5.3 Nutrition

Good nutrition is essential for optimal health and physical performance.

Nutrient	Major Functions
1) Carbohydrates	
2) Fats	
3) Protein	
4) Vitamins	
5) Minerals	
6) Water	

Average Healthy Diet

Normal, healthy individuals (average build and activity level) should consume a _____ diet including optimal amounts of all six classes of nutrients, according to the guidelines provided by Health Canada and the Canada Food Guide.

Calories

Although most people are not into calorie counting, it is important to understand that specific nutrients have different caloric values and there will take more or less time to 'burn off. Individuals who take in 5 g of fat are consuming 90 calories while someone else who consumed 10 g of carbohydrates would only consume 40 calories.

Nutrient	Energy Yield	% of Daily Intake
Protein		
Carbohydrate		
Fat		

Kilocalorie

When ingested and absorbed, food is 'burned' (oxidized) and energy is released. This energy can be then be used for muscular activity or any of the ongoing metabolic processes of the body (e.g. digestion and respiration). A kilocalorie is a measure of the energy released from this process. It is often abbreviated as "calorie" even though that is inaccurate.

Metabolism

The engine of the body: turning nutrients into energy

Basal Metabolic Rate (BMR): The number of calories needed to meet basic energy needs of the body ***at rest.*** If an individual increases their BMR (i.e. increases muscle tissue mass), they will burn more calories - approximately 50 kcals/day for each pound of muscle. This is because _____ therefore a muscular person would have a higher BMR than a sedentary person with a higher percentage of body fat.

Metabolic Rate (MR): The number of calories utilized at rest (BMR) plus during _____ is called the metabolic rate. This value would usually be higher for males (due to increased size and muscle mass), young adults and those who are physically active. The energy for metabolic activity comes from three main sources: carbohydrates, fats and proteins.

1) Carbohydrates

Carbohydrates serve as the primary source of energy for exercise and competition. Through the breakdown of ingested or stored carbohydrates (glycogen), _____ _____ can be produced for normal daily functions and muscular work.

Diet Recommendations

- ➔ Carbohydrates should account for 55—65% of daily calorie consumption.
- ➔ Keep ingestion of _____ carbohydrates to a minimum
- ➔ Include _____ in the daily diet.

Two types of carbs

1) _____ These simple sugars found are generally low in nutrition and high in calories (e.g. sucrose, lactose, fructose and galactose).

2) _____ Complex carbohydrates are generally nutrient-dense and contain dietary fibre that aids in digestion (e.g. starches, fruits, vegetables and whole grain).

Glycemic Index: The rate of digestion and absorption of carbohydrates compared to _____, which has a rating of _____. Not all carbohydrates affect the body in the same way. Some carbohydrates are absorbed into the blood stream very quickly and cause a surge in production to drive glucose from the blood into cells. Other carbohydrates reach the blood stream slower and the insulin response is more gradual.

Sample Glycemic Index

HIGH		MODERATE		LOW	
Glucose	137	Brown rice	79	Multigrain	69
*White bread	100	Banana	77	Apple	54
Doughnut	108	Orange juice	74	Orange	63
Raisins	91	Chocolate	70	Grapes	66
Baked potato	121	Popcorn	49	Barley	49
Instant rice	128	Corn	78	Fructose	32

Carbohydrate Loading

The practice of ingesting more carbohydrates than 'normal' to increase the muscle _____ is called carbohydrate loading. Carbohydrate loading does appear to have positive effects on endurance athletes (they can go longer before fatigue sets in). There are many different approaches to carbohydrate loading. Some athletes simply ingest large amounts of carbs the night before the event (i.e. the 'pasta party'). At the elite level, carbohydrate loading is more commonly done by first depleting the existing glycogen store, then loading up with carbohydrates for 3-4 days before the event.

Pre-Exercise

Often the glycogen stores are inadequate to meet the demands of the long endurance events. It appears that glycogen stores are adequate for about 1.5-2 hours.

Time: 2-4 hours
Suggestion:

Time: 30-60 minutes
Suggestion:

Post-Exercise

The goal during this time is to speed up the refilling of depleted glycogen stores so that energy is available for the next exercise session. Recent research clearly indicates the need to begin carbohydrates refilling immediately after exercise.

Guidelines: _____
for the first few hours.

2) Fats

Fats have a bad reputation due to their link to increasing obesity; cancer and heart disease. They are, however, a _____ nutrient for optimal health and performance. They are a source of vitamins A, D, E and K, in addition to being key in energy production, hormone synthesis and the maintenance of healthy cell membranes.

