

HYDRATION

There is no question that proper hydration (fluid and electrolyte balance) is a pre-requisite for optimal sports performance. Research has shown that athletes who do not drink anything during exercise will perform less well than they would if they drank ad libitum. However this must not be interpreted as drinking as much as possible – as this has not been shown to further improve performance and may in fact be fatal (see over-hydration).

Water and electrolyte balance are critical for the function of all organs. Water provides the medium for biochemical reactions within cell tissues and is essential for maintaining blood volume and thus the optimal function of the cardiovascular system. Physical exercise and heat stress cause both fluid and electrolyte imbalances that need to be corrected to avoid the effects of dehydration. These effects will vary according to the type and intensity of exercise, body size, environmental conditions including the climatic conditions (temperature and humidity) and clothing.

Risks of dehydration

- Increases core body temperature and the body begins to over-heat.
- Increases the strain on the heart, as the heart rate increases for a given workload.
- Perceived effort is greatly increased and concentration, skills and mental functioning is diminished.
- Rehydration is much more difficult to achieve because of the subsequent gastro-intestinal discomfort and upsets.

Signs:

Early signs of dehydration typically experienced include:

headache, fatigue, loss of appetite, flushed skin, heat intolerance, light-headedness, dry mouth and eyes, dark coloured and strong odour urine.

Advanced signs of dehydration require urgent medical attention such as difficulty in swallowing, clumsiness,

shrivelled skin, sunken eyes and dim vision, painful urination, numb skin, muscle spasms & delirium. Intravenous therapy may be required.

Risks of overhydration

Overhydration and hyponatraemia may occur in ultra-endurance events lasting longer than 4 hours as a result of the over-consumption of fluid diluting the body's sodium levels (exact mechanisms still under investigation). Specialized sports nutrition strategies are essential for these types of events and may include the addition of sodium as well as careful regulation and monitoring of fluid intake.

Signs: unconscious or severely confused especially when blood glucose concentrations are normal, vacant stare, oedema (e.g swollen fingers).

Strategies to replace fluid before, during and after exercise

Generally athletes dehydrate during exercise because of a mismatch between thirst and fluid requirements. They may also fear weight gain or the need to urinate during the event, or they may not have easy access to fluids during the event.

1. Begin exercise in a well-hydrated condition. Use all opportunities to drink before even exercising (e.g. meal- and snack times, in transit, at work or at school). Athletes can learn to tolerate up to 5ml fluid/kg body weight in the warm up before an event.
2. Don't rely on thirst. In general thirst is not perceived until an athlete has already lost 2% of body weight. A fluid replacement plan should be used to calculate individual fluid requirements and needs to be practised in training.
 - a. Determine weight before and after training in minimal clothing and after towel drying.
 - b. Monitor volume of fluid consumed during training.

- c. Determine change in body mass before and after any toilet stops.
- d. $\text{Sweat loss (ml)} = \text{Change in body mass(g)} + \text{fluid intake (ml)} - \text{urine losses (ml)}$.

3. During exercise start drinking early and continue to top up frequently (aiming to replace 80% of sweat losses). This will maintain gastric volume and increase fluid absorption minimizing the build-up of dehydration.

4. After exercise be aggressive in replacing all sweat losses (i.e. after exercise/training replace 1.5 x remaining weight loss). This is very important when competing in later events on the same day or the next day. Recovery of significant fluid loss after exercise is assisted by the simultaneous replacement of electrolytes (sodium and potassium).

5. GENERAL TIPS:

- Make the most of opportunities to drink within the confines of the sport (e.g. stoppages, injury time in team sport).
- Individually labelled bottles should be readily available, not in a tog bag left in the change rooms.
- Fluid should be served in containers that allow adequate volumes to be ingested with ease and minimal interruption of exercise.
- Coaches, trainers, parents must encourage full rehydration.
- Fluid intakes of children, the elderly, pregnant and lactating athletes require specific attention.
Contact a SASC dietician.

WIN WITH FOOD

THE IDEAL DRINK**1. Carbohydrate: Type and amount – (concentration)**

The addition of carbohydrate to the ingested fluid will enhance performance even further than water on its own. Preference should be given to drinks containing glucose or glucose polymers, rather than fructose since fructose during exercise delays gastric emptying and so decreases the rate of fluid absorption. Furthermore excessive fructose may increase the risk of diarrhoea and fruit juices are therefore not recommended during exercise.

The amount of carbohydrate in the drink (concentration) can be varied according to individual needs and environmental and climatic conditions. When carbohydrate needs are more important, a higher carbohydrate concentration not exceeding 10% (greater concentrations delay gastric emptying and may cause diarrhoea and stomach cramps) or 60g carbohydrate/hour will be of benefit. In extremely hot conditions when fluid needs take priority, a more dilute solution of 4% carbohydrate (containing sodium) can be used.

2. Electrolyte composition and concentration

Sodium and potassium, the main electrolytes lost through sweat are found in limited amounts in most commercial sports drinks. Too much sodium affects the taste of the drink and so the amount of sodium in drinks (10-30 mmol/l) only partially replaces sodium lost in sweat (ranging from 10-90mmol/l). Foods and snacks with a high salt content are therefore recommended to make up losses.

3. Other active ingredients

Sports drinks generally don't need to have added vitamins as losses via sweat are low. However optimal intakes of vitamins and minerals should still be met. Caffeine and caffeine-like substances may be present in some drinks and these drinks should be discouraged particularly in the post exercise recovery period since caffeine has a diuretic effect. Note that a urinary caffeine concentration above $> 12\mu\text{g}/\text{ml}^{-1}$ is considered as doping and may be achieved if

500 mg of caffeine is consumed within a short period (although this may vary between individuals). Always check labels of drinks for any other substances, some of which may be counter productive or even banned.

4. Palatability

This includes flavour, taste, mouth-feel and temperature and may have a large impact on voluntary fluid intake. Drinks should be cool (15-22C) and palatable for the individual – note taste does change during exercise and if a drink is unacceptably sweet during or even after exercise, experiment with other drinks or consider a lower concentration adding unflavoured glucose polymer powders if needed.

Carbohydrates (Win with food)

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