Spotlight on nutrition issues
Summer 2008

What's Inside

Author
Leigh Underhill holds a Master of Health Science degree in Community Nutrition from the University of Toronto and is currently working as a nutrition educator with the Dairy Farmers of Canada (Ontario). Prior to joining DFC in 2007, Leigh worked as a physiotherapist assistant in orthopedic and neuromuscular rehabilitation.

Acknowledgement
We would like to thank Elizabeth (Beth) Mansfield, MSc, RD, of Peak Performance in Ottawa for taking the time to contribute her expertise in sport nutrition to this newsletter. Beth works with Canadian athletes of all levels, helping them achieve peak health and sport performance. She is currently working on her PhD at McGill University, focusing on micronutrient status, energy balance and body composition of physically active women, specifically those who exercise more vigorously (e.g., female runners) as a means to maintain a healthy weight.

Developed by the team of Registered Dietitians at Dairy Farmers of Canada

Nutrition for Active Canadians
– and Those Trying To Be More Active!

Synopsis
It is well known that nutrition practices affect capacity for physical activity. The consensus among many experts is that the nutritional needs of athletes are not significantly different from those of the general population; *Canada's Food Guide* is the basis for success for both physically active individuals and competitive athletes. Very active people who are at a healthy weight may need to eat extra servings from the four food groups. Generally, when nutrient intake is adequate, supplements are not known to improve an individual's capacity for physical activity.

Physical activity can increase hydration requirements to compensate for sweating. Fluid should be consumed before, during and after physical activity to prevent dehydration and its negative impact on the capacity for physical activity. Similarly, snacks and meals should be timed around activity to ensure that the body has the energy and nutrients it needs to participate in activity, as well as to refuel and repair muscles afterwards. Competitive athletes and those unsure of whether they are meeting nutrient requirements should consult a Registered Dietitian.

Introduction

It's well established that nutrition practices affect capacity for physical activity; much research has sought to clarify the relationship between the two.[1,2] Knowledge of how nutrition and activity relate is of value to competitive athletes as well as to the general population, which is encouraged to engage in regular physical activity to promote physical and mental health. However, most studies of nutrition and activity have focused on the nutrient requirements of competitive athletes, with the express purpose of optimizing nutrient intake to improve athletic performance; several organizations have made specific nutrition recommendations for competitive athletes.[1–3] It is important to recognize that study results and specific dietary recommendations pertaining to competitive athletes do not apply

to the general population.[1] This fact has created and perpetuated confusion about what nutrition practices support physical activity because few people who seek guidance on this topic are active at the competitive level.[1]

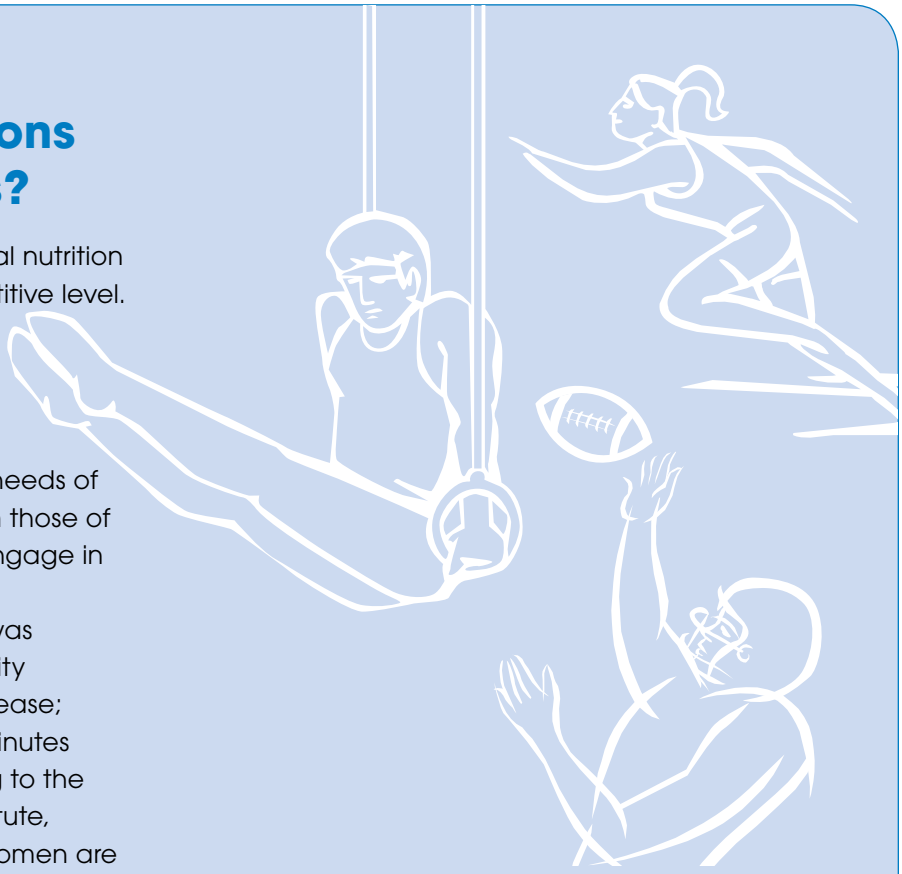
Drawing from the most recent findings, consensus reports and position statements, this issue of *Spotlight* brings you up to speed on knowledge of and recommendations for nutrition and hydration practices that support physical activity at a general, non-competitive level. Competitive athletes should seek individualized, evidence-based nutrition recommendations from a Registered Dietitian with expertise in sports nutrition.[1,2,4,5] Dietitians of Canada offers a locator service on its website, as does the Coaching Association of Canada.[6,7]

