

# Nutrition Guideline

## Cardiovascular Care

### Heart Healthy

*For Professional Reference Only*

Applicable to: Nurses, Physicians, and Other Health Professionals

#### Recommendations

There are several nutrition and lifestyle modifications that can be made to improve heart health and the risk of cardiovascular disease (CVD). Modifying these dietary and lifestyle elements can benefit weight management, lipid profiles, blood pressure and glucose management.

- Patients who are overweight or obese should be supported to reduce their weight to lower risk of CVD. Being overweight or obese has detrimental effects on low density lipoprotein cholesterol (LDL-C), triglycerides (TG), blood pressure, blood glucose, and high density lipoprotein cholesterol (HDL-C).
- Plant proteins (e.g. soy protein, nuts and legumes), plant sterols, fibre and soluble fibre contain nutrients that have the greatest cholesterol lowering ability. Dietary patterns such as the Mediterranean and vegetarian diets emphasize these nutrients:
  - Soy proteins contain isoflavones which reduce cholesterol synthesis and reduce premature atherosclerosis. Soy proteins are found in soybeans, edamame, tofu, and soy beverage.
  - Nuts are a good source of healthy mono and polyunsaturated fats. A diet that replaces the saturated fat with these healthy fats is beneficial for CVD.
  - Plant sterols reduce cholesterol absorption and may lower LDL-C. They are found naturally in whole foods, however, most Canadians cannot get adequate intake to lower LDL-C. Fortified foods are available (e.g. some margarines, orange juice).
  - Fibre helps to lower CVD risk. Patients with dyslipidemia benefit from 25 – 38 g/day of fibre. Fibre also helps reduce formation and progression of atherosclerosis.
  - Soluble fibre (e.g. psyllium and beta-glucan) lowers total and LDL-C.
- The Mediterranean diet encourages vegetables, fruits, whole grains and fish. This provides nutrients to help improve heart health such as antioxidants, omega-3 fatty acids, fibre and B vitamins. Supplementing antioxidants and B vitamins is not recommended for the prevention or treatment of CVD.
- Total dietary fat should range from 20 – 35% of calories. Less than 20% from fat may increase carbohydrate intake which increases TGs and lower HDL-C. More than 35% from fat may be beneficial if saturated and trans-fat intake remains low.
  - Limit saturated fat to <7% of calories to lower LDL-C. Replace with unsaturated fats rather than with protein or carbohydrates. Limit processed and packaged foods high in saturated fat and trans fat, red meat and high fat dairy products. Choose lean meats or plant proteins.
  - Choose long chain omega-3 fats (marine based EPA/DHA) at least twice per week. This provides approximately 200 – 500 mg/day of EPA/DHA. Alternative sources of EPA/DHA include kelp, seaweed, and fortified foods. Patients with elevated TGs may benefit from higher amounts (2000 – 4000 mg/day) of EPA/DHA through diet and supplements. Consider individualizing supplement recommendations.
  - Most dietary fat should come from foods high in monounsaturated fat such as olives, avocados, nuts, seeds, natural nut/seed butters, and vegetable oils like avocado, safflower, sunflower, sesame, olive and canola oils.
  - Coconut oil contains medium chain TG which digest differently than long-chain fats. Lauric acid, a medium chain TG, in coconut oil, is known to increase HDL-C, however, coconut oil is mainly saturated fat, which increases LDL-C, but not to the extent that animal fats do, such as butter. Coconut oil is not recommended as an alternative to vegetable oils.
- There is no limit for dietary cholesterol in the healthy population; however, the recommendation is to consume as little dietary cholesterol as possible while still consuming a healthy diet. Saturated fat has a

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greater effect on CVD risk than the effect of dietary cholesterol.

- Consuming excess sugar can increase TGs, therefore encourage <10% of total calories from added sugar such as packaged foods, restaurant meals, sweets, syrups and fruit juices.
- Review medications and diet for drug-nutrient interactions. People with CVD may need to consider the interaction of grapefruit with some statin medications and vitamin K rich foods (green leafy vegetables) with warfarin or other anticoagulating medications.
- Low to moderate alcohol intake can have positive and negative CV effects. Individualize alcohol recommendations. Patients with dyslipidemia should follow Canada's Low-Risk Drinking guidelines. Patients with elevated TGs should abstain from alcohol until TGs improve.

