

April 4, 2017



Competition-Coaching Introduction L2T

Step 5: Nutrition



**Reference Material
for Dryland Workshop**



PARTNERS IN COACH EDUCATION

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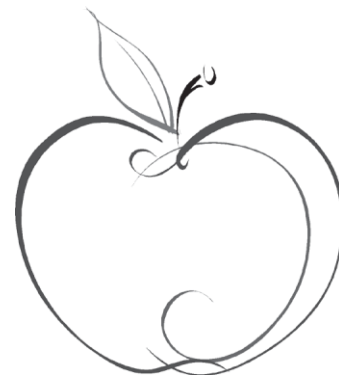
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5.1 Nutritional Needs of Endurance Athletes

A good diet and sufficient intake of fluids are important for health, growth and maturation, and may also have a significant effect on the ability of your athletes to train and perform well in competition. Maintaining good dietary habits plays an important role in establishing a healthy lifestyle. This may also help athletes perform to their best and promote faster recovery, for example when there are several training sessions or competitions on consecutive days.



On the other hand, you have to be realistic about how much you can influence your athletes' diet. The determining factor is more likely to be the involvement of the athletes' parents; they are usually the ones who decide the type of food eaten at home and the way it is prepared, both on a day-to-day basis and for meals before or after training or competition.

This section is not trying to make you an expert in sport nutrition! It contains information and simple, practical recommendations about diet and hydration before, during and after activity, both in practice and in competition. These recommendations will help you inform and influence your athletes and their parents on: (1) the importance of a good diet and hydration; and (2) how to put in place simple steps that will be useful for both the general good health of the athletes and their performance.

Specific problems like weight management, special diets, commercial products, combining foods based on their glycemic index, vegetarianism and eating disorders are well beyond the scope of this module. If you have questions on these topics, or if you are not sure what to recommend in certain situations, do not hesitate to consult an expert in sport nutrition.

Be aware of how much influence you can have on your athletes and their parents, and avoid making comments that could be misinterpreted, for example on an athlete's weight or size. If you are not an expert in sport nutrition, avoid giving advice on how to lose or gain weight; it could do more harm than good. Once again, it would be useful to consult an expert.

Nutritional Needs of Athletes Generally

An athlete's diet must be well balanced, supplying adequate energy and nutrients for optimum performance and providing for the repair and maintenance of tissues and for growth. In this respect, the nutritional needs of an athlete in training are not significantly different from the requirements of all healthy individuals. However, athletes should pay attention to the following:

- ❑ **Eating a Variety of Foods.** Foods from each group should be eaten every day (grain products, vegetables and fruits, milk products, meats and alternatives).
- ❑ **Sufficient Energy Intake.** There must be adequate dietary intake to meet the energy demands of training, competition and body weight maintenance. Energy requirements vary according to age, gender, body composition and amount and type of physical activity (related to exercise intensity and volume). In general, judged sports such as gymnastics, diving, skating and equestrian require less energy than endurance events like triathlon, swimming, cycling, cross-country skiing, road racing, speed skating, etc.

- ❑ **Sufficient Carbohydrate Intake.** Provided by the “grain products” food group, carbohydrate is the main energy source athletes rely on in most sports. Whether they are involved in high-intensity, short-duration events or in endurance events, athletes use carbohydrate as their main source of energy. Carbohydrate stored in muscles can be depleted after 75 – 90 minutes of moderate to high-intensity activity.
- ❑ **Sufficient Fluid Intake.** The need for water increases during exercise because of the loss of fluid caused by sweating and increased ventilation. This is important for all sports, including water sports, as dehydration can lead to a marked decrease in performance.
- ❑ **Sufficient Protein Intake.** An athlete requires slightly more protein than a sedentary person to provide for adequate maintenance of muscle mass and repair of tissues.

Nutritional Needs of Endurance Athletes

Athletes need an optimum mix of nutrients for different types of sporting events. There is a well known saying in sports nutrition: *“you can’t make an average athlete elite with a good diet, but you can make an elite athlete average with a poor diet!”* This section will deal with the most important nutrient for endurance athletes – carbohydrates.

The major storage fuel in the body is fat. However, the oxidation of fats for energy will only support running/cross-country skiing at tortoise-speed (about 50% VO₂ max.). In order to run or ski at more upbeat speeds, athletes have to break down carbohydrate (both simple sugars and complex starches), which is the high octane fuel for the muscle cells and the preferred source of energy for this task. All carbohydrate is broken down into glucose. This is the only type of carbohydrate (excluding lactate) that skeletal muscle can readily metabolize for energy or store as glycogen. However, an individual’s storage depots of glycogen are rather limited (350g in muscles and 100g in the liver of an average adult). It takes from 90-180 minutes of continuous exercise performed at 60-80% VO₂ max to deplete muscle glycogen stores, but only 15-30 minutes of exercise performed at very high intensities above 90% VO₂ max, such as interval sessions or competitions.

Optimizing recovery from exercise depends upon the type of exercise, the intensity and duration, as well as the time between training sessions or competitions. Athletes must learn how to maximize their glycogen stores (as well as to ensure proper rehydration and rest) – *i.e. they must learn to co-ordinate nutrition with training!*

The resynthesis of glycogen begins immediately after exercise. The most rapid resynthesis occurs during the first five/six hours of recovery from exercise. Eating or drinking carbohydrate immediately after exercise accelerates this process. It has been found that the highest rate of muscle glycogen resynthesis may be achieved when carbohydrate is consumed at the rate of 1.2g per kg body weight per hour during the initial five hours of the recovery process (taken in 15-30 minute intervals). Approximately 10g of carbohydrate per kg body weight should be sufficient to replenish glycogen stores within 24 hours after a hard training session or competition.

An example of a 24 hour carbohydrate (CHO) nutrition recovery plan is as follows:

- ❑ A 70kg athlete has just finished a 10 km race and is scheduled to race again in 24 hours.
- ❑ He/she needs approximately 10g CHO per kg of body weight to restore muscle glycogen levels within 24 hours. 70kg x 10g CHO = 700g CHO required.