Three Types of Fat:

Saturated Fats

The fat (lipid) molecule is saturated with hydrogen (i.e. all bonds within the fat molecule are single bonds). It is this variety that is linked to health issues. Typically, _____ products (dairy; meat, eggs) and some vegetable oils (coconut and palm) are high in saturated fat. No more than 10% of daily fat intake should be from saturated fat.

Unsaturated

This variety is considered healthy and should form the bulk of fats ingested each day. Unsaturated fats can be further divided into monounsaturated and polyunsaturated.

> _____**unsaturated Fats:** These are found in _____ sources (olive oil and peanut oil).
> _____**unsaturated Fats:** These are primarily from _____ sources (i.e. soybeans, sunflower, corn and cold water fish, such as tuna and salmon). This includes the often-talked about essential fatty acids.

Trans Fat

Trans fat is derived from a chemical process known as 'partial hydrogenation', which is the process of converting liquid oils to a semi-solid form.

Most Canadians should reduce their intake of saturated and trans fats because they increase risk factors for heart disease. _____ have one combined % Daily Value in the Nutrition Facts table because both types of fat have negative effects on blood cholesterol levels.

3) Proteins

Proteins are the fundamental building blocks of the human body. They are essential _____ and repair, synthesis of enzymes and hormones, as well as being critical to our immunity response. Protein is a limited source of energy supply, as carbohydrates and fats are mostly utilized for energy production, except under extreme conditions.

Structure

Proteins are made of combinations of _____. There are nine essential amino acids that must be supplied through food intake and eleven non-essential amino acids that can be synthesized by the body.

Vegetarians

Vegetarians need to ensure that all essential amino acids needs are being met through food combination, as most plant sources of protein are incomplete. A _____ shortage amongst vegetarian is very common because B12 is found in animal sources only.

Amino Acid Supplementation

Ingestion of large amounts of amino acids or protein in supplement form is a much disputed topic by researchers and fitness professionals. An individual with extremely high daily protein requirements may not be able to 'eat enough' to fill the need, but supplementation should not be necessary if daily caloric intake is adequate.

3&4) Vitamins and Minerals

Vitamins and minerals are essential for optimal health and performance. They have no caloric value but enhance metabolic reactions, assist in transport of oxygen, give strength to body cells and help maintain fluid and electrolyte balance.
In general, unless an individual is deficient, supplementation has not been proven to enhance performance. Eating a variety of foods, as recommended by the Canada Food Guide, should meet daily vitamin and mineral needs.

Antioxidant Vitamins

Antioxidant vitamins protect the body tissues and cell membranes from damage due to free radicals (molecules that have an electron without a partner). When electrons are paired they are stable, but when unpaired they become unstable and damage tissue. Intense exercise, stress, and environmental pollution can produce free radicals. Antioxidants help protect the body from free radical damage. The most common are: Carotene, vitamins C and E, and the minerals sulfur and chromium.

Vitamin Summary: Key Sources and Functions

VITAMIN	FUNCTION	SOURCE
A (carotene)	Maintenance of skin, hair, dental growth and vision	Yellow and orange vegetables, green leafy vegetables
B_1 (thiamine)	Release of energy from carbohydrates	Fortified cereals, meat, riches, whole grains
B_2 (riboflavin)	Release of energy from proteins, fats and CHOs	Whole grains, milk, eggs, leafy green vegetables
B_6 (pyridoxine)	Tissue building and protein metabolism	Fish, chicken, whole grains, bananas, meat
B_{12} (cobalamin)	Growth and development of nervous system and metabolism	Meat, dairy, seafood
Biotin	Metabolism	Cereals and grains, legumes
Folate (folic acid)	Red blood cell production	Green leafy vegetables, beans and lentils
Niacin	Metabolism	Meal, fish, poultry, dairy and peanuts
Pantothenic Acid	Energy production	Meats, whole grains, legumes, vegetables, fruit
C (ascorbic acid)	Musculoskeletal structure, iron absorption	Citrus fruits and vegetables (peppers)
D	Bone and teeth growth, cardiac and nervous function	Sunlight, fortified milk, fish and eggs
E	Protects blood cells, antioxidant	Multigrains, nuts, wheat germ, vegetables
K	Blood clotting	Leafy green vegetables, fruit and dairy, grains