Why Are There Different Nutrient Recommendations for Competitive Athletes?

Various organizations have developed special nutrition recommendations for athletes at the competitive level. In some instances, these guidelines differ from the recommendations for the general population. Sport-specific goals, and the greater intensity, duration and frequency of activities may increase some of the nutrient needs of athletes, and distinguish athletes' needs from those of the general population, who by and large engage in physical activity to maintain health.

Canada's Physical Activity Guide (CPAG) was developed to help Canadians achieve activity levels known to reduce the risk of chronic disease; it recommends accumulating a total of 60 minutes of activity most days of the week.[8] According to the Canadian Fitness and Lifestyle Research Institute, however, less than 54% of men and 48% of women are physically active enough to meet CPAG guidelines.[9]

Canada's Food Guide provides dietary guidelines for the generally sedentary Canadian population but should also adequately meet the nutrient needs of those striving to be more physically active, depending on the intensity, duration and frequency of their activities.[10, 11] Those who are very active have higher energy expenditures and therefore may need to eat extra servings from the food groups to meet their energy needs.[11]



Recreational athletes can sometimes be at the competitive level. Because of sport-specific goals and the intensity, duration or frequency of their activity, their nutritional requirements may be similar to those of competitive athletes.[12] For example, Jane, a 35-year-old mother of two children, regularly trains for and competes in half marathons; she may have different nutrient requirements than does Tina, a 24-year-old student who plays soccer twice a week in a recreational league.

Energy and Macronutrients

Energy

The dietary intake of calories from protein, carbohydrates, fat and alcohol provides the energy that fuels the brain and all bodily functions, including physical activity.[13] Evidence-based Acceptable Macronutrient Distribution Ranges (AMDRs) set by the Institute of Medicine recommend percentage ranges for calorie intake from protein (10%–35% of calories), carbohydrates (45%–65%) and fat (20%–35%) that ensure a balanced, adequate intake of nutrients while reducing the risk of chronic disease.[13] The eating pattern recommend by *Canada's Food Guide* meets the AMDRs and supports a balanced intake of protein, carbohydrates and fat.[11]

The daily energy intake (or calories) required by a healthy adult depends on factors such as age, gender, weight, height and level of physical activity and can be determined using scientifically derived equations.[13] A stable body weight is the preferred indicator of an adequate energy intake; changes in body weight indicate that an individual is eating more or less than required. Excess energy intake relative to expenditure typically results in fat gain and an increase in body mass index (BMI). An energy intake lower than required results in the body using its energy stores, which may, in time, result in decreases in body weight and BMI.[13] Inadequate energy intake can impair health and the ability to perform physical activity, especially if the inadequacy is chronic.[2,13]

Physical activity is the variable that has the greatest influence on the overall amount of energy expended by an individual. Energy expenditure can increase greatly during physical activity and may stay elevated for up to 24 hours afterwards, depending on an individual's level of fitness; environmental conditions; and activity type, duration and intensity.[13] As a result, it has been suggested that the equations used to quantify the energy requirement for the general population may not apply to athletes who undertake a significantly higher level of physical activity (and therefore have greater energy requirements).[5] It is generally noted, however, that there is a lack of compelling data to indicate that those who are physically active, including athletes, need a diet substantially different from what the general healthy population requires.[2,13,14]

Bottom line: *Physically active individuals, and those trying to be more active, should refer to* Canada's Food Guide *for dietary guidance on meeting energy needs.[11] People who are very active (and who are at a healthy weight) may need extra servings from the four food groups to meet their energy needs.[2,11] Body weight is a useful indicator of the adequacy or inadequacy of an individual's usual energy intake in relation to their usual energy expenditure.[13] Competitive athletes should consult a Registered Dietitian with expertise in sports nutrition.[1,5]*