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- ❑ CHO should be consumed at the rate of 1.2g CHO/kg/per hour for the first five hours. $70 \text{ kg} \times 1.2 \text{g CHO} = 84 \text{g per hour}$. This is best taken in 15-30 minute intervals. Thus 42g per 30 minutes or 21g per 15 minutes is required.
- ❑ $84 \text{g per hour} \times 5 \text{ hours} = 420 \text{g}$ consumed in five hours. Therefore the athlete would need to consume an additional 280g (700g minus 420g) over the next 19 hours (24 hours minus five hours) to optimize recovery.

Other important factors an athlete should consider in order to optimize recovery:

- ❑ The type of carbohydrate consumed during recovery may have an influence on the rate of muscle glycogen resynthesis. Some studies have indicated that it may be more effective to consume high glycemic index (HGI) carbohydrate in the first few hours post exercise, and then switch to low glycemic index snacks (meals) for the remainder of the recovery. Sports drinks are typically HGI. As well, these drinks assist in rehydration, which is an essential part of the recovery. Further studies are required in order to determine the mix of carbohydrate that maximizes glycogen restoration.
- ❑ Some studies indicate that consuming a protein-carbohydrate mixture immediately after exercise increases the rate of post exercise muscle glycogen resynthesis beyond that which occurs with carbohydrates alone. Other studies contradict this. However, some of the studies report that there was less post-exercise muscle soreness when a protein-carbohydrate drink is used. This may be due to the fact that small amounts of muscle protein are degraded and converted to fuel during exercise. It would therefore be prudent for athletes to add a high quality protein to their recovery drink in the event that further studies prove that protein increases the resynthesis of glycogen. The protein would also be beneficial for long-term recovery over days and weeks as it would help with net protein synthesis in the muscles.
- ❑ Rehydration post exercise is optimal when athletes ingest a volume of fluid equivalent to 150% of the body weight loss.
- ❑ **Carbohydrate Consumption During Exercise or Competition.** During long distance training sessions (longer than 45 minutes), or interval sessions (although short in duration), an athlete should drink 90-120mL (approximately three sips) of a sport drink every 10-15 minutes. Likewise, an athlete in a cross-country ski competition that is in hilly terrain and more than 11 km in length should consume a carbohydrate feed en route. These frequent feedings have a muscle glycogen sparing effect.
- ❑ **Pre-Race Carbohydrate Consumption.** A pre-race sport drink or gel taken anywhere from one/two hours prior to an event can top-up an athlete's tank of carbohydrates and act as a muscle glycogen sparing technique. Individuals respond differently to this intake, so all athletes need to experiment themselves to find out how close to a competition they can consume a sport drink or gel.
- ❑ **Carbohydrate Consumption During Cross-Country Ski Sprint Competitions.** As has been pointed out, carbohydrate consumption immediately after exercise accelerates muscle glycogen resynthesis. This is true even during short recovery periods such as the period between heats in a sprint race where HGI carbohydrate consumption

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should take place approximately every 15 minutes. The formulation of the recovery drink should be similar to the 24 hour recovery drink.

❑ **Food items containing 20-25 grams of carbohydrate:**

- ✓ Two cups of skim milk.
- ✓ A little more than half a bagel.
- ✓ A 2/3 cup serving of cooked pasta.
- ✓ An apple OR a banana OR a pear.
- ✓ Four dates.
- ✓ A cup of orange juice.
- ✓ 1/5 cup of raisins (or two 1/2 oz packages).
- ✓ A medium baked potato.
- ✓ A slice and a 1/4 of most breads.
- ✓ An English muffin.
- ✓ A cup of oatmeal.
- ✓ One and a half cups of Special K cereal.
- ✓ 1/2 cup of cooked rice.
- ✓ Two tablespoons of jelly or jam.

❑ **Food items containing 50 grams of carbohydrate:**

- ✓ Four oz of whole wheat bread.
- ✓ Seven oz of whole grain rice.
- ✓ Two and a half oz of shredded wheat cereal.
- ✓ Seven oz baked potato.
- ✓ Nine oz banana.
- ✓ Two and three quarter oz of raisins.
- ✓ Seven oz of spaghetti.
- ✓ Two and a half oz of oatmeal.
- ✓ Eleven oz green grapes.
- ✓ Approximately 1 lb of oranges.

Sample Diets for Different Types of Sports

The following table identifies an action plan for athletes in different types of sports based on Canada's Food Guide. The appropriate dietary action plan should supply adequate energy to meet an athlete's current training demands. The number of recommended servings represents minimum quantities. Note: growth, gender and body size will influence energy needs.

Sample Diet - Recommended Servings Per Day

Food Group	Select an Action Plan		
	Judged Sports For athletes in judged sports, such as gymnasts, divers, and figure skaters	Team Sports For most athletes, including players in team sports	Endurance Sports For endurance athletes e.g., cross-country skiers, swimmers, cyclists competing in road-racing, cross-country runners, triathletes, speed skaters
Refer to <i>Canada's Food Guide</i> for examples of servings from each food group	NO ATHLETE SHOULD EAT LESS THAN THE MINIMUM NUMBER OF SERVINGS		
Grain Products	Minimum of 6 servings	10 servings or more	15 servings or more
Vegetables and Fruit	Minimum of 7 servings	10 servings or more	15 servings or more
Milk Products	3-4 servings	3-4 servings	3-6 servings
Meat and Alternatives	Minimum of 2 servings	2 servings	2-4 servings
Oils and Fats	Minimum of 30 to 45 mL (2 to 3 Tbsp) of unsaturated fat	Minimum of 30 to 45 mL (2 to 3 Tbsp) of unsaturated fat	Minimum of 30 to 45 mL (2 to 3 Tbsp) of unsaturated fat
Other Foods	Minimize – there just isn't room for extra energy coming from foods that are not nutrient-rich	Choose in moderation after you have enough servings from the other food groups	If you are finding it difficult to eat a large enough volume of food to meet your energy needs, extra sweets and fats can be added

