to reduce the onset and effects of heat illness.

- Provision of rest breaks.
- Provision of adequate supplies of cool drinking water. It is suggested that the consumption of 100-200ml of water at frequent intervals is of benefit.
- Provision of shade.
- Provision of suitable personal protection equipment e.g. wide brimmed hat with neck guard, sunscreen, sunglasses
- Spray bottles.
- Rotation of officials e.g. changing of tasks at point where possible and practical without causing disruption to the event.
- Removal of personal protective equipment (balaclavas, heavy protective clothings etc) when appropriate at events e.g. between races
- Wearing of loose clothes may be beneficial.

It is considered that it is the responsibility of the officials to discuss any concerns they may have with the organiser of the event.

10. Conclusion

- Heat illness can be significantly reduced or prevented by the simple action of consumption (drinking) of adequate amounts of appropriate fluid (water) prior to, during and after competition or officiating duties.
- The risk of heat illness is significantly greater when participants are exposed to an environment where they experience hotter conditions than they are used to.
- Such conditions may be exacerbated by not only heat increase, but by the length of time undertaking a task, length of time in an unprotected (non-shaded) environment and lack of cool drinking water.
- The most effective way of reducing the risk of heat illness is to drink adequate amounts of appropriate fluid (water) before an activity.
- The hotter the day; the more exposure to a heated environment; the longer you are 'at a task', ***the greater the amount of fluids which should be consumed is necessary.***

References and further information

www.ais.org.au/nutrition/HotTopics.asp
www.sma.org.au/information/resources.asp
www.smartplay.com.au/national/doclib/xpub/docliball
www.sportdieticians.com
www.ais.org.au/nutrition/documents/FactFluid.pdf

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