Mineral Summary: Key Sources and Functions

MINERAL	FUNCTION	SOURCE
Calcium	Strengthens teeth and bone, aids in muscle contraction, blood clotting	Milk and milk products
Chromium	CHO metabolism and insulin function	Whole grains, brewers' yeast, corn oil
Copper	RBC production, bone growth	Nuts, legumes, meat
Iodine	Metabolism and formation of thyroid hormones	Salt (iodized), seafood
Iron	Anti-stress, hemoglobin formation	Meats, legumes, nuts, green vegetables, whole grains
Magnesium	Skeletal development, CHO metabolism, acid-base balance	Nuts, whole grains, fruits
Manganese	Skeletal development, hormone production and metabolism	Meat, fish, poultry, grains, eggs
Phosphorus	Bone growth, nutrient use	Meat, vegetables, fruits
Potassium	Cardiac and nervous function, kidney function, acid-base balance	Seafood, meat, grains
Selenium	Antioxidant	Meats, eggs, whole grains
Zinc	Digestion and metabolism, reproduction and healing	Sunlight, fortified milk, fish and eggs

5) Water

Water accounts for _____ of the body's weight. Maintaining hydration is critical to health and performance. Performance can suffer when as little as 2% of water weight is lost, so it is a constant critical battle to keep hydration at the optimal level.

Water is Essential for:

Carrying nutrients throughout the body (oxygen and assisting in removal of metabolic waste such as carbon dioxide)

- ➔ .
- ➔ .
- ➔ .

Normal Water Intake and Loss

An average individual (relatively inactive) requires about 2.5 L of water each day to combat normal water loss through defecation, respiration, urination and perspiration. A highly active individual may need up to _____ of water each day.

NORMAL WATER LOSS

Skin (perspiration)	500 ml
Feces (defecation)	200 ml
Lungs (respiration)	300 ml
Kidneys (urination)	1,500 ml
Total	2,500 ml

Hydration of Athletes
Replenishment of lost water really needs to begin long before the thirst sensation is experienced and may include electrolyte drinks depending on the length, intensity and environment of exercise.

Guidelines for Fluid Replacement and Prevention of Water Loss:
one hour before exercise :

15—20 minutes prior to exercise: _____

every 15—20 minutes during exercise : _____

after exercise: _____

Other recommendations

- ➔ Wear light-colored and light-weight clothing
- ➔ Drink _____ water (0°C) as at this temperature, water will leave the stomach faster
- ➔ If using electrolyte or carbohydrate-mixed fluid, use a 5-8% mixture (this empties as fast as water)
- ➔ Limit _____ (usually in coffee, tea and pop) because caffeine is a diuretic and will increase fluid loss

Electrolytes
For endurance athletes, _____ replacement is necessary because much is lost through perspiration. Sports drinks containing sodium, potassium, chloride and phosphorous is recommended for exercise lasting longer than _____. Because muscle and liver glycogen stores become depleted during long periods of physical exercise, sports drinks containing carbs and sodium can delay fatigue and thus sustain optimal performance longer.

Vegetarian Life Style

The vegetarian must be willing to spend time planning and preparing meals to ensure adequate nutrition. One of the biggest problems (although there are many positives) is ensuring adequate protein intake from non-meat sources, as grains and legumes do not individually provide all of the _____
For example, lysine is found in legumes but not in grains, while grains contain methionine but legumes do not. Eating a variety of grains, fruits and vegetables should meet all amino acid needs. Vegetarians do have a lower rate of heart disease, breast and colon cancer and typically lower percentage of body fat, but need to ensure vitamin B12 is added to their diet.
Female vegetarians who acquire most of their iron from non-animal sources are at risk of developing iron deficiency. Iron from plant sources, non-heme iron, is absorbed less than iron from animal sources (heme iron). Therefore, female vegetarians are at risk for losing more iron and absorbing less. Vitamin C intake can assist in increasing non-heme iron absorption.

Weight Loss

The approach to weight loss can vary from calorie reduction to use of supplements to enhance fat burning. Liposuction certainly reduces fat but really isn't part of a fitness leader's bag of tricks!

Weight loss should focus on altering _____ and _____ habits to facilitate weight loss of approximately _____ /week.

On the other hand, reducing caloric intake below 1200 calories/day will slow down the BMR (basal metabolic rate) and may decrease LBM (lean body mass) causing a further reduction in the metabolic rate, and as a result maintaining weight loss becomes even more difficult.

Spot Reducing

Although it would be great if we could specify where we wanted to lose body fat, it just doesn't work that way! As caloric intake is reduced caloric burn is increased to create a negative energy balance, fat loss occurs throughout the body and not in one specific desired location. Although muscle groups can be selectively targeted for toning or strength against body fat loss is a 'total body experience'.