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5.1.1 Nutrition Answer Sheet #1 (working copy)

A. My first answer	C. My answer after checking sections 5.1 and 5.1.2
B. More ideas after discussion with others	

5.1.2 Canada Food Guide

Recommended Number of Food Guide Servings per Day

Age in Years Sex	Children			Teens		Adults			
	2-3	4-8	9-13	14-18		19-50		51+	
	Girls and Boys			Females	Males	Females	Males	Females	Males
Vegetables and Fruit	4	5	6	7	8	7-8	8-10	7	7
Grain Products	3	4	6	6	7	6-7	8	6	7
Milk and Alternatives	2	2	3-4	3-4	3-4	2	2	3	3
Meat and Alternatives	1	1	1-2	2	3	2	3	2	3








The chart above shows how many Food Guide Servings you need from each of the four food groups every day.

Having the amount and type of food recommended and following the tips in *Canada's Food Guide* will help:

- Meet your needs for vitamins, minerals and other nutrients.
- Reduce your risk of obesity, type 2 diabetes, heart disease, certain types of cancer and osteoporosis.
- Contribute to your overall health and vitality.

What is One Food Guide Serving?

Look at the examples below.

 <p>Fresh, frozen or canned vegetables 125 mL (½ cup)</p>		 <p>Leafy vegetables Cooked: 125 mL (½ cup) Raw: 250 mL (1 cup)</p>		 <p>Fresh, frozen or canned fruits 1 fruit or 125 mL (½ cup)</p>		 <p>100% Juice 125 mL (½ cup)</p>					
 <p>Bread 1 slice (35g)</p>		 <p>Bagel ½ bagel (45 g)</p>		 <p>Flat breads ½ pita or ½ tortilla (35 g)</p>		 <p>Cooked rice, bulgur or quinoa 125 mL (½ cup)</p>		 <p>Cereal Cold: 30 g Hot: 175 mL (¾ cup)</p>		 <p>Cooked pasta or couscous 125 mL (½ cup)</p>	
 <p>Milk or powdered milk (reconstituted) 250 mL (1 cup)</p>		 <p>Canned milk (evaporated) 125 mL (½ cup)</p>		 <p>Fortified soy beverage 250 mL (1 cup)</p>		 <p>Yogurt 175 g (¾ cup)</p>		 <p>Kefir 175 g (¾ cup)</p>		 <p>Cheese 50 g (1 ½ oz.)</p>	
 <p>Cooked fish, shellfish, poultry, lean meat 75 g (2 ½ oz.)/125 mL (½ cup)</p>		 <p>Cooked legumes 175 mL (¾ cup)</p>		 <p>Tofu 150 g or 175 mL (¾ cup)</p>		 <p>Eggs 2 eggs</p>		 <p>Peanut or nut butters 30 mL (2 Tbsp)</p>		 <p>Shelled nuts and seeds 60 mL (¼ cup)</p>	

Make each Food Guide Serving count... wherever you are – at home, at school, at work or when eating out!

▶ **Eat at least one dark green and one orange vegetable each day.**

- Go for dark green vegetables such as broccoli, romaine lettuce and spinach.
- Go for orange vegetables such as carrots, sweet potatoes and winter squash.

▶ **Choose vegetables and fruit prepared with little or no added fat, sugar or salt.**

- Enjoy vegetables steamed, baked or stir-fried instead of deep-fried.

▶ **Have vegetables and fruit more often than juice.**

▶ **Make at least half of your grain products whole grain each day.**

- Eat a variety of whole grains such as barley, brown rice, oats, quinoa and wild rice.
- Enjoy whole grain breads, oatmeal or whole wheat pasta.

▶ **Choose grain products that are lower in fat, sugar or salt.**

- Compare the Nutrition Facts table on labels to make wise choices.
- Enjoy the true taste of grain products. When adding sauces or spreads, use small amounts.

▶ **Drink skim, 1%, or 2% milk each day.**

- Have 500 mL (2 cups) of milk every day for adequate vitamin D.
- Drink fortified soy beverages if you do not drink milk.

▶ **Select lower fat milk alternatives.**

- Compare the Nutrition Facts table on yogurts or cheeses to make wise choices.

▶ **Have meat alternatives such as beans, lentils and tofu often.**

▶ **Eat at least two Food Guide Servings of fish each week.***




- Choose fish such as char, herring, mackerel, salmon, sardines and trout.

▶ **Select lean meat and alternatives prepared with little or no added fat or salt.**


- Trim the visible fat from meats. Remove the skin on poultry.
- Use cooking methods such as roasting, baking or poaching that require little or no added fat.
- If you eat luncheon meats, sausages or prepackaged meats, choose those lower in salt (sodium) and fat.

*Health Canada provide advice for limiting exposure to mercury from certain types of fish. Refer to www.healthcanada.gc.ca for the latest information.

Advice for different ages and stages...

<p>Children</p> <p>Following <i>Canada's Food Guide</i> helps children grow and thrive.</p> <p>Young children have small appetites and need calories for growth and development.</p> <ul style="list-style-type: none"> • Serve small nutritious meals and snacks each day. • Do not restrict nutritious foods because of their fat content. Offer a variety of foods from the four food groups. • Most of all... be a good role model. 	<p>Women of childbearing age</p> <p>All women who could become pregnant and those who are pregnant or breastfeeding need a multivitamin containing foliac acid every day. Pregnant women need to ensure that their multivitamin also contains iron. A health care professional can help you find the multivitamin that's right for you.</p> <p>Pregnant and breastfeeding women need more calories. Include an extra 2 to 3 Food Guide Servings each day.</p> <p>Here are two examples:</p> <ul style="list-style-type: none"> • Have fruit and yogurt for a snack, or • Have an extra slice of toast at breakfast and an extra glass of milk at supper. 	<p>Men and women over 50</p> <p>The need for vitamin D increases after the age of 50.</p> <p>In addition to following <i>Canada's Food Guide</i>, everyone over the age of 50 should take a daily vitamin D supplement of 10 µg (400 IU).</p> 
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How do I count Food Guide Servings in a meal?