Carbohydrates

Carbohydrates (sugars and starches) are metabolized into glucose by the body to maintain blood sugar and stored glucose levels; they are the preferred source of energy for most of the body's activities. Carbohydrates are stored as glycogen in the muscles and the liver as an energy or fuel reserve.[13] The amount of carbohydrates needed depends on the individual and his or her energy expenditure, but beyond meeting the Recommended Dietary Allowance for carbohydrates (130 grams per day for basic brain function), the level of carbohydrate intake that best supports optimal health in humans is not known.[2,13] However, the AMDR recommends that carbohydrates provide between 45% and 65% of total caloric intake.[13] Within the four food groups, Grain Products and Vegetables and Fruit are excellent sources of carbohydrates, but certain foods from the Milk and Alternatives group (such

as yogourt and chocolate milk) and the Meat and Alternatives group (such as legumes) are also excellent sources of carbohydrates.

An inadequate intake of carbohydrates (such as with a low-carbohydrate diet) may leave one feeling lethargic during physical activity; this is a result of the limited amount of carbohydrate available to provide fuel for activities.[2,13] As well, since carbohydrate storage (glycogen in the muscles) is relatively limited, it may be depleted during intermittent high-intensity or prolonged activity (greater than 90 minutes), resulting in fatigue, compromised performance and poor recovery.[2] Therefore, consuming enough carbohydrates to maintain blood glucose and glycogen stores is essential for participation in physical activities. Eating sufficient carbohydrates after an activity to restock glycogen stores is especially important for people who participate in multiple sessions of physical activity per day or in moderate- or high-intensity activity daily.[2]

Bottom line: *Sufficient dietary carbohydrates are essential to fuel physical activities as well as activities of daily living. Carbohydrates should account for 45% to 65% of total caloric intake, according to the Acceptable Macronutrient Distribution Range.[13] Physically active individuals can meet their carbohydrate needs by eating a variety of foods from the four food groups, such as starchy vegetables and fruit, grains (bread, pasta, rice, cereal), chocolate milk, yogourt, and legumes and beans. At least half of the grain selections should be whole grains because of their superior fibre and nutrient content.*[10,11]

Protein

Protein is the chief functional and structural building block of every cell in the body. It is continually being broken down and resynthesized, especially in response to daily physical activity; this is referred to as body protein turnover. Adequate dietary protein is necessary for the maintenance of muscle mass, cellular integrity and function, reproductive function, and overall health.[13] When protein intake is inadequate, protein turnover is not maintained – body protein breakdown becomes greater than body protein synthesis; all organs and systems are negatively affected.[13] When carbohydrate intake is adequate and protein intake is greater than what is required, the excess protein is either used for energy or stored as fat.[2,15]

It has been suggested that athletes have higher protein needs than the general population and that they should consume 50% to 100% more protein to maintain optimum physical performance.[2,5,13] This belief is due to the recognition that the Recommended Dietary Allowance for protein (0.8 grams per kilogram per day) was established using sedentary subjects, and it was hypothesized that athletes might have greater requirements to support the increased protein turnover resulting from physical activity.[1] The Institute of Medicine, however, reports that compelling evidence of this increased need is lacking; no additional dietary protein is suggested for healthy adults who undertake strength or endurance activities, beyond that which occurs naturally when extra food is eaten to meet higher energy needs.[13,14,16] The Acceptable Macronutrient Distribution Range of 10% to 35% for protein is wide enough to meet a variety of needs, and higher protein needs can be met with an intake at the upper end of the range.[15]

Many studies have focused on elucidating how the source or quality of dietary protein affects physical activity or sports performance in athletes. A key aspect of these studies has been the comparison of animal and plant protein, but results have been mixed.[17] Consequently, it has been suggested that the predominant source of protein (animal or plant) is not likely to matter as long as total protein and

carbohydrate intake is adequate.[13,18] When carbohydrate intake is inadequate, consumed protein is used for energy at the expense of body protein.[2]

Bottom Line: *Meeting the AMDR of 10% to 35% of total calories from protein, and following* Canada's Food Guide, *can provide sufficient protein for physically active Canadians as long as overall energy intake is adequate to fuel activities.*[2,11,14] *Protein-rich foods include meat, fish, poultry, eggs, milk, cheese, yogourt, legumes and nuts.*

Fat

Fats are essential for the absorption of fat-soluble vitamins and materials, cellular signalling, gene expression, and lipid and carbohydrate metabolism.[13] Fats are also an important source of fuel for the body – muscle uses both fatty acids and glucose for energy during physical activity.[13,15,19] The AMDR for fat is 20% to 35% of total daily calories; this includes the intake of saturated fats (from animal sources) and unsaturated and polyunsaturated fats (from plants and fish).[13] The latter group is also known as "good fats" because eating foods that contain unsaturated and polyunsaturated fats may decrease the risk of certain diseases.[20]