Patients who are at risk or have heart disease or dyslipidemia may work with multiple different healthcare professionals including the primary care or family physician, cardiologist, registered nurse or nurse practitioners, physical, occupational therapists, registered dietitians, mental health professionals, social workers and pharmacists. This guideline provides nutrition interventions to help prevent and manage dyslipidemia and improve heart health.

### Health Benefits

Following the recommendations in this guideline can help individuals:<sup>1,2</sup>

- Decrease risk for cardiovascular disease.
- Achieve and maintain a healthy body weight.
- Achieve recommended levels of low density lipoprotein cholesterol, high density lipoprotein cholesterol, and triglycerides.

Nutrition and lifestyle modifications decrease cardiovascular risk.<sup>3</sup> The following modifications are reviewed throughout this guideline:

- High cholesterol
- Smoking
- Overweight / obesity
- Reduced high density lipoprotein cholesterol
- High blood pressure
- High triglycerides
- Diabetes
- Physical inactivity

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**Key Questions**

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Definition

- What is cardiovascular disease (CVD)?
- What are the risk factors for CVD?
- What are the major types of serum lipids?
- What nutrition and lifestyle practices help lower LDL-C levels?
- What nutrition and lifestyle practices help increase HDL-C levels?
- What nutrition and lifestyle practices help lower triglycerides?

Weight Management

- Are overweight and obesity risk factors for CVD?
- Does weight management help manage serum cholesterol and triglycerides?
- What is a healthy body weight for adults?
- What tips at restaurants can patients use to make their meals healthier?

Dietary Patterns

- What dietary patterns help manage CVD?
- What is the Mediterranean dietary pattern?
- What are the Vegetarian and Portfolio dietary patterns?
- Why are vegetables and fruits recommended for heart health?
- How do plant sterols lower LDL-Cholesterol?
- How do soy products lower LDL-Cholesterol?
- How do nuts lower LDL-Cholesterol?

Fibre

- Why is dietary fibre important for heart health?
- How does soluble fibre help lower LDL-C levels?
- How can patients get 7 – 13 grams of soluble fibre per day?

Dietary Fat

- How much total fat is recommended daily?
- What does 20-35% of calories from fat look like?
- How do saturated fats affect heart health?
- How do polyunsaturated fats affect heart health?
- How do monounsaturated fats affect heart health?
- How do trans-fats affect heart health?
- How does coconut oil affect heart health?

Dietary Cholesterol

- Does dietary cholesterol affect heart health?
- What is the heart healthy recommendation for dietary cholesterol?
- Are there limitations to eating eggs?

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### Omega-3 Fatty Acids

- What are the benefits and risks to eating fish?
- How much omega-3 fats are recommended?
- Are there dietary alternatives to eating fish?
- Are omega-3 fat supplement recommended?

### Sugar

- What is the effect of added sugar on triglycerides and heart health?
- How much added sugar is acceptable daily?

### Supplements

- Do patients with CVD require vitamin or mineral supplements?
- How does folic acid affect serum homocysteine levels and does this lower CVD risk?
- What are some potential food and drug interactions that patients with CVD may have?

### Alcohol

- What are Canada's Low-Risk Drinking Guidelines?
- How does alcohol affect heart health?
- Does alcohol affect triglycerides?

### Physical Activity

- What type of physical activity is recommended?
- What is the recommended amount of physical activity for prevention and management of CVD?

### Smoking

- Should patients with or at risk for CVD avoid smoking and second hand smoke?

### Resources

- Are there any handouts on heart healthy I can use with my patients?