Nutrition Assignment

Based on Canada's Food Guide

1) What are two of your favorite foods from each category on your food guide?

Food Groups	Favorite Food	1 Serving Size	Total Serving Recommended
Vegetables and Fruit			
Grain Products			
Dairy and Alternatives			
Meat and Alternatives			

2) Give an example of each colour of vegetable you should eat:

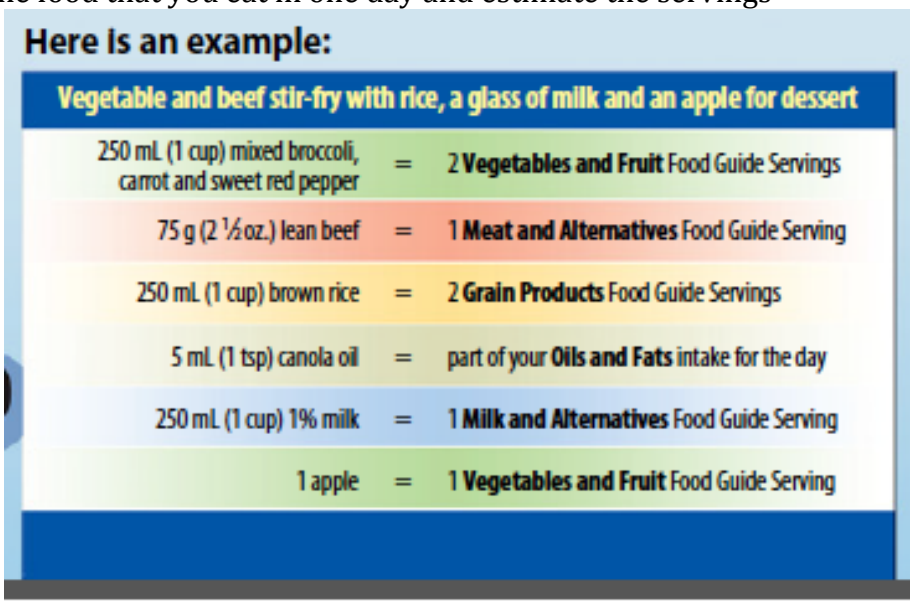
3) How many of your grain choices should be whole grain?

4) How much milk (or soy beverage) should you drink every day to get enough vitamin D?

5) How many servings of fish should you have in a week?

6) How much extra does a pregnant woman need to eat in a day?

Make a list of all the food that you eat in one day and estimate the servings



Breakfast

Lunch

Dinner

Other (snacks, etc.)

Total for your typical day:

Food Group	**Total Servings**	**Difference with Recommended Amount**
Vegetables and Fruit		
Grain Products		
Dairy and Alternatives		
Meat and Alternatives		

Personal Reflection

1) In what areas are you currently doing very well with your nutritional intake?

2) In what areas can you improve your nutritional intake?

3) Have you tried any specific diets currently or in the past? Have they worked?

4) What diet programs have you heard others using? What was their experience?

5) What steps could you take to be more careful with your nutritional intake?

Reading Labels:

#1

Nutrition Facts

Per 3/4 cup (175 g)

Amount	% Daily Value
Calories	
Fat 2.5 g	**4** %
Saturated 1.5 g + Trans 0 g	**8** %
Cholesterol 10 mg	
Sodium 75 mg	**3** %
Carbohydrate 25 g	**8** %
Fibre 0 g	**0** %
Sugars 24 g	
Protein 8 g	

Vitamin A	2 %	Vitamin C	0 %
Calcium	20 %	Iron	0 %

Estimate the number of calories in one serving of yogurt, using the following chart:

	Grams	Multiply by	Calories
Fat		x9	
Carbs		x4	
Protein		X4	
		Total	

When reading a nutrition chart, you are checking for…

a) Fat content (anything over 15% is a lot)
b) Saturated fat and trans fat are generally bad for you
c) Less sodium is better (anything over 15% is a lot)
d) Carbs (Fibre is good, Sugar should be low)
e) Protein (Generally good)
f) Vitamins (Everyone likes vitamins)

Any health concerns with the yogurt?

