Recommendations

- Following the principles of healthy eating outlined in Eating Well with Canada's Food Guide will help support physical activity as outlined in the Canadian Physical Activity Guidelines.
- For individual guidance related to enhancing athletic performance for training and competitive sport, referral to a dietitian with expertise in sports nutrition is recommended.
- Fluid requirements for the average adult are approximately 2.25–3 L (9 to 12 cups). These requirements increase with increased activity due to fluids lost through sweat. Other variables that influence the requirements for active individuals include individual sweat rates, intensity and duration of the activity, and weather.
- Drinking before, during, and after exercise can help maintain hydration.
- For physical activity that is moderate to vigorous intensity, eating prior to exercise is important to prevent fatigue and maintain hydration. The timing of food is also important and can impact performance.
- Consuming sports drinks provides carbohydrate, fluid, and electrolytes and is helpful during intense exercises like soccer, interval training, CrossFit®, or another intense activity that lasts longer than one hour.
- Deciding what to eat before an activity depends on the time, length, and intensity of the activity, and when the last meal was consumed.
- Choosing foods to eat prior to activity that are lower fibre, lower fat, and low-to-moderate protein may be better tolerated.
- A recovery meal rich in carbohydrate and protein is recommended within 30 minutes of completing intense activity lasting longer than one hour.
- Protein needs for the average healthy adult may be met following the principles of healthy eating. For people who exercise regularly and intensely, protein needs can be higher.
- If choosing physical activity for health benefits, a sports performance supplement is not necessary. If looking to improve performance in a specific sport, consult with a dietitian with expertise in sports nutrition to determine if a sports supplement would help enhance performance.

The Rationale for this Guideline

Regular and adequate levels of physical activity in adults reduce the risk of many chronic diseases and can improve bone health and functional health.[1]

The Canadian recommendations for physical activity can be found at the Canadian Society for Exercise Physiology at www.csep.ca.

This nutrition guideline will help answer questions related to eating and drinking for various types of physical activity. The amount of physical activity recommended for health benefits generally do not require specific sports nutrition advice. Needs can be met by following the principles of healthy eating.

For individual guidance related to enhancing athletic performance for training and competitive sport, referral to a dietitian with expertise in sports nutrition is recommended.

There are some terms in bold. These are defined at the end of the Nutrition Guideline.

Key Questions

What are the recommendations for healthy eating for activity?

Following a healthy well-balanced diet will provide adequate energy and nutrients from food.

The recommended nutrition guidelines for healthy eating for activity can be found in the *Nutrition Guideline: General Healthy Eating Guideline for Children and Adults.*

What is the role of fluid in physical activity and sports?

Maintaining adequate hydration contributes to optimal health and exercise performance.[2] Fluid requirements for the average adult are approximately 2.25–3 L (9 to 12 cups) of fluids per day. Fluid requirements increase with increased activity due to fluids lost through sweat. Variables that influence daily fluid requirements for active individuals include:

- individual sweat rates
- intensity and duration of the activity
- weather

Water, milk, and/or soy beverages are examples of fluids to choose most often, but 100% fruit juice, sports drinks, tea, and coffee also provide fluid. It is important to begin physical activity in a well-hydrated state.

An inadequate fluid intake can lead to dehydration and negatively impact physical and mental performance.[3]

Sometimes individuals can overhydrate during exercise if they drink more than their sweat losses. Women generally have a smaller body size and lower sweat rates and appear to be at greater risk of overdrinking.[2] In individuals who run marathons, overhydration is more likely to occur in smaller, less lean individuals who run slowly and sweat less. This is mainly seen in recreational exercisers who work at low intensity but drink large volumes of fluid. Although the risk of dehydration is greater than overhydration, overhydration may be dangerous and require prompt medical attention.[2]

To stay well hydrated:

- Drink throughout the day.[3]
- Choose water or a sports drink during exercise.
- Having flavour in beverages can increase the likelihood that an individual will drink it.[2]

Sports drinks are flavoured drinks that typically have carbohydrate, sodium, and potassium and are meant to rapidly deliver fluid and fuel during and after exercise.[4] They can be useful in the following situations:[3]