## Definition

### What is cardiovascular disease?

Cardiovascular disease (CVD) includes diseases or injuries that affect the heart or the blood vessels of the heart, body and brain.<sup>3</sup> CVD may include the following conditions:<sup>4</sup>

- Heart disease (heart and vascular)
- Angina
- Heart failure
- Coronary insufficiency
- Arrhythmia (bradycardia, tachycardia)
- Stroke (ischemic, hemorrhagic)
- Myocardial infarction (fatal or non-fatal heart attacks)
- Heart valve conditions/disease (stenosis, regurgitation, and mitral valve prolapse)

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About one third of all deaths in Canada are from major cardiovascular (CV) events.<sup>5</sup> Heart disease (also called coronary artery disease) is a condition that affects the blood supply to the heart due to partially or completely blocked arteries. Heart disease includes atherosclerosis, angina, myocardial infarctions and sudden coronary death.

#### What are the risk factors for cardiovascular disease?

It is well known that heart disease and stroke have an increased risk of occurrence when a person has abnormal lipids, hypertension and diabetes and is a smoker. The Heart and Stroke Foundation and the INTERHEART study state that the following risk factors can be modified to help lower the risk for heart disease:<sup>2,6</sup>

- Hypertension
- Dyslipidemia
- Diabetes
- Dietary patterns
- Overweight/obesity
- Abdominal obesity (a high waist circumference)
- Excessive alcohol intake
- Physical inactivity
- Smoking
- Stress

Some risk factors such as age, gender, ethnicity, family history and a history of stroke or transient ischemic attack (TIA or mini-stroke) cannot be modified to reduce their risk for heart disease:<sup>3,6</sup>

Age:

women >50 years or postmenopausal  
men >40 years

Ethnicity:

South Asian, African, and First Nations are more likely to have hypertension and dyslipidemia and are therefore at increased risk for heart disease

Family history:

premature heart disease in first degree relatives (parent, sibling, children) before age 55 years in men, 65 years in women  
stroke risk increases if first degree relative has a stroke before age 65 years

The Framingham Risk Assessment tool can be performed to determine the 10-Year risk of major CV events, and screens adults at high, intermediate, or low risk for CVD.<sup>3</sup> The level of risk a person is measured at will help determine how strict a dietary restriction is required. Examples of further restriction in dietary modifications include dietary cholesterol and trans-fat for those patients with a high risk score.

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Table 1. Framingham Risk Score (FRS) and Target Serum Lipid Levels<sup>3</sup>

Risk Category	Primary Target	Alternate Target
<b>High Risk (FR Score <math>\geq 20\%</math>)</b> <ul style="list-style-type: none"> <li>clinical vascular disease</li> <li>abdominal aortic aneurysm</li> <li>diabetes (<math>\geq 40</math> years old or <math>\geq 30</math> years old with <math>&gt; 15</math> years of diabetes or microvascular disease)</li> <li>chronic kidney disease</li> </ul>	$\leq 2.0$ mmol/L or $\downarrow$ LDL-C by $\geq 50\%$	ApoB $\leq 0.80$ g/L or Non-HDL-C $\leq 2.6$ mmol/L
<b>Intermediate Risk (FR Score 10-19%)</b> <ul style="list-style-type: none"> <li>If LDL-C <math>\geq 3.5</math> mmol/L</li> <li>For LDL-C <math>&lt; 3.5</math>, consider treatment if:</li> <li>Apo B <math>\geq 1.2</math> g/L or Non-HDL-C <math>\geq 4.3</math> mmol/L</li> </ul>	$\leq 2.0$ mmol/L or $\downarrow$ LDL-C by $\geq 50\%$	ApoB $< 0.80$ g/L or Non-HDL-C $\leq 2.6$ mmol/L
<b>Low Risk (FR Score <math>&lt; 10\%</math>)</b> <ul style="list-style-type: none"> <li>If LDL-C <math>\geq 5.0</math> mmol/L or</li> <li>Familial hypercholesterolemia</li> </ul>	$\downarrow$ LDL-C by $\geq 50\%$	

LDL-C - low density lipoprotein cholesterol, HDL-C - high density lipoprotein cholesterol, Non-HDL-C - total cholesterol minus HDL-C, ApoB - Apolipoprotein B