Inadequate intake of dietary fat may impair growth and immune function, increase the risk of chronic disease, reduce the capacity for prolonged physical activity and result in a negative energy balance if protein and carbohydrate intakes are also inadequate.[12,13] Overconsumption may result in a positive energy balance, leading to weight gain in sedentary individuals.[13] Physically active people, however, can probably maintain their body weight with higher fat intakes than sedentary individuals can, owing to active people's greater overall energy expenditure.[13] Despite some evidence that a high-fat diet (that is, fat consumption above the AMDR) can sustain or improve athletic performance, this possible benefit is overshadowed by the fact that high-fat diets are known to increase the risk of chronic disease.[5,13]

Bottom Line: *High-fat and excessively low-fat diets are deleterious to health and may negatively affect the capacity for physical activity.*[2,12] *Calories from dietary fat should account for 20% to 35% of one's total calorie intake to reduce the risk of chronic disease but also ensure that energy needs for physical activity are met.*[13] *An appropriate fat intake can be achieved by following* Canada's Food Guide *and should include two tablespoons of unsaturated fat every day (from various sources including cooking oils, salad dressings and spreads such as mayonnaise or margarine), and at least two servings of fish per week to ensure the intake of good fats.*[10,11]

Fat Zone

While muscle uses both fat and carbohydrates for energy during physical activity, the amount of fat used peaks during activities that are of moderate intensity – these are the activities said to be in the "fat zone." As the intensity of physical activity increases, the amount of carbohydrate used for fuel increases while the use of fat decreases. However, the overall amount of energy (calories) used may actually be greater due to the greater intensity of the activity.[2,12,15,19]

Micronutrients

Higher levels of physical activity may mean higher requirements for some micronutrients – many of the Dietary Reference Intakes for micronutrients were derived using lightly or moderately active individuals.[13,21] According to the Institute of Medicine, however, iron is the only micronutrient for which evidence supports greater requirements for physically active individuals.[13] Table 1 indicates what is known about the relationship between electrolytes (sodium and potassium), iron status and physical activity.

For most micronutrients, more studies are needed to elucidate whether physical activity changes individual requirements.[21] For example, the Institute of Medicine notes that there is a lack of data on the micronutrient intakes and nutritional status of specific female subpopulations (such as very active women 30 years of age and older but still premenopausal), especially those who are inclined to exercise more vigorously as

Table 1. Iron, Potassium and Sodium Status and Physical Activity

Micronutrient	Requirement/Status and Physical Activity
Iron	• Iron deficiency is noted more often in recreational athletes than in the general population and is noted most often in females who are regularly physically active.[13,22] • There is increased iron loss through foot-strike hemolysis (such as occurs during running), gastrointestinal blood loss and sweating but this varies according to activity and gender.[13] • Low iron status may limit capacity for endurance activities and impair cognitive function.[13,22,23] • Individuals, particularly females, who regularly engage in intense physical activity may have iron requirements 30% to 70% greater than those who do not.[13] • Iron status screening and consultation with a Registered Dietitian is recommended for endurance athletes.[22]
Potassium	• Heat exposure and exercise can increase potassium loss, primarily through sweat, thereby increasing potassium requirements.[13] • The above point is particularly noteworthy given that the potassium intake of North American women is low, and only half of men meet required intakes.[13,21] • The negative impact of electrolyte imbalance on health and performance is well documented but depends on the severity of the imbalance.[13,22] • Conditions associated with potassium inadequacy and deficiency include cardiac arrhythmia; muscle weakness; glucose intolerance; increased blood pressure, salt sensitivity and bone turnover; and increased risk of kidney stones and cardiovascular disease. Toxicity or chronic excess potassium is also associated with cardiac arrhythmia.[13]
Sodium	• Large volumes of sodium may be lost in sweat by athletes or by individuals not accustomed to prolonged strenuous activities in a hot environment. Sodium loss may indicate that an increased intake of sodium is required for these groups.[13] • Loss of sodium depends on many factors, including overall diet, sodium intake, sweating rate, hydration status, degree of acclimation to heat, genetics and fitness level.[12,13] • The negative impact of electrolyte imbalance on health and performance is well documented and in the case of sodium is associated with its role in fluid balance, including increases or decreases in cell and blood plasma volume and blood pressure, impaired physical performance due to dehydration and hyponatremia.[13, 22]

a weight-loss or weight-maintenance tool.[12]

As new evidence becomes available the Dietary Reference Intakes (which are based on current scientific knowledge) may need to be refined.[5]

Bottom Line: *Micronutrient supplementation above required levels is not known to enhance the capacity for physical activity if the diet is already adequate in these micronutrients.[2] Iron requirements may be higher for people regularly participating in high-intensity activities; people unsure of whether they are getting enough micronutrients should consult a Registered Dietitian.[13,22] It is important for a health professional to be involved in the decision to supplement with certain micronutrients because there may be a risk of harm with an excessive intake.[2,23]*

Did you know?