- intense exercise
- exercise lasting longer than one hour
- exercise that takes place in hot or humid weather
- when wearing heavy sports equipment like in football or hockey
- when an individual has more than one sporting event per day such as a soccer or hockey tournament

Table 1. Fluids Before, During, and After Exercise[3]

Time	Volume of fluid
4 hours before exercise	Drink 1–2 cups (250–500 mL) of fluid.
2 hours or less before exercise	Drink ½–1½ cups (125–375 mL) of fluid.
During exercise	Sip fluid during activity.
Immediately after exercise	If an individual drinks regularly and there was no weight change, drink according to thirst for the rest of the day. If the individual lost weight, drink 2–3 cups of fluid (500–750) mL per 0.5 kg (1 lb) of weight lost.

To check if an individual is drinking enough:

- A pale yellow urine colour is a sign that an individual is well hydrated.
- To test if an individual is drinking enough fluid for activity, measure weight before and after activity (void and remove sweaty clothing in post-exercise weighing). This can estimate sweat losses and help the individual customize their fluid replacement. 1 kg body weight loss represents 1 L sweat loss.[2] (Refer to Table 1 above). Weight gain during an activity is a sign of overhydration. Drinking too much can cause low blood sodium levels (hyponatremia). Symptoms of hyponatremia include:
  - swollen hands and feet
  - vomiting
  - confusion
  - wheezing
  - weight gain during exercise or competition
  - in rare cases, death.

The goal of drinking during exercise is to prevent excessive dehydration (>2% body weight loss). Losing more than 2% body weight in fluids means the individual needs to drink more during that activity.[5]

Avoid drinking soft drinks or full-strength juice as this can cause stomach upset.[3]

Does an individual need to eat before physical activity?

Deciding what to eat before an activity depends on the time, length, and intensity of the activity, and when the last meal was consumed.

For moderate to vigorous intensity physical activity, eating prior to exercise is important to prevent fatigue. The timing of food is also important and can impact performance.

Choosing foods to eat prior to the activity that are lower in fibre, low-to-moderate in protein, and lower in fat may be better tolerated.[2] High fibre foods such as beans, peas, lentils, or bran breakfast cereals may cause stomach upset.

Carbohydrate and protein before activity

Foods with carbohydrate provide the fuel needed for the brain and muscles. Foods with carbohydrate include:

- Bread, pitas, bagels, wraps, crackers, plain cereals
- Rice, pasta, quinoa, couscous, barley, other grains
- Fruit like bananas, oranges, apples, pears, grapes, melons
- Starchy vegetables like potatoes, sweet potatoes, yams, winter squash, corn

Include foods with protein in meals when there is more time for digestion before activity. Protein is an important nutrient to help with feelings of fullness and for building and maintaining muscle. Foods that provide protein include:

- lean meats, poultry, fish, seafood
- milk, yogurt, cheese, cottage cheese
- beans, peas, lentils
- tofu, soy products, fortified soy beverage
- nuts, seeds

How much to eat before an activity

The more time before activity, the bigger the meal or snack can be as the body has more time to digest the food. Before high-intensity exercise, eating a smaller meal may help prevent stomach upset. This response is individual.

Meal examples: 1–4 hours before starting an activity[6]

- Peanut butter and banana on a bagel
- Oatmeal with low-fat milk, and a banana
- Low-fat cottage cheese or yogurt and granola and fruit
- Lean meat (chicken breast, ham), tomato, lettuce, cucumber in a wrap

Snack examples 30-60 minutes before exercise

- A piece of fruit, applesauce, crackers, a jam sandwich

What should an individual drink or eat during activity?

Consuming food during brief exercise is not necessary (<45 minutes).[7]

Consuming sports drinks provides carbohydrate, fluid, and electrolytes and is helpful during intense exercises like soccer, interval training, CrossFit®, or other intense activity that lasts longer than one hour.[8] Other examples include full or half marathons, long cycling rides or races, and hockey games or tournaments.