To determine a person's 10-year risk of developing CVD, use the Framingham risk score: [CVD Risk Check™](#)

## What are the major types of serum lipids?

The major types of serum cholesterol include total cholesterol, low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C) and triglycerides (TG):

Total -C:	Combines the plasma concentrations of LDL-C, HDL-C and other lipoproteins. A more specific blood lipid profile is required to be able to assess level of CVD risk.
LDL-C:	Has a strong positive association with risk of CVD. CV risk increases as LDL-C increase. <sup>1</sup>
HDL-C:	Plasma concentration of HDL-C is inversely associated with CVD risk. CV risk decreases as HDL-C concentrations increase. <sup>1</sup>
TG:	Are produced from dietary fats (or indirectly from added sugars and excess alcohol) and carried in the blood stream. May increase the risk for heart disease and is a sign of metabolic syndrome.

Metabolic syndrome is a combination of high blood sugars, high blood pressure, low HDL-cholesterol, high triglycerides and excess abdominal fat (abdominal obesity). Metabolic syndrome increases the risk for heart disease, diabetes and stroke.

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Encouraging healthy dietary and lifestyle practices can help lower patient's serum cholesterol and TGs and in turn helps to reduce their risk for heart disease. Patients may have particular serum lipid markers that are not within optimal range. Focusing the dietary and lifestyle interventions towards these particular markers can be helpful in creating specific and attainable goals with the patient to help reduce their CV risk.

Each of the interventions listed here are described in detail within this guideline. Encourage and support your patients on making healthy diet and lifestyle changes to improve their health and lower their risk for CVD.

#### What nutrition and lifestyle practices help lower LDL-C levels?

Listed below are the major dietary and lifestyle interventions that can help reduce LDL-C levels:

- Healthy body weight
- Plant sterols and stanols
- Moderate total dietary fat
- Avoid trans fat
- Limit saturated fat (replace with mono and polyunsaturated fats)
- Being physically active
- Increasing soluble fibre
- Limiting dietary cholesterol

#### What nutrition and lifestyle practices help increase HDL-C levels?

Listed below are the major dietary and lifestyle interventions that can help increase HDL-C levels:

- Healthy body weight
- Moderate alcohol intake
- Being physically active

#### What nutrition and lifestyle practices help lower triglycerides?

Listed below are the major dietary and lifestyle interventions that can help reduce triglycerides: Healthy body weight

- Limit or avoid alcohol
- Omega-3 fats and fish oil
- Smoking cessation
- Being physical activity
- Mediterranean dietary pattern
- Limit added sugars
- Eliminate trans fats (replace with mono and polyunsaturated fats)

## Weight Management

### Are overweight and obesity risk factors for cardiovascular disease?

Overweight and obesity are independent risks factor for CVD, causing detrimental changes to LDL-C, triglycerides (TG), blood pressure (BP), blood glucose levels, and HDL-C.<sup>7,8,9</sup> Individuals who are overweight or obese should be encouraged to decrease weight to lower risk of heart disease.

### Does weight management help improve serum cholesterol and triglycerides?

A healthy lifestyle including diet and exercise is needed to achieve and maintain a healthier weight. Weight loss and maintenance of 3 – 5% body weight can improve triglyceride levels. Larger amounts of weight loss can improve LDL-C and HDL-C and decrease the need for CVD medications. Therefore, a weight loss of 5 – 10% is recommended within a 6 month period. A realistic weight loss goal is up to 2 pounds per week.<sup>10</sup>

### What is a healthy body weight for adults?

**Body mass index (BMI)** is measurement based on height and weight. BMI classifies the person's risk for developing health problems based on the categories of BMI.<sup>9</sup> Normal weight is a BMI of 18.5 – 24.9 kg/m<sup>2</sup> which is associated with the least risk for developing health problems. Being overweight or obese increases the risk for developing health problems. Below are the BMI categories for overweight and obese:

- Overweight is a BMI of 25.0 – 29.9 kg/m<sup>2</sup>
- Obesity class I is a BMI of 30.0 – 34.9 kg/m<sup>2</sup>
- Obesity class II is a BMI of 35.0 – 39.9 kg/m<sup>2</sup>
- Obesity class III is a BMI >40.0 kg/m<sup>2</sup>
- Underweight is a BMI <18.5 kg/m<sup>2</sup>

Note that patients who are very muscular (athletes) may have a low percent body fat and large amount of muscle mass. This may result in an elevated BMI calculation and overestimate their health risk. For this population the waist circumference is a better tool to assess health risk.