Here is an example:

Vegetable and beef stir-fry with rice, a glass of milk and an apple for dessert		
250 mL (1 cup) mixed broccoli, carrot and sweet red pepper	=	2 Vegetables and Fruit Food Guide Servings
75 g (2 1/2 oz.) lean beef	=	1 Meat and Alternatives Food Guide Serving
250 mL (1 cup) brown rice	=	2 Grain Products Food Guide Servings
5 mL (1 tsp) canola oil	=	part of your Oils and Fats intake for the day
250 mL (1 cup) 1% milk	=	1 Milk and Alternatives Food Guide Serving
1 apple	=	1 Vegetables and Fruit Food Guide Serving

Eat well and be active today and every day!

The benefits of eating well and being active include:

- Better overall health.
- Lower risk of disease.
- A healthy body weight.
- Feeling and looking better.
- More energy.
- Stronger muscles and bones.



Be active

To be active every day is a step towards better health and a healthy body weight.

It is recommended that adults accumulate at least 2 1/2 hours of moderate to vigorous physical activity each week and that children and youth accumulate at least 60 minutes per day. You don't have to do it all at once. Choose a variety of activities spread throughout the week.

Start slowly and build up.



Eat well

Another important step towards better health and a healthy body weight is to follow *Canada's Food Guide* by:

- Eating the recommended amount and type of food each day.
- Limiting foods and beverages high in calories, fat, sugar or salt (sodium) such as cakes and pastries, chocolate and candies, cookies and granola bars, doughnuts and muffins, ice cream and frozen desserts, french fries, potato chips, nachos and other salty snacks, alcohol, fruit flavoured drinks, soft drinks, sports and energy drinks, and sweetened hot or cold drinks.

Take a step today...

- ✓ Have breakfast every day. It may help control your hunger later in the day.
- ✓ Walk wherever you can – get off the bus early, use the stairs.
- ✓ Benefit from eating vegetables and fruit at all meals and as snacks.
- ✓ Spend less time being inactive such as watching TV or playing computer games.
- ✓ Request nutrition information about menu items when eating out to help you make healthier choices.
- ✓ Enjoy eating with family and friends!
- ✓ Take time to eat and savour every bite!



Read the label

- Compare the Nutrition Facts table on food labels to choose products that contain less fat, saturated fat, trans fat, sugar and sodium.
- Keep in mind that the calories and nutrients listed are for the amount of food found at the top of the Nutrition Facts table.

Limit trans fat

When a Nutrition Facts table is not available, ask for nutrition information to choose foods lower in trans and saturated fats.

Nutrition Facts

→ Per 0 mL (0 g)

Amount	% Daily Value
Calories 0	
Fat 0 g	0 %
Saturated 0 g	0 %
+ Trans 0 g	
Cholesterol 0 mg	
Sodium 0 mg	0 %
Carbohydrate 0 g	0 %
Fibre 0 g	0 %
Sugars 0 g	
Protein 0 g	
Vitamin A 0 %	Vitamin C 0 %
Calcium 0 %	Iron 0 %

5.1.3 Iron and Endurance Athletes

Iron depletion is a common nutrient deficiency worldwide. Despite the availability of iron-rich foods in Canada, cross-country skiers are at risk of iron depletion and developing iron deficiency. For example, iron depletion can develop quickly in any skier who participates in regular physical activity and has inappropriate, unplanned eating habits. Because endurance athletes are at higher risk than the general public, you should be aware of the principal causes of iron depletion in athletes and ways to prevent this from happening.

Iron and Anemia

The three key functions of iron are:

- ❑ Transport (hemoglobin) and storage (myoglobin) of oxygen.
- ❑ Energy production and cell diffusion.
- ❑ A functional role in the immune and central nervous system.

Iron deficiency is most commonly described as occurring in three stages.

- ❑ **Stage 1** - refers to the depletion of iron stores, which is characterized by low serum ferritin levels. Depleted iron stores have not been found to cause any dysfunction, although new data suggests that training adaptation may be improved when iron-depleted athletes increase dietary iron intake through iron supplementation.
- ❑ **Stage 2** - the major concern of iron depletion is that it may progress to Stage 2 - iron deficiency. Abnormalities such as reduced work capacity and exertional fatigue are seen in Stage 2, which can be detected by low serum iron, reduced transferrin saturation levels and low serum ferritin.
- ❑ **Stage 3** - iron deficiency anemia; this is the most severe stage, identified by a significant reduction in hemoglobin and hemtocrit levels and clear signs and symptoms of reduced work capacity, delayed recovery and greater susceptibility for illness.

Serum ferritin is an indirect measure of the total body iron stores, and can therefore provide an early warning signal that an individual is at risk for anemia (low hemoglobin). The body has a poor capacity to change iron stores rapidly, which makes an early warning sign especially important. If an athlete is anemic, it generally takes a long time to correct the situation.

The reported causes of iron deficiency are diverse and none fully explain this medical condition. Examples of likely causes include excessive sweating, gastro-intestinal bleeding, mechanical trauma, impaired iron absorption, heavy bleeding at time of menstruation, growth spurts and insufficient dietary intake of iron.

Treatment aims to normalize iron stores, and consists of: (1) increasing the dietary intake of absorbable iron; and (2) iron supplementation.