Taking vitamin supplements does not provide extra energy. But vitamins *are* necessary for the chemical reactions in the body that release energy from food. Consuming food that naturally contains vitamins, as recommended by *Canada's Food Guide,* is the simplest and most inexpensive way to meet nutrient and energy needs.[24]

Fluid

Water is the largest component of the body (60% of body weight, on average) and is necessary for the maintenance of cellular homeostasis, vascular volume, transportation of substances within the body, nutrient supply and waste removal.[13] The adequate intake of water from all sources (water in food and fluids) for healthy people 19 and older is 2.7 litres per day for women and 3.7 litres per day for men.

Daily water intake must balance water losses to preserve total body water. Water loss results from evaporation from the lungs during respiration, from the skin through sweating and passive diffusion, and from renal and gastrointestinal tract water losses.[13]

It is recognized that there is confusion among the general public – and health-care providers – about the amount of water that individuals need to drink.[13] However, the commonly held belief that adults should drink eight glasses of water per day has no scientific basis. Hydration needs can be met by consuming a variety of foods and fluids; studies indicate that 20% of our daily water intake comes from the food we eat (such as vegetables, fruit and soup) and 80% comes from beverages (juice, milk, coffee, etc.), including water. This means that women need to drink 2.2 litres (9 cups) of fluids per day and men need to drink 3.0 litres (13 cups) to meet their basic fluid requirement. It should be emphasized that any beverage can provide the daily requirement for fluid.[13]

Prolonged physical activity, especially in a warm environment, can considerably increase water loss due to sweating, so a greater intake of fluids may be required to compensate for the loss.[13] For example, daily water requirements for adults can double in hot weather (above 30° C) and triple in very hot weather (40° C). Cold-weather activities can also affect hydration requirements since water loss in cold weather can be as high as in hot climates owing to

high rates of energy expenditure, the use of heavily insulated clothing, and reduced fluid intake because the thirst mechanism is diminished in cold temperatures.[13]

Bottom Line: *Fluids should be consumed before, during and after physical activity to replace fluid lost through sweating and thus support adequate hydration; plain water is sufficient to meet hydration needs when physical activity lasts less than 60 minutes.*[2,25] *Beverages containing a small amount of carbohydrate (such as diluted fruit juice) and a pinch of sodium (salt) may be more appropriate for activities lasting longer than 60 minutes and for intense, stop-and-go activities in hot conditions.*[2,25]

Dehydration Compromises Physical Activity

Dehydration occurs when water loss exceeds water gain; it can be the result of inadequate water intake or excessive water loss.[13] Dehydration affects the performance and tolerance of physical activity in several ways. Water loss of as little as 2% of body weight may cause:[13,25]

- Impaired mental function and motor control
- Reduced capacity for prolonged activities
- Increased core temperature during physical activity
- Reduced tolerance and reduced cardiac output during the stress of exercise and heat
- Fainting in susceptible people

Urine volume and colour are crude indicators of hydration status (other factors, such as medication, diet and vitamin intake, also influence volume and colour). Scant volume of dark urine may indicate a need to increase fluid intake.[13,15]

What's New?

Recover with Milk

Scientific evidence supporting milk's value as a post-exercise recovery drink is growing. A very recent study found that drinking skim milk after cycling in a warm environment had a greater rehydrating effect during the recovery period than drinking a popular sports drink. Furthermore, exercise capacity was not different with skimmed milk than with the sports drink in a follow-up session of cycling.[36] This is in line with other recent findings, including a similarly designed study that found low-fat milk to be a better post-exercise rehydration drink than a commercially available sports drink.[37] Recent findings also suggest that chocolate milk is an effective recovery aid when consumed between two exhausting bouts of exercise compared with two popular sports drinks.[26] Similarly, drinking skim milk after resistance exercise was noted to have a greater effect on muscle growth than either a sports drink or a soy beverage.[17] It is suggested that the natural nutrient profile of milk and chocolate milk, which includes water, carbohydrate, protein and electrolytes, is responsible for the positive effects on exercise recovery.[17,26,36,37] Fast and effective recovery after exercise is especially important for those participating in multiple sessions of physical activity per day and for those who exercise daily.[2]

Fuelling Physical Activity: Timing Is Important

Dietary guidelines for competitive athletes acknowledge that adequate food and fluid intake before, during and after physical activity helps maintain hydration and blood glucose levels and enhances performance and recovery.[2] Nutrition strategies are also important for people striving to be physically active as part of a healthy lifestyle.[27] For example, food and fluid intake during physical activity is most important for events lasting longer than an hour, if the individual did not eat beforehand and for extreme environmental conditions.[2] Following physical activity, especially after prolonged or strenuous activities, it is necessary to replace depleted muscle glycogen stores and to counter the breakdown of body protein with carbohydrate and protein intake.[2] Such strategies facilitate not only an individual's successful participation in but also their enjoyment of the activity.