Table 2. Carbohydrate Needs for Activity Type[8]

Type	Duration of Activity	Amount of carbohydrate needed	Examples of food/drink with carbohydrate
Brief exercise	<45 minutes	Not needed	
Sustained high intensity	45–75 minutes	Very small amounts. including rinsing mouth with carbohydrate (swilling or significant duration of mouth contact)	A **mouth rinse** with a beverage containing carbohydrates (like a sports drink) can stimulate the nervous system.
Endurance exercise *including "stop and start" sports (like soccer, basketball and football)	1–2.5 hours	30–60 g/hour	Bagel, plain 1 whole (100 g): 52 g Banana, 1 large (136 g): 31 Crackers, saltine, 10: 22 g Pretzels,18 g (about 30 sticks): 15 g Raisins, seedless 1 small box (42 g): 33 g Sports drink (fruit-flavoured) 500 mL: 25–40 g
During **ultra-endurance exercise**	>2.5–3 hours	Up to 90 g/hour	Products that provide **multiple transportable carbohydrates** like some sports drinks or sports gels.

Sports gels are more concentrated in carbohydrates than sports drinks and provide a large fuel burst in a single serving.[4] Sports gels can be used instead of sports drinks for exercise lasting longer than one hour.[2]

Active individuals should practice finding a refuelling plan during an activity that suits their individual goals, which includes hydration requirements and intestinal comfort.[2]

Carbohydrate needs of training and competition are well established in adults. There is little evidence that they differ substantially for adolescents. Some training and competition requirements may differ in youth because sports can have different rules, game duration, or race lengths. This may require an adjustment in carbohydrate intake to match demands of the activity.[9]

When is it necessary for individuals to eat after activity for recovery purposes?

A recovery meal rich in carbohydrate and protein is recommended within 30 minutes of completing intense activity lasting longer than one hour. Carbohydrates will replenish glycogen (stored glucose) and protein will help to repair muscle damage and build strength. Eating a recovery meal is especially important if exercise is occurring twice on the same day or on back to back days. It is not needed if exercise is lasting less than one hour or after lighter physical activity such as walking, yoga, leisure swimming or bike riding.[10]

Recovery meal and snack examples to try[10]

- Greek-style yogurt with low-fat granola
- Whole grain cereal such as oatmeal with low-fat milk or fortified soy beverage
- Whole grain pita, lean chicken, tuna, or salmon and low-fat mayonnaise
- Brown rice or quinoa with grilled fish and steamed vegetables

What about sports drinks and energy drinks for children and youth?

Sports Drinks

For active youth engaged in routine physical activity, the use of sports drinks in place of water is not necessary. This is because sweat sodium losses are generally lower in young athletes compared with adults, and the consumption of sports drinks may lead to excessive calorie intake. However, for competitive adolescent athletes, the use of carbohydrate/electrolyte based sports drinks may offer benefits by providing additional carbohydrate and fluid in prolonged and vigorous sports.[9]

For recovery between events which occur in close proximity, the use of carbohydrate/electrolyte based sports drinks or milk can offer benefits by providing additional carbohydrate, fluid, sodium, and protein.[9]

Note that sweat rates vary in youth and young athletes need to monitor to ensure they are well hydrated before starting exercise, especially in hot environments. This can be done by monitoring body weight changes over the exercise session (compare body weight pre- and post-exercise). It is suggested that the athlete's weight should not change >2% of their pre-exercise weight.[9]

Energy Drinks

Note that sports drinks are not the same as caffeinated energy drinks and adolescent athletes should not be encouraged to consume energy drinks to support the demands of sporting activities.[9]

Energy drinks typically contain high amounts of carbohydrate along with nutrients purported to improve attention and mental alertness. Low-calorie energy drinks are marketed to increase mental alertness, energy metabolism, and performance.[11]

The potential ergogenic (work-enhancing) value of energy drinks comes from the caffeine and carbohydrate contained in them.

Energy drinks are not recommended for children because of their high levels of caffeine and other ingredients. In some cases, one energy drink could have more caffeine than the safe daily intake for many children and teens. Energy drinks should not be used as a fluid replacement.[12]

For more information refer to *Nutrition Guideline: Food and Drinks High in Calories, Fat, Sugar, or Salt*

Do individuals need to take a multivitamin supplement to meet their needs when they participate in physical activity?