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Maximizing Iron Absorption

- ❑ Iron in food of animal origin is absorbed more readily than the iron from grains, legumes, nuts and seeds. As well, foods of animal origin enhance iron absorption from other food sources.
- ❑ Eating a good source of vitamin C (i.e. fruit such as orange, grapefruit, lemon, kiwi; vegetables such as peppers, tomato) at the same meal as iron-rich foods will improve iron absorption.
- ❑ Delay drinking coffee or any other source of caffeine (i.e. cola, chocolate and many medications) until several hours after a meal to reduce their negative effect on iron absorption.
- ❑ Avoid consuming large quantities of EDTA (a food additive) by checking and becoming familiar with the list of ingredients in commonly used food items.

Daily Intake Recommendations for Iron

The Canadian Recommended Nutrient Intake (RNI) for iron is as follows:

Age	Females	Males
13-15	13mg	10mg
16-18	12mg	10mg
19-49	13mg	9mg

These intake recommendations may not be sufficient for cross-country skiers, however, because iron loss increases as a result of sweating and the breakdown of hemoglobin during endurance training/competitions.

Norms of Serum Ferritin

In the general population the normal values for serum ferritin ranges from 30-233 ug/L. The recommended serum ferritin level for cross-country skiers is between 35-200 ug/L.

Monitoring and Supplementation

The risk of overdosing from reasonable daily supplementation is low. However you should be aware that an excess in iron stores (high serum ferritin) is a risk factor for heart disease, stroke, cirrhosis of the liver and diabetes. Moreover it can be toxic and people do die from overdosing on it (typically children).

Iron supplements should not be used without monitoring iron status. Monitoring will help detect low AND high iron levels.

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All cross-country skiers 14 years of age and older who are training more than 250 hours a year should have their hemoglobin and serum ferritin tested twice a year. Female skiers who are vegetarians, have a history of low serum ferritin and are training more than 250 hours a year should be tested three times a year.

When parents/athletes ask their doctor for a check-up, they should ask specifically for the serum ferritin test and hemoglobin test, as there are other types of blood tests for iron. Some medical practitioners may be reluctant to do these tests because they feel it is expensive and medically unnecessary. In case this happens, the parent/athlete should be prepared to explain clearly that the athlete is at high risk because of their involvement in endurance activities (and other reasons if they apply).

Competitive athletes should be encouraged to keep a record of their test results throughout their ski career.

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5.2 Nutrition Before, During and After a Competition

5.2.1 Nutrition Answer Sheet #2 (working copy)

Keep in mind that you are to choose ONE of three possible scenarios – nutrition before competition, nutrition between competitions or nutrition following competitions.

Our first suggestions	Our suggestions after reviewing section 5.2

5.2.2 Eating Well Before, During and After Activity

Priorities for a Competition Day

On a competition day, the aim is to ensure proper hydration and sufficient energy to allow the athlete to meet the demands of the activity. As a result, the focus should be on ensuring the following:

- ❑ The amount of food consumed is appropriate given the type of effort to be performed.
- ❑ The majority of food ingested is carbohydrate.
- ❑ The fat content of the food ingested is low.
- ❑ Enough water is consumed.

Recommended Foods

❑ General Characteristics

- ✓ *Rich in Carbohydrate.* The pre-event meal must be high in carbohydrate (65-70% of total calories consumed). Fat and protein, which take longer to digest, should be consumed in smaller amounts. For instance, pasta, rice, cereals, potatoes, bread, low-fat granola bars and dry cookies are all appropriate, as they are easy to digest and absorb.
- ✓ *Familiar.* Since pre-competition “nerves” can upset the stomach, athletes should be familiar and comfortable with the food. In other words, they should have tried it before, preferably in pre-exercise or training conditions.

❑ **The Best Choices When Breakfast is the Pre-Event Meal.** The following are examples of foods that are appropriate for breakfast the day of a competition or during training:

- ✓ Cereal – with low-fat milk.
- ✓ Yogurt – low-fat, plain or fruit.
- ✓ Fruit.
- ✓ French toast and/or pancakes – with no added butter or margarine.
- ✓ Egg dishes – not fried.
- ✓ Ham or steak – if lean/not fried (small amounts).
- ✓ Potato – not fried.
- ✓ Rice – not fried.
- ✓ Noodles, pasta.
- ✓ Toast – with limited amounts of butter/margarine.
- ✓ Muffins – try jam or jelly, not butter.
- ✓ Beverages – athletes should drink plenty of fluid!
- ✓ Bottled water.

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- ✓ Fruit juice – fresh, canned, cartons.
- ✓ Skim milk, Ovaltine.

❑ **The Best Choices When Lunch or Dinner is the Pre-Event-Meal.** The following are examples of foods that are appropriate for lunch or dinner before competition or training:

- ✓ Fruit and vegetables, fruit and vegetable juices – fresh, canned, cartons.
- ✓ Soups – broth-based.
- ✓ Meat, fish, poultry – broiled, roasted, baked, barbecued, poached (reasonable portions; trimmed fat; skin from chicken removed).
- ✓ Cold cuts – turkey, chicken, lean beef, lean ham (reasonable portions).
- ✓ Meat alternatives – beans, peas and lentil dishes if these are familiar foods; gas produced when these foods are not part of the usual diet can cause discomfort.
- ✓ Vegetables – steamed, boiled, baked.
- ✓ Potatoes – baked, boiled, mashed (without butter/margarine).
- ✓ Rice – steamed, plain.
- ✓ Noodles – plain.
- ✓ Pasta – plain or tomato or vegetable sauce.
- ✓ Bread – rolls, crackers, all breads.
- ✓ Salads – bean, peeled fresh vegetables, fruit salad, low-fat cottage cheese (small amount of dressing).
- ✓ Desserts – fruit, yogurt (low fat), custards, puddings.
- ✓ Cheese – in moderation.

Foods to Avoid

❑ **Characteristics.** The following should be limited before competition or training:

- ✓ Fatty foods, because they are slow to digest.
- ✓ Protein-rich foods, because they are slow to digest and are not needed as fuel during exercise.
- ✓ Alcoholic beverages such as wine and beer, because they can have a dehydrating effect.