#2

Cracker A

Nutrition Facts

Per 9 crackers (23 g)

Amount		% Daily Value
Calories		
Fat 4.5 g		7 %
Saturated 2.5 g + Trans 0 g		13 %
Cholesterol 0 mg		
Sodium 280 mg		12 %
Carbohydrate 12 g		4 %
Fibre 1 g		4 %
Sugars 0 g		
Protein 3 g		
Vitamin A 0 %	Vitamin C	0 %
Calcium 2 %	Iron	8 %

Cracker B

Nutrition Facts

Per 4 crackers (20 g)

Amount		% Daily Value
Calories		
Fat 2 g		3 %
Saturated 0.3 g + Trans 0 g		2 %
Cholesterol 0 mg		
Sodium 90 mg		4 %
Carbohydrate 15 g		5 %
Fibre 3 g		12 %
Sugars 1 g		
Protein 2 g		
Vitamin A 0 %	Vitamin C	0 %
Calcium 2 %	Iron	6 %

Estimate the number of calories in each type of cracker

A	Grams	Multiply by	Calories
Fat		x9	
Carbs		x4	
Protein		X4	
		Total	

B	Grams	Multiply by	Calories
Fat		x9	
Carbs		x4	
Protein		X4	
		Total	

Based on the nutritional facts, which type of cracker should you choose? Why?

Sirloin burger

Nutrition Facts
Per 1 burger (130 g)

Amount			% Daily Value
Calories			
Fat 27 g			**42** %
Saturated 12 g + Trans 2 g			**70** %
Cholesterol 70 mg			
Sodium 330 mg			**14** %
Carbohydrate 3 g			**1** %
Fibre 0 g			**0** %
Sugars 3 g			
Protein 24 g			
Vitamin A	0 %	Vitamin C	0 %
Calcium	2 %	Iron	30 %

Chicken Burger

Nutrition Facts
Per 1 burger (130 g)

Amount			% Daily Value
Calories			
Fat 9 g			**14** %
Saturated 2 g + Trans 1 g			**15** %
Cholesterol 70 mg			
Sodium 800 mg			**33** %
Carbohydrate 4 g			**1** %
Fibre 0 g			**0** %
Sugars 0 g			
Protein 25 g			
Vitamin A	0 %	Vitamin C	0 %
Calcium	4 %	Iron	2 %

Estimate the number of calories in each type of burger

A	Grams	Multiply by	Calories
Fat		x9	
Carbs		x4	
Protein		X4	
		Total	

B	Grams	Multiply by	Calories
Fat		x9	
Carbs		x4	
Protein		X4	
		Total	

Health concerns with burger A?

Health concerns with burger B?

Based on the nutritional facts, which type of cracker should you choose? Why?

Unit 3: Fitness Theory

3.7 Nutrition

Good nutrition is essential for optimal health and physical performance.

Nutrient	Major Functions
1) Carbohydrates	Major fuel source for energy (ATP) production
2) Fats	Source of stored energy especially for long-term activities Source of fat-soluble vitamins Insulation and protection
3) Protein	Growth and development Tissue repair Essential element of enzymes and hormones
4) Vitamins	Regulate normal body functions and assist in energy production
5) Minerals	Major component of musculoskeletal system Help enzymes function
6) Water	Composes 60—70% of the body Necessary for normal metabolic function

Average Healthy Diet

Normal, healthy individuals (average build and activity level) should consume a balanced diet including optimal amounts of all six classes of nutrients, according to the guidelines provided by Health Canada and the Canada Food Guide.

Calories

Although most people are not into calorie counting, it is important to understand that specific nutrients have different caloric values and there will take more or less time to 'burn off. Individuals who take in 5o g of fat are consuming 90 calories while someone else who consumed 10 g of carbohydrates would only consume 40 calories.

Nutrient	Energy Yield	% of Daily Intake
Protein	1g = 4 kcal of energy	15-20%
Carbohydrate	1g = 4 kcal of energy	55-65%
Fat	1g = 9 kcal of energy	25-30%

Kilocalorie

When ingested and absorbed, food is 'burned' (oxidized) and energy is released. This energy can be then be used for muscular activity or any of the ongoing metabolic processes of the body (e.g. digestion and respiration). A kilocalorie is a measure of the energy released from this process. It is often abbreviated as "calorie" even though that is inaccurate.

Metabolism

The engine of the body: turning nutrients into energy

Basal Metabolic Rate (BMR): The number of calories needed to meet basic energy needs of the body at rest. If an individual increases their BMR (i.e. increases muscle tissue mass), they will burn more calories—approximately 50 kcals/day for each pound of muscle. This is because more muscle burns more calories, therefore a muscular person would have a higher BMR than a sedentary person with a higher percentage of body fat.