Patients over the age of 65 have a slightly higher BMI range than other adults. The ideal BMI range is 22 to 29.9 kg/m<sup>2</sup>.<sup>9</sup>

Using BMI as a tool to establish weight loss goals is not recommended.

**Waist circumference** measurements can be used for patients with a BMI between 18.5 and 34.9 kg/m<sup>2</sup>.<sup>9</sup> A high waist circumference suggests the patient has abdominal obesity and indicates that there is an increased risk of developing health problems such as type 2 diabetes, heart disease and hypertension.<sup>9</sup> Abdominal obesity increases the risk of developing health problems such as type 2 diabetes, heart disease and hypertension.<sup>9</sup>

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Table 2. Abdominal Obesity Based on Waist Circumference<sup>8</sup>

	Country or Ethnic Group	Abdominal Obesity Cut-off Points	
		Men	Women
Waist circumference	North American*	> 102 cm	> 88 cm
	Europid**, Sub-Saharan African, Eastern Mediterranean and Middle East (Arab)	≥ 94 cm	≥ 80 cm
	South Asian, Chinese (Chinese, Malay, Asian Indian), Japanese, South and Central American	≥ 90 cm	≥ 80 cm

\* Health risk associated with degree of obesity is most associated to the North American WC cut off points<sup>11</sup>

\*\*Europid ethnic group can use both European and North American cutoff points to allow better comparisons.

Using both the BMI and waist circumference together can help to provide additional information on health risk.<sup>9</sup> Using BMI alone as a tool to establish weight loss goals is not recommended.

Table 3. Health Risk Based on Both Body Mass Index and Waist Circumference

		Body Mass Index		
		Normal weight	Overweight	Obese Class I
WC	No abdominal obesity	Least Risk	Increased Risk	High Risk
	Abdominal obesity	Increased Risk	High Risk	Very High Risk

WC: Waist circumference. Abdominal obesity is based on Table 2.

## What tips at restaurants can patients use to make their meals healthier?

The following tips can help individuals control what they eat when they go out:

- Ask questions. The server can usually tell an individual how the food is made and what ingredients are in the dish. Lower the fat content of the meal by asking for healthier cooking methods or substituting high fat foods for healthier choices.
- Don't go out to eat when really hungry. Eat a piece of fruit an hour before going out to help decrease the feeling of hunger. If an individual goes out when really hungry they will likely eat too much.
- Many restaurant chains provide nutritional information for their menus. Use the nutritional information to pick foods that are lower in fat, sodium, and sugars, and higher in fibre.
- Individuals may share their meal with someone else. Restaurants often give more food than they would eat at home.
- Ask for leftovers to be packed up. The leftovers can be eaten at another meal.
- Don't add salt or butter to food at the table. Restaurant food is often already high in fat and sodium.

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## Dietary Patterns

### What dietary patterns help manage cardiovascular disease?

Dietary patterns like the Mediterranean and vegetarian (Portfolio) diets are high in fibre (especially soluble fibre), healthy fats and lean proteins (especially fish and plant proteins). These nutrients and particular food qualities are associated with the greatest cholesterol lowering results.<sup>12</sup> All individuals should be encouraged to adopt healthy eating habits to lower their CVD risk, and these diets emphasize:<sup>13,14,15</sup>