❑ **Before competition or training, avoid the following foods (breakfast).** The following foods are high in fat, difficult to digest, or nutrient poor:

- ✓ Whole milk, cream.
- ✓ Fried eggs.
- ✓ Side bacon, sausage.
- ✓ French fries, hash browns.

- ✓ Fried rice.
- ✓ Cream or butter sauces.
- ✓ Doughnuts, Danishes, pastries.

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- ✓ Croissants.
- ✓ Butter, margarine.

❑ **Before competition or training, avoid the following foods (snack, lunch, or dinner.)**

The following foods are high in fat or nutrient poor:

- ✓ Cookies, crackers, chips, granola bars.
- ✓ Cream soups.
- ✓ Fried fish, meat, poultry.
- ✓ Buttered, sautéed, creamed vegetables, or soufflés.
- ✓ Fried potatoes.
- ✓ Butter or cream sauces.
- ✓ Pâté, sausages, processed meats, liverwurst.
- ✓ Potato and macaroni salad, creamy coleslaw.
- ✓ Salad dressing.
- ✓ Pies, ice cream, pastries.

Foods to be Wary Of

The following foods are not well tolerated before competition or practice and should therefore be treated with caution:

- ❑ Spicy foods may be difficult to digest before exertion. (When travelling in other countries, athletes can bring a few favourite spices if they are already used to them.)
- ❑ Fibre-rich foods like whole-grain bread, cookies, whole-wheat cereals and dried fruits (prunes, etc.) stimulate digestion and induce elimination. These foods should be avoided before exercise, especially if the athlete has diarrhoea.
- ❑ Gas-producing foods like cabbage, broccoli, onions and carbonated drinks make some athletes feel bloated.
- ❑ Coffee, tea, cola and chocolate may cause diarrhea, which can have a dehydrating effect.
- ❑ Alcoholic beverages can impair performance and have a dehydrating effect. In some sports, alcohol is a banned substance.

Digestion Period

The meal size and food choices will vary depending on the time between eating and performing. Athletes must allow sufficient time for digestion. High kcal meals, especially those high in fat content, take longer to digest than lighter snacks.

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The guidelines below should be used when planning meal times relative to a training session, a competition or a series of competitions held on the same day. Coaches should be aware of individual tolerance levels for food. Experiment with these guidelines in practice to establish an appropriate protocol for each athlete.

- Allow 3-4 hours for a large meal (approximately 500-800 kcal or more) to digest.
- Allow 2-3 hours for a smaller meal (approximately 300-500 kcal) to digest.
- Allow 1-2 hours for a small snack or blender/liquid meal to digest, or whatever the athlete's own tolerance indicates.

If the athlete will be competing within the next two hours, small quantities of carbohydrate are the best choice: fruit, beverages, low-fat crackers, bread, yogurt and/or well-cooked pasta. The athlete should also drink plenty of water, and when traveling, bottled water should be used.

General Food Safety Advice

The following suggestions apply to food served in cafeterias and restaurants or prepared for bag lunches taken to sport venues:

- Hot dishes (e.g. meat, casseroles, rice) should be served hot (not warm).
- Cold foods (e.g. cold cuts, salads, milk, dessert, sandwiches) should be served cold (not warm).
- If the meals at the venue have NOT been refrigerated, do NOT eat salads prepared with mayonnaise (e.g. macaroni, potato or creamy coleslaw) or egg-based dishes (including custards).
- Foods should be served either hot or cold, and should be consumed within one hour of preparation.

For information specifically on nutrition and cold weather situations refer to section 8 of this document. For more information about eating well before, during and after an activity that is specific to cross-country skiing, refer to section 7 of the CCI-L2T (On- Snow) Reference Material.

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5.2.3 Nutrition Answer Sheet #3 (working copy)

Record important points you have picked up about the other two scenarios.

Making the Best Possible Choices	
Scenario ____	Scenario ____

5.2.4 Hydration

Importance of Fluids

Proper hydration is important for all athletes to:

- Replace water lost as a result of sweating.
- Avoid marked decreases in performance that result from dehydration.
- Help maintain core body temperature within acceptable limits during exercise.



Effects of Dehydration on Performance

Dehydration negatively affects performance and is associated with premature fatigue. This is particularly the case for prolonged aerobic exercises such as distance running or cycling, but athletes competing in team sports or events of short duration can also be affected by dehydration.

Ironically, dehydration reduces the capacity of the digestive system to absorb water. Athletes should not wait until they are dehydrated before they drink, as this slows rehydration and causes gastric cramping.

Feeling Thirsty and Dehydration Level

It is well established that the sensation of thirst is not a good indicator of an individual's level of dehydration. When thirst manifests itself, approximately 2% of body mass has already been lost. Consequently, one cannot gauge dehydration by referring to the sensation of thirst. Therefore, during exercise it is important to drink on a schedule rather than according to thirst.

If thirst were the only point of reference used for determining fluid needs following profuse sweating, re-establishing optimum hydration could take 24 to 48 hours.

Drinking Fluids before Activity

Athletes should drink plenty of fluid every day, particularly before a practice session or competition. Athletes who are well hydrated have the following characteristics:

- Sweating that starts sooner and is more abundant.
- An enhanced rate of absorption of the fluids consumed during exercise.

In practical terms, this means drinking 1.5 - 2.5 cups (400 - 600mL) of fluid two to three hours before exercise. This allows time for excess fluid to be excreted as urine before the exercise starts. To ensure complete hydration, an athlete should consume 0.5 - 1.5 cups (150 - 350mL) of fluid about 15 minutes before exercising.

Drinking Fluids During Activity

- ❑ **Amount of Fluids to Drink.** Athletes should drink enough fluid to maintain fluid balance throughout the exercise. The amount of fluid an individual can tolerate during exercise varies from one person to another, but usually ranges between 10 and 15mL per kg of body weight per hour. In other words, as the following table suggests, a 60 kg person can absorb between 600 and 900mL of fluid in an hour, a 70 kg person between 700 and 1050mL, etc.