Metabolic Rate (MR): The number of calories utilized at rest (BMR) plus during normal daily activities is called the metabolic rate. This value wou1d usually be higher for males (due to increased size and muscle mass), young adults and those who are physically active. The energy for metaabolic activity comes from three main sources: carbohydrates, fats and proteins.

1) Carbohydrates

Carbohydrates serve as the primary source of energy for exercise and competition. Through the breakdown of ingested or stored carbohydrates (glycogen), ATP can be produced for normal daily functions and muscular work.

Diet Recommendations

- ➔ Carbohydrates should account for 55—65% of daily calorie consumption.
- ➔ Keep ingestion of simple carbohydrates to a minimum (less than 15% unless high activity level).
- ➔ Include fibre in the daily diet.

Two types of carbs

1) Simple: These simple sugars found are generally low in nutrition and high in calories (e.g. sucrose, lactose, fructose and galactose).

2) Complex: Complex carbohydrates are generally nutrient-dense and contain dietary fibre that aids in digestion (e.g. starches, fruits, vegetables and whole grain).

Glycemic Index: The rate of digestion and absorption of carbohydrates compared to white bread, which has a rating of 100. Not all carbohydrates affect the body in the same way. Some carbohydrates are absorbed into the blood stream very quickly and cause a surge in production to drive glucose from the blood into cells. Other carbohydrates reach the blood stream slower and the insulin response is more gradual.

Sample Glycemic Index

HIGH		MODERATE		LOW	
Glucose	137	Brown rice	79	Multigrain	69
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Carbohydrate Loading
The practice of ingesting more carbohydrates than 'normal' to increase the muscle glycogen stores is called carbohydrate loading. Carbohydrate loading does appear to have positive effects on endurance athletes (they can go longer before fatigue sets in). There are many different approaches to carbohydrate loading. Some athletes simply ingest large amounts of carbs the night before the event (i.e. the 'pasta party'). At the elite level, carbohydrate loading is more commonly done by first depleting the existing glycogen store, then loading up with carbohydrates for 3—4 days before the event.

Pre-Exercise
Often the glycogen stores are inadequate to meet the demands of the long endurance events. It appears that glycogen stores are adequate for about 1.5—2 hours.

Time: 2—4 hr before exercise
Suggestion: 200—300 g of Carbs to ensure glycogen stores are full

Time: 30—60 mm before exercise
Suggestion: 6o—75 g of Carbs

Post-Exercise
The goal during this time is to speed up the refilling of depleted glycogen stores so that energy is available for the next exercise session. Recent research clearly indicates the need to begin carbohydrates refilling immediately after exercise.

Guidelines: 0.7—1.0 g Carbs/kg of body weight for the first few hours.

2) Fats
Fats have a bad reputation due to their link to increasing obesity; cancer and heart disease. They are, however, a necessary nutrient for optimal health and performance. They are a source of vitamins A, D, E and K, in addition to being key in energy production, hormone synthesis and the maintenance of healthy cell membranes. Fats can be further divided into saturated and unsaturated fats.

Saturated Fats
The fat (lipid) molecule is saturated with hydrogen (i.e. all bonds within the fat molecule are single bonds). It is this variety that is linked to health issues. Typically, animal products (dairy; meat, eggs) and some vegetable oils (coconut and palm) are high in saturated fat. No more than 10% of daily fat intake should be from saturated fat.

Unsaturated: Monounsaturated and Polyunsaturated
Unsaturated fats have one or more double bonds between the carbon molecules. This variety is considered healthy and should form the bulk of fats ingested each day. Unsaturated fats can be further divided into monounsaturated and polyunsaturated.

Monounsaturated Fats: These are found in vegetable sources (olive oil and peanut oil).
Polyunsaturated Fats: These are primarily from vegetable sources (i.e. soybeans, sunflower, corn and cold water fish, such as tuna and salmon). This includes the often-talked about essential fatty acids.

What is trans fat?
Trans fat is derived from a chemical process known as 'partial hydrogenation', which is the process of converting liquid oils to a semi-solid form.

Trans fat, like saturated fat, has been shown to raise blood LDL-cholesterol levels. LDL-cholesterol is a risk factor for coronary heart disease. Unlike saturated fat, trans fat also reduces blood HDL-cholesterol (a good fat in the blood). Reduced HDL-cholesterol is a risk factor for heart disease.
Most Canadians should reduce their intake of saturated and trans fats because they increase risk factors for heart disease. Saturated fat and trans fat have one combined % Daily Value in the Nutrition Facts table because both types of fat have negative effects on blood cholesterol levels.