For most people, eating the types and amounts of food recommended by Canada's Food Guide provides the vitamins and mineral needed.[13]

Alberta Health Services recommends that all Albertans take a vitamin D supplement every day, year round.

Iron deficiency can impair muscle function which can lead to impaired athletic performance. Inadequate iron consumption from food sources and inadequate energy intake, periods of rapid growth, training at high altitudes, foot-strike hemolysis (from marathon running or other running sports), blood donation, or injury can affect iron status.

It is important to discuss supplementation with a doctor or Registered Dietitian.

For more information refer to *Nutrition Guidelines: Vitamins and Minerals; Calcium and Vitamin D for Prevention and Treatment of Osteoporosis; and Iron*

How much protein is necessary?

Protein provides the building blocks of all tissues and is composed of amino acids. It is an essential nutrient that is important for building and maintaining muscle. An exercise stimulus, like resistance training in particular, and protein are both necessary to stimulate muscle protein synthesis.[14] With physical exertion, protein requirements for athletes and active adults are greater than sedentary populations.[15]

Protein needs for the average healthy adult are 0.8 grams per kilogram (g/kg) of body weight per day. For people who exercise regularly and intensely, protein needs can be higher, up to 1.2–2.0 g/kg of body weight per day.[8]

A practical approach is to aim for 20–40 g of protein per meal.[15]

Table 3. Protein Content of Some Common Foods[8]

Food	Amount	Protein (g) approximate
Meat, fish, poultry or shellfish, cooked	2 ½ oz (75 g):	21
Yogurt, Greek (plain)	¾ cup (175 g)	17
Cheese	1 ½ oz (50 g)	12
Hemp seeds	¼ cup (60 mL)	13
Cow's milk	1 cup (250 mL)	9
Yogurt	¾ cup (175 g)	8
Peanut butter	2 Tbsp (30 mL)	7
Nuts, shelled (varies by type)	¼ cup (50 mL)	7

What is the optimal time to eat protein?

The optimal time during which to eat protein is a matter of tolerance since the benefits are derived if the protein is consumed either before or after the workout or activity. Total protein (and energy) intake are important of building or maintaining muscle.[14]

Protein should be evenly distributed into about 3–4 meals or snacks across the day. This would be around every 3–4 hours.[8,14]

Are protein powder supplements necessary?

Protein is a nutrient that is essential in building and maintaining muscle and supporting muscle recovery after exercise. Research shows that taking protein after intense exercise can help build muscle and repair muscle damage. Protein supplements have not been shown to be better than protein-rich foods like meat, fish, poultry, milk, yogurt, eggs, and soy for building muscle.[16]

The protein in protein supplements comes from many sources like milk-based proteins (whey and casein), soy, hemp, and peas. Milk-based proteins contain all the essential amino acids and are considered complete proteins. Amino acids are the building blocks of protein. Essential amino acids cannot be produced in the body and need to be consumed from food. Soy is also a complete protein but contains less essential amino acids than milk proteins.[14] Animal and dairy-based protein have the highest amounts of essential amino acids when compared to vegetarian ones. Milk-based proteins have high levels of the amino acid leucine. Getting enough leucine is important in helping your body build muscle.

Protein supplements are not necessary if an individual can meet their needs through dietary sources. Some people may choose protein supplements for ease and convenience.[16]

Individuals who are considering taking a supplement to gain muscle mass should consult a physician, Registered Dietitian, or pharmacist first.

Is creatine a necessary supplement?

Creatine is naturally found in muscle. It comes from animal sources such as meat and fish. There is a lot of evidence to support that it can improve performance in short duration sports (10-30 seconds, like sprinting), high intensity, or explosive power exercises like weightlifting or sprint cycling.[16] Creatine supplementation has been recommended for power/strength athletes for training adaptations (that is to get help the body get accustomed to the stress of a new training program). It is also recommended for athletes who sprint intermittently and recover during competition (football, soccer, basketball, tennis).[17]

The long-term safety of creatine supplementation by children and adolescents still undergoing growth and development has not yet been established. Organizations, like the American College of Sports Medicine, advise against creatine for the pediatric population (<18 years) and for pregnant and breastfeeding women.[7]

Are there special recommendations for individuals following a vegetarian diet?