Body weight (kg)	Approximate quantity of fluid absorbed by the body in one hour (mL)	
	from ...	to ...
30	300	450
40	400	600
50	500	750
60	600	900
70	700	1050
80	800	1200
90	900	1350

Rather than drinking large amounts of fluid at one go, it is better to drink 0.5 - 1.5 cups (150 - 350mL) of fluid every 15 to 20 minutes, or as much as one can tolerate without feeling any discomfort.

Athletes rarely consume enough fluid to maximize the absorption capacity of the digestive system or to balance fluid losses. Increased fluid intake during exercise will improve fluid balance for most athletes.

- ❑ **Precautions.** To encourage athletes to drink plenty of fluids, have them bring several bottles or containers of water or sport drinks. For reasons of good hygiene, do not allow them to share bottles or containers with other people.
- ❑ **Sport Drinks.** Sport drinks containing carbohydrate are recommended for activities lasting more than 60 minutes without interruption. Several studies suggest an improvement in performance as a result of drinking sport drinks, which promote optimal performance by providing both fluids and carbohydrates.

When exercise lasts less than one hour, consuming a sport drink will probably not improve performance significantly. In this circumstance, drinking water should be adequate unless it is hot and humid, in which case a sport drink is recommended.

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- ❑ **Strategy for Encouraging Hydration in Children.** Recent studies show that children's consumption of fluids is increased when drinks contain carbohydrates (40–80 grams per litre) and a little sodium. It is suggested that the coach encourage this type of drink rather than plain water to ensure that children take in enough fluids when they exercise in hot weather.

Rehydration After Activity

After an exercise where sweating has been profuse, it is extremely important to replace fluid. This sensation of thirst is not a good gauge. Consequently, forced hydration is often necessary.

It is possible to estimate how much fluid an individual has lost during exercise by weighing before and after the activity. The difference in kg represents the amount of fluid lost, in litres, since one litre of water weighs one kg. For each kg of body weight lost, at least 1.0 litre of fluid plus an extra 0.5 litre should be consumed. It is important to drink more than one litre per kg of body weight lost to account for urinary losses.

The colour and amount of urine are an easy way for athletes to monitor their dehydration level. Scanty, dark urine signals a need for more fluid, in which case athletes should force themselves to drink more fluids. Plenty of clear-coloured urine usually indicates adequate hydration.

5.2.5 Making Sense Out of Sport Drinks

Sport drinks are carbohydrate electrolyte solutions that are available in a variety of compositions. The following information explains why an athlete may choose to use a sport drink and if they do, how to decide which one is best for them.

Why?

- ❑ For energy - they are designed to maintain an athlete's blood glucose level, thereby minimizing fatigue during physical efforts that generally exceed 90 minutes duration.
- ❑ To prevent cramping - they contain the electrolytes that are lost in sweat and can therefore reduce the risk of muscle and stomach cramping.
- ❑ To hydrate - they improve hydration by 10% compared to water alone, since the sodium (i.e. an electrolyte) helps retain water.

When?

- ❑ For endurance – drinking a sport drink at regular intervals (i.e. every 15 minutes) will help maintain endurance when the exercise is longer than 90 minutes.
- ❑ Prevent hunger - before the exercise a sport drink may help to improve blood glucose levels and therefore prevent hunger.
- ❑ Recovery - following the exercise a sport drink will help restore fluids, electrolytes and energy (i.e. glycogen).
- ❑ Endurance needs – some sport drinks can meet the athletes' endurance needs as described below, or an athlete may choose to have food and water instead:

- ✓ 30 - 60 grams of carbohydrate for every hour of non-stop exercise;

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- ✓ 400 - 800mL of fluid for every hour of exercise; and
- ✓ up to 500mg of sodium per hour of exercising.

Which Sport Drink?

Athletes are very individual when it comes to deciding whether or not to use a sport drink and determining which sport drink works best for them. When experimenting to find out what is optimal, they should be made aware that they can tolerate a sport drink that is between 3% - 10% carbohydrate concentration (between three grams of carbohydrate in 100mL of fluid and 10 grams of carbohydrate in 100mL of fluid).

The following table (prepared in 2006) describes the composition of various sport drinks. To help your athletes choose which product is best suited for their individual needs, you may wish to provide them with a similar, current chart.

Composition of Sport Drinks: per 100mL (nutritional content according to mixing directions)

Product	First Three Ingredients	CHO (g)	Protein (g)	Fat (g)	Sodium (mg)	Potassium (mg)
Accelerade Advanced Sports Drink (1 scoop and 355mL)	sucrose, whey protein concentrate, trehalose	5.9	1.4	0.3	53.5	18.3
Accelerade Advanced Sports Drink (591mL bottle)	water, sugar, trehalose	6.6	1.5	0.0	49.1	6.8
All Sport Body Quencher (591mL bottle)	water, high fructose corn syrup, citric acid	6.7	0.0	0.0	22.9	20.8
Biox Amino Blast (600mL bottle)	water, whey protein isolate, fructose	4.8	3.3	0.0	6.7	20
Biox Carbo Blast (600mL bottle)	water, maltodextrin, fructose	18.3	0.0	0.0	3.3	16.7
Champion Nutrition Revenge Sport Energy Drink (1 scoop and 240mL)	CHO blend (including maltodextrin, amylopectin starch), fructose, sodium lactate	9.6	0.0	0.0	41.7	45.8