Key Strategies to Fuel Physical Activity

- Follow *Canada's Food Guide* to meet basic energy and nutrient needs.[10,11]
- Eat breakfast every day.[10,11]

Before activity:

- Fuel up with a balanced meal three to four hours before an activity, or have a snack one to two hours before an activity.[27–29]
- Eat or drink a light, easy-to-digest carbohydrate-based snack such as fruit, crackers, a muffin, a smoothie or some chocolate milk 30 minutes before activity if you need an energy boost.[28]

During moderate or high-intensity or prolonged activities:

- Maintain fuel and fluid stores by drinking water and eating a small amount of carbohydrates, such as dried fruit, an oatmeal cookie or a sports drink.[29]

After physical activity:

- Refuel and repair by drinking fluids and eating a combination of carbohydrate-rich foods and some protein in a series of small snacks or a snack followed by a meal two to three hours later.[27–29]

Supplements

The greatest value of some sports supplements – such as gels, bars and drinks – may be their convenience and food-safety factor. These products are portable, don't require refrigeration and encourage adequate nutrient intake before, during and after activity, thereby providing energy and promoting recovery.[3,30] However, sports supplements also tend to be more expensive than food-based snacks or beverages. Most studies indicate that supplements are not necessary if individuals are meeting their required nutrient intake from food and are maintaining their body weight.[2] People who are physically active but restrict their energy intake or the variety of food they eat (such as with low-carbohydrate diets and fat avoidance) may be at risk of not meeting their energy, protein or micronutrient needs from food alone.[2,3]

Bottom Line: *Physically active individuals generally don't need sports supplements (protein powders, vitamin or mineral supplements, sports bars, etc.) if they are eating a balanced diet that meets their energy needs.[2] The convenience of a sports supplement must be weighed against its typically higher price compared with whole-food sources of energy and nutrients.[30]*

Q&A

Q. Are physically active vegetarians able to meet their nutrient needs through diet alone?

A. Vegetarians, including those who are physically active, are able to meet their nutrient and energy needs by eating a variety of food from the four food groups, as recommended by *Canada's Food Guide*.[13,23] A vegetarian diet that provides sufficient energy and that includes a variety of both grain and legume sources of protein can provide the same overall quality of protein as a diet that includes animal protein.[13,31] Active vegetarians are more likely to meet their protein requirements if they include eggs and milk products in their diet.[31]

Q. Is it possible to drink too much water?

A. Hyponatremia is a potentially life-threatening condition that can occur when fluid intake is greater than urinary and sweat losses during or after prolonged high-endurance physical activity. There is some contention that excessive sodium loss may also be a factor. Although rare, hyponatremia is most commonly seen in novice athletes or less-experienced individuals participating in physical activities lasting longer than four hours and who drink "plenty" of water before, during and after the activity because they have heard it is important to stay hydrated. Excessive drinking behaviour in these individuals results in the overconsumption of fluids (in excess of fluid losses to sweat and urine) and an increase in total body water. Fluid losses due to physical activity vary greatly and individuals should consult a Registered Dietitian with expertise in sports nutrition if they are planning to train for a prolonged endurance activity.[13,25,32]

Q. When is a sports drink appropriate?

A. Sports drinks were developed to specifically address fluid losses during athletic events.[33,27] Sports drinks contain about 4% to 8% carbohydrates as well as the electrolytes sodium and potassium, which are lost in sweat. The carbohydrates help keep blood sugar levels up during physical activity, improve endurance and replace glycogen (the form of carbohydrate energy stored in muscles) after exercise. Some people may find sports drinks more palatable than water and thus these drinks can encourage fluid intake during and after prolonged or intense physical activities. Sports drinks may be useful when[33,27]:

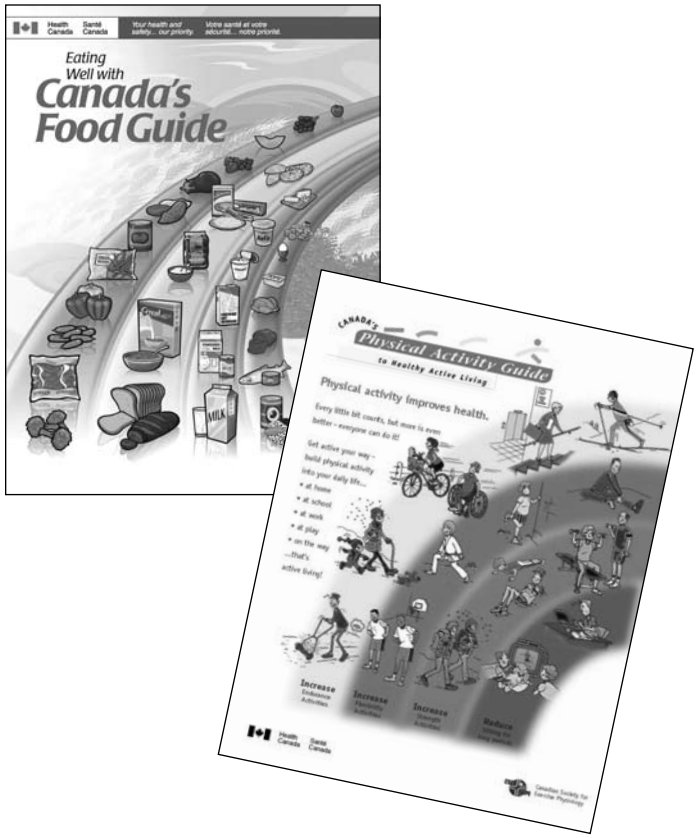
- Sweating a great deal, such as during intense activities in a hot environment
- Exercising very strenuously or for a prolonged period (longer than one hour)
- Exercising in hot and humid conditions while wearing protective equipment such as hockey or football gear
- Participating in multiple sessions in a day or in a multiple-day competition and quick recovery is essential

You can make your own sports drink by mixing 500 mL of water, 500 mL of unsweetened orange juice and 1.25 to 1.75 mL of salt.[34] Note that "energy drinks" are not sports drinks; energy drinks are meant to revive mental alertness in people having difficulty staying awake. Energy drinks contain much more carbohydrates than sports drinks do and may upset the stomach during physical activity.[35]

Conclusion

The consensus of experts is that good nutrition habits facilitate successful participation in physical activity.[2] Following the dietary guidelines in *Canada's Food Guide* provides the energy and other nutrients needed for physical activity; extra servings from the four food groups may be required by very active individuals who are at a healthy weight.[11,29] However, the timing of food and fluid intake around physical activity is also important to ensure that the body has the energy and nutrients it needs to participate in activity, as well as to refuel and repair muscles after the activity.[2,29]

Dietary guidelines for competitive athletes and study results pertaining to this group do not apply to the general population.[1] Competitive athletes and those unsure of whether they are meeting their nutrient requirements should consult a Registered Dietitian.



References

1. Rosenbloom C (2006). Fueling athletes: facts versus fiction on feeding athletes for peak performance. Nutr Today 41:227–232.
2. Dietitians of Canada, American Dietetic Association, American College of Sports Medicine (2000). Position statement, endorsed by the Coaching Association of Canada. Can J Diet Prac Res 61:176–192.
3. International Olympic Committee Medical Commission Working Group on Sports Nutrition (2003). Nutrition for athletes. http://multimedia.olympic.org/pdf/en_report_833.pdf.
4. Burke LM, Cox GR, Cummings NK, Desbrow B (2001). Guidelines for daily carbohydrate intake: do athletes achieve them? Sports Med 31:267–299.
5. Zello G (2006). Dietary reference intakes for the macronutrients and energy: considerations for physical activity. Appl Physiol Nutr Metab 31:74–79.
6. Dietitians of Canada (2008). http://www.dietitians.ca/public/content/find_a_nutrition_professional/find_a_dietitian.asp.
7. Coaching Association of Canada (2008). http://www.coach.ca/eng/nutrition/find.cfm.
8. Public Health Agency of Canada, Canadian Society for Exercise Physiology (1998). Canada's physical activity guide. http://www.phac-aspc.gc.ca/pau-uap/paguide/index.html.
9. Warburton DER, Katzmarzyk PT, Rhodes RE, Shephard RE (2007). Evidence-informed physical activity guidelines for Canadian adults. Appl Physiol Nutr Metab 32(Suppl 2E):S16–S68.
10. Health Canada (2007). Eating well with Canada's food guide. http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/index-eng.php.
11. Health Canada (2007). Eating well with Canada's food guide: a resource for educators and communicators. http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/educ-comm/index-eng.php.
12. Mansfield B (July 2008). Personal communication.
13. Institute of Medicine (2006). Dietary reference intakes: the essential guide to nutrient requirements. Washington: National Academies Press.
14. Philips S (2004). Protein requirements and supplementation in strength sports. Nutrition 20:689–695.
15. Bernardot D (2005). Advanced sports nutrition. Champaign, IL: Human Kinetics.
16. Tipton K, Wolfe R (2004). Protein and amino acids for athletes. J Sports Sci 22:65–79.

