7 HYDRATION AND NUTRITION

Optimal nutrition and hydration require careful consideration and involve activities before, during and after exercise. Sports nutrition strategies planned in advance can provide performance benefits to players in all sports and can help reduce the risk of injury.

The Aims and Benefits of Good Hydration and Nutrition

Dehydration impairs physiological function and exercise performance, which can result in injury.[1] The aim of good hydration is to minimise or prevent the progressive dehydration that occurs during exercise as a consequence of fluid losses owing to sweating. Good sports nutrition aims to provide an optimal fuel supply for exercise and promote a nutritional environment that allows for recovery between training sessions and satisfies the basic nutrient requirements of good health and growth.[2] Nutrition also provides a way to obtain and maintain an appropriate body mass and level of body fat.[2] There is no benefit in consuming a fat intake less than 15% (aim for 20-25%) of total energy.[3]

Best Practice for the Good Hydration and Nutrition Process

Although guidelines for hydration and nutrition vary depending on the intensity of effort and the type of sport, general recommendations can be given for players at all levels to maintain healthy sports participation.

Before Exercise

Consuming a high-carbohydrate diet for a few days before competition can improve endurance capacity in events lasting longer than one hour and improve performance in both high-intensity exercise lasting three to six minutes and sports involving intermittent exercise for long periods.[4,5] Pre-hydration (drinking fluids before exercise) reduces the physiological strain on the body, particularly in hot and humid environments.[6]

During Exercise

Maintaining an ideal fluid balance during exercise means that fluid intake must keep up with sweat losses. Dehydration is not uncommon in cold environments (owing to low rates of fluid intake and additional clothing) and at altitude.[3] During exercise lasting longer than one hour (both endurance and intermittent), it is beneficial if carbohydrates are consumed, in addition to fluids, as this maintains fuel supplies and delays fatigue.[6]

After Exercise

Consuming fluids and food immediately after competition or training replenishes players' glycogen stores and reduces the effects of fatigue (aim for 1.5g carbohydrate per kilogram of body weight in the first 30 minutes and repeat every two hours for four to six hours).[3] For a 70kg runner, netball or touch player, 105g would be provided by 500ml of sports drink (35g), a large banana (30g), bread roll (25-30g) and a piece of fruit (10-15g).

For hygiene purposes, and to prevent the spread of hepatitis and flu, players should not share drink bottles.

If players have any doubts about their food intake, are newly vegetarian or have low-energy intakes (for example, are required to make a weight category or to reduce body fat levels) it is recommended that they seek assistance and advice from a sports dietitian to ensure they are meeting all their energy and nutrient requirements (especially for calcium, iron, carbohydrate and protein). This is particularly important for young female players and those going through the rapid growth phases of adolescence. Failure to meet the additional energy needs at this stage of the life cycle can result in delayed growth, menstrual dysfunction in females,

and chronic fatigue, in addition to an impaired immune system and fatigue.[3]

Hydration

To maintain proper fluid balance during exercise the following are recommended:[6,7]

- Aim to start training sessions or competition well hydrated (a clear or light-coloured urine is a good indicator of adequate hydration)
- Drink small amounts at regular intervals during exercise. Use breaks in the game or training to take on additional fluids
- Increase fluid intake in hot and humid conditions
- After exercise, replace 1.5 litres of fluid for every kilogram of body weight lost
- Avoid caffeine, energy drinks (e.g. Red Bull, V) and alcohol when rehydrating (these promote fluid loss)
- Drink fluids that are flavoured and cooler than the ambient temperature
- The addition of sodium (0.5-0.7g/L) and carbohydrate (4-8% concentration) to drinks improves absorption by the body and promotes glycogen replenishment. Additional sodium may be necessary for ultra-endurance events and for individuals who are "salty" sweaters
- As children are less efficient in sweating and produce more metabolic heat during exercise than adults, special attention should be placed on hydration and fluid intake when exercising in hot/humid climates[8]
- Guidelines for quantities of fluid intake are shown in table 4.[3,9-11]

500-600ml	Two hours before exercise.
500ml	15 minutes before exercise.
120-150ml per 10-15 minutes	During exercise.* More in hot, humid environments.
1-1.5 litres per kg of body weight lost	After exercise. Aim to replace 1.5 x losses. Use sports drinks containing carbohydrate and sodium.

table 4: GUIDELINES FOR FLUID INTAKE FOR EXERCISING ADULTS

***Note – Plain water is appropriate for exercise events lasting less than one hour. Drinks containing 4-8% carbohydrate and 0.5-0.7g/litre sodium are recommended for intense exercise events lasting longer than one hour.[9]**

Carbohydrates

Carbohydrates are converted to glycogen when digested, and the glycogen provides the majority of the energy used during moderate to intense sporting activity. If glycogen levels are not maintained the body will be unable to sustain the activity level owing to enforced reliance on fat as a fuel. Unless the intensity is reduced the players will be unable to maintain their level of activity and fatigue will result.[12]