A varied and well-planned vegetarian diet (lacto-ovo, lacto, or vegan) should meet the nutritional needs of individuals of all activity levels. Protein needs of vegetarian and non-vegetarian individuals are the same.

Individuals who follow a vegetarian diet need almost twice the amount of iron since the iron from plant foods is poorly absorbed. Training can also increase iron needs. Vegetarian athletes should have their iron checked yearly to determine if a supplement is needed.[18]

For more information refer to *Nutrition Guidelines: Vegetarian Eating; Calcium and Vitamin D for Prevention and Treatment of Osteoporosis; and Iron*

Are there other dietary supplements that can improve performance?

Sports supplements represent an ever-growing industry, but a lack of regulation in manufacturing and marketing means that individuals can fall victim to false advertising and unsubstantiated claims.[2]

The benefits of using supplements and sports foods include practical assistance to meet sports nutrition goals, prevention or treatment of nutrient deficiencies, a placebo effect, and in some cases a direct ergogenic (work-enhancing) effect. However, this must be balanced against risks and expense. There are relatively few supplements that claim benefits that are supported by sound evidence. Their use is best undertaken as an adjunct to a well-chosen nutrition plan.[2]

If choosing physical activity for health benefits, a sports performance supplement is not necessary. If looking to improve performance in a specific sport, consult with a dietitian with expertise in sports nutrition to determine if a sports supplement would help enhance performance.

Sports supplements are not justified in the case of young athletes who can make significant improvements in performance via maturation in age, sports exercise, and the development of a sports nutrition plan.[2]

How do I find a Registered Dietitian?

Visit the Dietitians of Canada website at www.dietitians.ca. Click on the link “Find a Dietitian”, and type the keywords “sports dietitian” into the search box. Fill out the criteria that will help find a Registered Dietitian that specializes in athletic performance/competitive sports.

Are there any handouts on nutrition and physical activity I can use with my patients?

Refer to approved provincial Alberta Health Services nutrition handouts to support patient education. For more information, contact Nutrition.Resources@albertahealthservices.ca

Canadian Society for Exercise Physiology at www.csep.ca.

Access to referenced Nutrition Guidelines can be found at:
https://www.albertahealthservices.ca/info/Page3505.aspx

Glossary

Exercise: Exercise is a subcategory of physical activity that is planned, structured, repetitive, and purposeful in the sense that improvement or maintenance of one or more components of physical fitness is the objective.[1]

Moderate activity: Requires a moderate amount of effort and noticeably accelerates the heart rate. Examples: brisk walking, dancing, gardening, traditional hunting and gathering, active involvement in games and sports with children, general building tasks like roofing, painting, carrying, and moving moderate loads.[1]

Mouth rinse: Routinely rinsing the mouth with a sports drink (approximately 25 mL) for 5 to 10 seconds and spitting it out has been shown to activate the central nervous system and positively affect performance during high-intensity exercise lasting about an hour.[19] Example: cycling

Multiple-transportable carbohydrates: This is a combination of carbohydrates (glucose and fructose or maltodextrin and fructose) that use different intestinal transporters for absorption so that carbohydrate delivery and oxidation can be increased. This can be beneficial in endurance exercise lasting three hours or more.[20]

Physical activity: Physical activity includes exercise as well as other activities which involve bodily movement and are done as part of playing, working, active transportation, house chores, and recreational activity.[1]

Recovery nutrition: This involves a nutrition to support the restoration and adaptation to the physiological stress of exercise. It is specific to each athlete and to each workout and depends on the extent of glycogen depletion, dehydration, and muscle damage. It can be a challenge for elite athletes who do 2-3 workouts a day or for recreational athletes who train once or twice a day in preparation for an endurance event.

Ultra-endurance exercise: Ultra-endurance competition is defined as events that exceed six hours in duration.[21]

Vigorous activity: Requires a large amount of effort and causes rapid breathing and a substantial increase in heart rate. Examples: running, walking/climbing briskly up a hill, fast cycling, aerobics, fast swimming, competitive sports and games, heavy shovelling and digging ditches, carrying/moving heavy leads.[1]

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