3) Proteins

Proteins are the fundamental building blocks of the human body. They are essential for tissue-building and repair, synthesis of enzymes and hormones, as well as being critical to our immunity response. Protein is a limited source of energy supply, as carbohydrates and fats are mostly utilized for energy production, except under extreme conditions.

Structure

Proteins are made of combinations of 20 amino acids. There are nine essential amino acids that must be supplied through food intake and eleven non-essential amino acids which can be synthesized by the body.

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Vegetarians need to ensure that all essential amino acids needs are being met through food combination, as most plant sources of protein are incomplete. A vitamin B12 shortage amongst vegetarian is very common because B12 is found in animal sources only.

Amino Acid Supplementation

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3&4) Vitamins and Minerals

Vitamins and minerals are essential for optimal health and performance. They have no caloric value but enhance metabolic reactions, assist in transport of oxygen, give strength to body cells and help maintain fluid and electrolyte balance.
In general, unless an individual is deficient, supplementation has not been proven to enhance performance. Eating a variety of foods, as recommended by the Canada Food Guide, should meet daily vitamin and mineral needs.

Antioxidant Vitamins

Antioxidant vitamins protect the body tissues and cell membranes from damage due to free radicals (molecules that have an electron without a partner). When electrons are paired they are stable, but when unpaired they become unstable and damage tissue. Intense exercise, stress, and environmental pollution can produce free radicals. Antioxidants help protect the body from free radical damage. The most common are: Carotene, vitamins C and E, and the minerals sulfur and chromium.

Vitamin Summary: Key Sources and Functions

VITAMIN	FUNCTION	SOURCE
A (carotene)	Maintenance of skin, hair, dental growth and vision	Yellow and orange vegetables, green leafy vegetables
B_1 (thiamine)	Release of energy from carbohydrates	Fortified cereals, meat, riches, whole grains
B_2 (riboflavin)	Release of energy from proteins, fats and CHOs	Whole grains, milk, eggs, leafy green vegetables
B_6 (pyridoxine)	Tissue building and protein metabolism	Fish, chicken, whole grains, bananas, meat
B_{12} (cobalamin)	Growth and development of nervous system and metabolism	Meat, dairy, seafood
Biotin	Metabolism	Cereals and grains, legumes
Folate (folic acid)	Red blood cell production	Green leafy vegetables, beans and lentils
Niacin	Metabolism	Meal, fish, poultry, dairy and peanuts
Pantothenic Acid	Energy production	Meats, whole grains, legumes, vegetables, fruit
C (ascorbic acid)	Musculoskeletal structure, iron absorption	Citrus fruits and vegetables (peppers)
D	Bone and teeth growth, cardiac and nervous function	Sunlight, fortified milk, fish and eggs
E	Protects blood cells, antioxidant	Multigrains, nuts, wheat germ, vegetables
K	Blood clotting	Leafy green vegetables, fruit and dairy, grains

Mineral Summary: Key Sources and Functions

MINERAL	FUNCTION	SOURCE
Calcium	Strengthens teeth and bone, aids in muscle contraction, blood clotting	Milk and milk products
Chromium	CHO metabolism and insulin function	Whole grains, brewers' yeast, corn oil
Copper	RBC production, bone growth	Nuts, legumes, meat
Iodine	Metabolism and formation of thyroid hormones	Salt (iodized), seafood
Iron	Anti-stress, hemoglobin formation	Meats, legumes, nuts, green vegetables, whole grains
Magnesium	Skeletal development, CHO metabolism, acid-base balance	Nuts, whole grains, fruits
Manganese	Skeletal development, hormone production and metabolism	Meat, fish, poultry, grains, eggs
Phosphorus	Bone growth, nutrient use	Meat, vegetables, fruits
Potassium	Cardiac and nervous function, kidney function, acid-base balance	Seafood, meat, grains
Selenium	Antioxidant	Meats, eggs, whole grains
Zinc	Digestion and metabolism, reproduction and healing	Sunlight, fortified milk, fish and eggs

5) Water

Water accounts for 60—65% of the bodys veight. Maintaining hydration is critical to health and performance. Performance can suffer when as little as 2% of water weight is lost, so it is a constant critical battle to keep hydration at the optimal level.