Players are encouraged to eat 6-10g carbohydrate per kilogram of body weight.[3] For a 70kg player this means consuming approximately 500-600g of carbohydrate per day.[12] It is wise to eat a low-fat meal containing 200-300g of carbohydrate during the three to four hours before competition to top-up the muscle stores and maintain blood glucose levels.[3] Consuming carbohydrate during exercise (in food and fluids as appropriate) lasting more than one hour can delay fatigue and improve performance (30-60g carbohydrate per hour or 0.7g carbohydrate per kilogram of body weight).[3]

Protein

Proteins are essential in the diet to build, maintain and repair body tissue. Recent studies of protein metabolism during exercise support increased protein requirements for heavily training players.[13] A diet providing 1.2-1.7g protein per kilogram of body weight should be sufficient for most players. Endurance players require 1.2-1.4g protein per kilogram body weight, and resistance and strength training players require 1.6-1.7g protein per kilogram body weight.[3,13] Players with low energy intakes and requirements and vegetarian players should be given special assistance.

7. HYDRATION AND NUTRITION cont.

A small amount of protein in recovery (6g) may accelerate protein synthesis in the muscle following exercise.[14] A sports dietitian can provide guidance on the nutritional requirements for sport.

Alcohol

Alcohol consumption before exercise has negative effects on both aerobic and anaerobic endurance.[15] After exercise it is particularly important that players are completely rehydrated before consuming any alcohol and that they consume some food (carbohydrates promote faster recovery) to reduce the rate of alcohol absorption. Alcohol interferes with rehydration and other recovery processes.

Iron

Iron deficiency in players' diets is responsible for the commonest form of anaemia seen in this group. The presence of anaemia must be firmly established by blood tests before iron supplements are commenced (this is because a small but significant group of the population has the inherited gene for haemochromatosis, and excess iron can cause severe health problems). Low iron leads to increased fatigue, which may be related to a greater risk of injury and poor performance.[3] Fatigue may also be due to other nutrition-related conditions such as poor intake or insufficient carbohydrate, low vitamin B12 status, low folate levels, and dehydration.

Practical guidelines on hydration and nutrition can be found in the "Hydration and Nutrition" section of the *ACC SportSmart Coaches' Kit*.

References

1. Hargreaves, M. Physiological benefits of fluid and energy replacement during exercise. *Australian Journal of Nutrition and Dietetics*, 1996, 53(4): S3-S7.
2. Deakin, V. and Inge, K. Training nutrition. In: Burke, L. and Deakin, V. (Eds.) *Clinical Sports Nutrition*. McGraw-Hill Book Company: Sydney, 1994.
3. ACSM Joint Position Statement: Nutrition and Athletic Performance. *Medical Science Sport & Exercise*, 2000, 2130-2145.
4. Maughan, R.J., Greenhaaf, P.L., Leiper, J.B., Ball, D., Lambert, C.P. and Gleeson, M. Diet composition and the performance of high intensity exercise. *Journal of Sports Sciences*, 1997, 15(3): 265-275.
5. Hawley, J.A., Dennis, S.C. and Noakes, T.D. Carbohydrate, fluid, and electrolyte requirements of the soccer athlete: a review. *International Journal of Sport Nutrition*, 1994, 4(3): 221-236.
6. Murray, B. Fluid replacement: The American College of Sports Medicine position stand. *Sports Science Exchange*, 1996, 9(4): 1-6.
7. Maughan, R.J., Leiper, J.B. and Shirreffs, S.M. Rehydration and recovery after exercise. *Sports Science Exchange*, 1996, 9(3): 1-5.
8. Gatorade Sports Science Institute, *Nutrition for Child and Adolescent Athletes*, 2000, 77 Vol 13(2).
9. Brukner, P.D. and Khan, K. *Clinical Sports Medicine*. 2nd edition. McGraw-Hill Book Company: Sydney, 2000.
10. Burke, L. Rehydration strategies before and after exercise. *Australian Journal of Nutrition and Dietetics*, 1996, 53(4): S22-S26.
11. Gatorade Sports Science Institute, *Sports Foods for Athletes: What Works?* 1998, 32 Vol 9(2).
12. Coyle, E.F. Carbohydrates and athletic performance. *Sports Science Exchange*, 1988, 1(7): 1-5.
13. Burke, L. and Inge, K. Protein requirements for training and "bulking up". In: Burke L., and Deakin, V. (Eds.) *Clinical Sports Nutrition*. McGraw-Hill Book Company: Sydney, 1994. 124-150.
14. Gatorade Sports Science Institute, *Speeding recovery from exercise*. 2001, 46 Vol 12(4).
15. Williams, M.H. Alcohol intake and sport performance. *Strength and Conditioning*, 1998, 20(2): 16-17.