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Champion Nutrition Revenge Pro Energy Drink (1 scoop and 240mL)	CHO blend (amylopectin starch, maltodextrin), fructose, protein blend	8.3	1.7	0.2	35.4	66.7
Cytomax Ready-to-Drink (240mL bottle)	water, maltodextrin, fructose	5.4	0.0	0.0	22.9	12.5
Cytomax Sport Energy Drink (1½ scoop and 475mL)	CHO blend (including amylopectin starch, maltodextrin), fructose, alpha-l-poly lactate	6.9	0.0	0.0	37.9	18.9
eLoad™ (1 packet and 500mL)	dextrose, sucrose, citric acid	5.4	0.0	0.0	74	19.3
Endurox R4 (2 scoops and 355mL) *fat and sodium vary slightly with flavour	dextrose, whey protein concentrate, complex carbohydrates	14.6	3.7	0.3*	59.2*	76.1 (chocolate) 33.8 (orange, lemon, fruit punch & vanilla)
Hydra Fuel (1 scoop and 240mL)	dextrose, fructose, citric acid	7.1	0.0	0.0	10.4	20.8
Gatorade Thirst Quencher (various sized bottles)	water, sucrose syrup, glucose-fructose syrup	5.8	0.0	0.0	45.8	12.5
Powerade (various sized bottles)	water, high fructose corn syrup, maltodextrin	7.1	0.0	0.0	22.1	13.3
Ultimate Nutrition Pure Muscle Carbs (2 scoops and 300mL)	complex carbs from grain sources, fructose, citric acid	17.3	0.0	0.0	11.7	0.0

5.3 Strategies for Promoting Recovery

Nutrition between Competitions

When there are two or more competitions on the same day, it is primarily the time available between periods of activity that will determine the quantity and type of food consumed. The principles described in this section, and also those contained in section 5.2.2, should be respected.

In general terms, it is better to consume snacks high in carbohydrates between each competition and wait until the end of the day to consume a more substantial meal. It is also important to ensure that athletes consume enough fluid between each event.

Recommendations for Replenishing Reserves After Activity

For rapid recovery, it is important that athletes refuel immediately after a practice session or competition, especially if another physically demanding event or training session is scheduled the following day. Athletes should:

- ❑ Drink plenty of fluids. At least 1.0 litre (four cups) of fluid per kg of body weight lost during exercise, plus 500mL is recommended. Refer to section 5.2.4, (Hydration) for rehydration strategies. To rehydrate between competitions on the same day, follow the guidelines for hydration during activity.
- ❑ Consume carbohydrates soon after the activity. As soon as possible after exercise, preferably within 30 minutes, athletes should consume carbohydrate; this procedure should be repeated every two hours until the next meal. This allows muscle energy stores to be replenished at a faster rate than if the athlete waits until mealtime to consume carbohydrate- rich foods. Athletes usually find it easier to consume liquid carbohydrate (fruit juices, sweet drinks, etc.) rather than solid foods, since exercise dulls the appetite.

The following table shows the amount of carbohydrate to consume relative to body weight. Also provided are examples of foods providing approximately 50 grams of carbohydrate.

Body weight (kg)	Approximate quantity of carbohydrate to consume up to 30 minutes after activity and every two hours until the next meal-time
30	45 grams
40	60 grams
50	75 grams
60	90 grams
70	105 grams
80	120 grams
90	135 grams

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- ❑ Examples of foods containing approximately 50 grams of carbohydrate:
 - ✓ 700mL of sport drink.
 - ✓ 500mL of fruit juice or soft drink.
 - ✓ Three average size pieces of fruit.
 - ✓ A large Mars bar.
 - ✓ Three muesli bars.
 - ✓ Two pancakes with maple syrup.
 - ✓ 60g packet of jelly beans or jujubes.
- ❑ Examples of foods containing approximately 50 grams of carbohydrate and 10 grams of protein:
 - ✓ 300mL of milkshake.
 - ✓ 400g of fruit yogourt.
 - ✓ Bowl of cereal with milk.
 - ✓ 300mL of liquid meal supplement.
 - ✓ Two English muffins with peanut butter.
- ❑ The meal after exercise should be high in carbohydrate, adequate in protein and relatively low in fat. Carbohydrate-rich foods should constitute the meals and snacks that follow an intense effort, to ensure carbohydrate stores in the muscles can be replenished quickly.
- ❑ Moderate amounts of salt and a few portions of salty foods should be consumed - for example, tomato or vegetable juice, pretzels, canned soup or bouillon, pickles, ketchup, soy sauce, salsa, cheese, salted nuts.
- ❑ At least three portions of potassium-rich foods (vegetables and fruit) are recommended, for example, vegetables, potatoes, fruit juices and fresh fruit, dried fruit.
- ❑ Think ahead. Non-perishable foods can be brought to the competition or training site if food choices are limited there.

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5.4 Getting the Message Across

5.4.1 Nutrition Answer Sheet #4 (working copy)

Getting the Message Across...	
Educating Athletes	Keeping Parents Informed

5.5 Nutrition: Self-Assessment

The items that are listed in the self-assessment below are the evidences that an Evaluator will be looking for during assignments and observations. They will help determine if you have the required abilities/competencies for coaching athletes at this level. This exercise will allow you to reflect on your current coaching practices and help you identify areas of strength and areas for improvement.

To rate your ability to provide nutritional support to athletes in training and competition, circle the number at right that best represents whether you achieve the corresponding statement at left (Never, Sometimes, Often, Always).

I provide basic nutritional advice to my athletes by...	Never	Some-times	Often	Always
Reinforcing healthy eating habits as outlined in Canada's Food Guide	1	2	3	4
Ensuring appropriate hydration before activity	1	2	3	4
Recommending what to eat before competition or before activity to maximize performance	1	2	3	4
Identifying when to eat before activity to maximize performance	1	2	3	4
Ensuring appropriate hydration during competition	1	2	3	4
Identifying foods that should be restricted or eaten with caution	1	2	3	4
Providing information on food safety concerns	1	2	3	4
Ensuring appropriate hydration following competition	1	2	3	4
Recommending what to eat after competition to maximize recovery	1	2	3	4
Identifying when (how soon) to eat after competition to maximize recovery	1	2	3	4
Communicating with parents to reinforce healthy eating habits	1	2	3	4
Identifying strategies to ensure that appropriate foods are available for activity and competition	1	2	3	4

DATE: _____

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