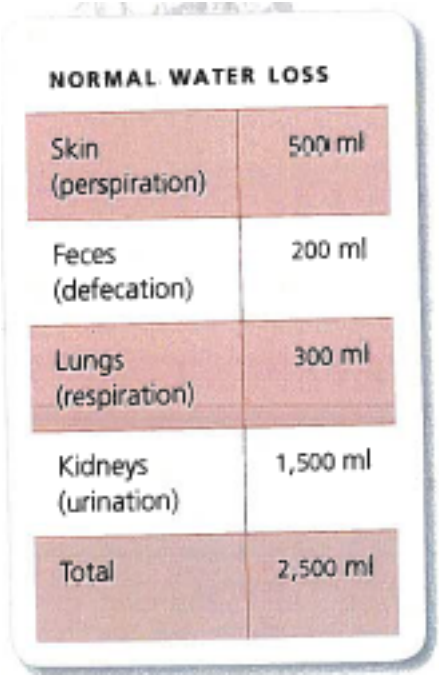
Water is Essential for:

Carrying nutrients throughout the body (oxygen and assisting in removal of metabolic waste such as carbon dioxide)

- ➔ Maintaining body temperature
- ➔ Efficiency of metabolic reactions
- ➔ Lubrication of joints

Normal Water Intake and Loss

An average individual (relatively inactive) requires about 2,500 ml (z. L) of water each day to combat normal water loss through defecation, respiration, urination and perspiration. A highly active individual may need up to 5-10 L/day of water each day.



NORMAL WATER LOSS

Skin (perspiration)	500 ml
Feces (defecation)	200 ml
Lungs (respiration)	300 ml
Kidneys (urination)	1,500 ml
Total	2,500 ml

Hydration of Athletes
Replenishment of lost water really needs to begin long before the thirst sensation is experienced and may include electrolyte drinks depending on the length, intensity and environment of exercise.

Guidelines for Fluid Replacement and Prevention of Water Loss:
500—700 (2—3 cups) of water one hour before exercise
250—500 ml (1—2 cups) 15—20 minutes prior to exercise
150—250 ml (about 1 cup) every 15—20 minutes during exercise
1—2 cups (250—500 ml) for every pound of body weight lost during the exercise (approximately 1 L/kg)

Other recommendations
- ➔ Wear light-colored and light-weight clothing
- ➔ Drink cool water (o°C) as at this temperature, water will leave the stomach faster
- ➔ If using electrolyte or carbohydrate-mixed fluid, use a 5—8% mixture (this empties as fast as water)
- ➔ Limit caffeine (usually in coffee, tea and pop) because caffeine is a diuretic and will increase fluid loss

Electrolytes
For endurance athletes, electrolyte replacement is necessary because much is lost through perspiration. Sports drinks containing sodium, potassium, chloride and phosphorous is recommended for exercise lasting longer than a hours. Because muscle and liver glycogen stores become depleted during long periods of physical exercise, sports drinks containing carbs and sodium can delay fatigue and thus sustain optimal performance longer.

Vegetarian Life Style

The vegetarian must be willing to spend time planning and preparing meals to ensure adequate nutrition. One of the biggest problems (although there are many positives) is ensuring adequate protein intake from non-meat sources, as grains and legumes do not individually provide all of the essential amino acids.

For example, lysine is found in legumes but not in grains, while grains contain methionine but legumes do not. Eating a variety of grains, fruits and vegetables should meet all amino acid needs. Vegetarians do have a lower rate of heart disease, breast and colon cancer and typically lower percentage of body fat, but need to ensure vitamin B12 is added to their diet.

Female vegetarians who acquire most of their iron from non-animal sources are at risk of developing iron deficiency. Iron from plant sources, non-heme iron, is absorbed less than iron from animal sources (heme iron). Therefore, female vegetarians are at risk for losing more iron and absorbing less. Vitamin C intake can assist in increasing non-heme iron absorption.

Weight Loss

The approach to weight loss can vary from calorie reduction to use of supplements to enhance fat burning. Liposuction certainly reduces fat but really isn't part of a fitness leader's bag of tricks! Weight loss should focus on altering lifestyle and nutritional habits to facilitate weight loss of approximately i lb/week. On the other hand, reducing caloric intake below 1200 calories/day will slow down the BMR (basal metabolic rate) and may decrease LBM (lean body mass) causing a further reduction in the metabolic rate, and as a result maintaining weight loss becomes even more difficult.

Spot Reducing

Although it would be great if we could specify where we wanted to lose body fat, it just doesn't work that way! As caloric intake is reduced caloric burn is increased to create a negative energy balance, fat loss occurs throughout the body and not in one specific desired location. Although muscle groups can be selectively targeted for toning or strength against body fat loss is a 'total body experience'.

Assignment