17. Wilkinson SB, Tarnopolsky MA, MacDonald MJ, MacDonald J, MacDonald JR, Armstrong D, Phillips SM (2007). Consumption of fluid skim milk promotes greater muscle protein accretion after resistance exercise than does consumption of an isonitrogenous and isoenergetic soy-protein beverage. Am J Clin Nutr 85:1031–1040.
18. Campbell W, Leidy HJ (2007). Dietary protein and resistance training effects on muscle and body composition in older persons. J Am Coll Nutr 26:696S–703S.
19. Helge JW, Stallknecht B, Richter EA, Galbo H, Kiies B (2007). Muscle metabolism during graded quadriceps exercise in man. J Physiol 581:1247–1258.
20. Heart and Stroke Foundation (2008). http://www.heartandstroke.on.ca/site/apps/nlnet/content2.aspx?c=pvI3IeNWJwE&b=4147011&ct=5689457.
21. Whiting S, Barabash W (2006). Dietary reference intakes for the micronutrients: considerations for physical activity. Appl Physiol Nutr Metab 31:80–85.
22. Sinclair L, Hinton P (2005). Prevalence of iron deficiency with and without anemia in recreationally active men and women. J Am Diet Assoc 105:975–978.
23. Barr S, Rideot CA (2004). Nutritional considerations for vegetarian athletes. Nutrition 20:696–703.
24. Dietitians of Canada (2000). Are you winning at sports nutrition? http://www.dietitians.ca/english/pdf/2000_sports_nutrition_factsheet.pdf.
25. American College of Sport Medicine (2007). Exercise and fluid replacement. Med Sci Sports Exerc 39:377–390.
26. Karp J, Johnston J, Tecklenburg S, Mickleborough T, Fly A, Stager J (2006). Chocolate milk as a post-exercise recovery aid. Int J Sport Nutr Exerc Metab 16:78–91.
27. Ontario Ministry of Health Promotion, EatRight Ontario (2008). Nutrition and active living FAQs. http://www.eatrightontario.ca/en/ViewDocument.aspx?id=40.
28. Ledoux M (2005). Food for performance: the ultimate ergogenic aid. Food strategy to maximize performance. http://www.coach.ca/sportleadershipsportif/2005/e/presentations/documents/SLS05_Ledoux_C6.pdf.
29. Dietitians of Canada (2000). The nutrition file: nutrition and athletic performance. http://www.dietitians.ca/news/downloads/sport_nutrition_file_english.pdf.
30. Clark N (2003). Nancy Clark's sports nutrition guidebook, 3rd ed. Champaign, IL: Human Kinetics.
31. Sport Nutrition Advisory Committee (2005). Vegetarian ways of eating: finding the nutrients. http://www.coach.ca/admin/pdf_admin/pdf/Vegetarian%20Ways%20of%20Eating%202005.pdf.
32. Exercise-Associated Hyponatremia Consensus Panel (2005). Consensus statement of the 1st International Exercise-Associated Hyponatremia Consensus Development Conference. Clin J Sport Med 15:208–213.
33. Dietitians of Canada (2005). Sports drinks: their role in hydration for athletic performance. http://www.dietitians.ca/resources/resourcesearch.asp?fn=view&contentid=5853.
34. Sport Nutrition Advisory Committee (2002). Fluids for athletes. http://www.coach.ca/eng/nutrition/everyday_eating/index.cfm.
35. Health Canada (2008). Safe use of energy drinks. http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/prod/energy-energie-eng.php.
36. Watson P, Love TD, Maughan RJ, Shirreffs SM (July 2008). A comparison of the effects of milk and a carbohydrate-electrolyte drink on the restoration of fluid balance and exercise capacity in a hot, humid environment. Eur J Appl Physiol (published online, accessed via SpringerLink).
37. Shirreffs SM, Watson P, Maughan RJ (2007). Milk as an effective post-exercise rehydration drink. Br J Nutr 98:173–180.

If you are interested in being on our mailing list please visit our health professional Web site: www.dairynutrition.ca (click on "newsletter" at upper righthand corner of page to subscribe).

To see archived issues of *Spotlight* please visit www.dairynutrition.ca
(click on Nutrition > Our Newsletters > Spotlight).

For hard-copy subscriptions in Ontario call 1-866-392-9929 and in the Maritimes call 1-800-465-2697.

Spotlight is a free newsletter written by Registered Dietitians for health professionals. It is available in French and English and covers current research on milk-related issues.

A client-friendly fact sheet accompanies this newsletter.