- Rich sources of vegetables and fruits (fresh or frozen)
- Good sources of fibre from whole-grain cereals and legumes
- Lower fat milk or milk alternatives
- Plant sources of proteins (including soy protein)
- Low in sodium
- Moderate intake of lean unprocessed meat and poultry
- Fish (especially fatty fish) and seafood
- Moderate intake of unsaturated fats including vegetable oils (especially olive oil) and nuts and peanuts
- Low in saturated and trans-fats

### What is the Mediterranean dietary pattern?

The dietary components that make up the Mediterranean diet have a CV protective effect.<sup>15</sup> The Mediterranean diet has shown to improve CVD risk factors, reduce markers of oxidation and inflammation, lower endothelial dysfunction (an imbalance in vasodilation and vasoconstriction) and reduce CV events (especially stroke) and mortality.<sup>2,15</sup> Studies have shown that improved outcomes are seen in patients with hypertension, dyslipidemia, diabetes, and who have abdominal obesity who adhere closely to the Mediterranean dietary pattern.<sup>15,16</sup> Following the Mediterranean dietary pattern help can help prevent and treat dyslipidemia and reduces LDL-C by 5 to 10%.<sup>2</sup>

The Mediterranean diet replaces some of the carbohydrates with fat.<sup>16</sup> The Mediterranean diet is considered a higher fat diet, with lower carbohydrates and moderate protein. The following is the macronutrient profile for the Mediterranean diet:<sup>16,17</sup>

Table 4. Comparison of the Mediterranean Diet to the Dietary Reference Intake Guidelines<sup>16,17,18</sup>

Dietary Nutrient	Mediterranean Diet Recommendation	Dietary Reference Intake
Total Fat	40 – 45% (mainly monounsaturated fat)	20 – 35%
Saturated Fat	<10%	<10%
Protein	5 – 20% (mainly fish, shellfish, and plant proteins)	10 – 35%
Carbohydrate	40%	45 – 65%
Fibre	14 grams/100 kcal	22 – 34 grams
Sugar	<10%	<10%

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Although the Mediterranean dietary pattern is a higher fat diet, it results in greater weight loss and more improvements in CV risk factors than a low-fat, high-carbohydrate diet.<sup>16</sup> A diet that is high in total fat and low in saturated fat does not lead to weight gain and can promote weight loss when included with a caloric deficit. It also does not appear to contribute to the development of insulin resistance, type 2 diabetes or some types of cancer. In the past, high fat diets were linked to cancer and insulin resistance, but they were correlated to obesity, lack of activity and other dietary factors.<sup>16</sup>

The Mediterranean dietary pattern emphasizes vegetables, fruits, olive oil, and whole grains at each meal. It recommends olives, nuts, seeds, dairy, onions, garlic and herbs on a daily basis. It suggests that white meat, fish, seafood, eggs, and legumes be consumed a few times each week and that red meat, processed meat and sweets are limited to 1 or less times a week.<sup>19</sup> Water and regular physical activity are also part of the dietary pattern.

#### What are the Vegetarian and Portfolio dietary patterns?

The vegetarian diet is a way of eating that eliminates all or some of the following: animal meats, poultry, eggs and dairy. A type of vegetarian diet is the Portfolio diet, which eliminates the animal products, but emphasizes certain aspects of plant based eating that can help improve CV health, inflammation and oxidative stress. The diet is high in phytonutrients, healthy fats, plant sterols, viscous soluble fibre, soy proteins and nuts.<sup>20</sup>

The pharmaceutical industry provides traditional ways of combating dyslipidemia through prescribing statins. Recent studies have consistently shown that consuming a dietary portfolio of foods known to lower LDL-C and raise HDL-C, can achieve statin-like effects.<sup>21,22,23</sup> These foods and nutrients listed above are aimed towards getting optimal LDL-C lowering effects and following this dietary pattern can achieve and 8 to 14% reduction in LDL-C.<sup>2</sup>

Although attaining all of the foods recommended by the Portfolio dietary pattern may not be achievable for all patients, incorporating some of these foods may still provide heart healthy benefits. Encourage patients to choose food sources that are high in:<sup>20,22,23</sup>

Plant sterols (phytosterols):	Fortified foods: proactive Becel <sup>®</sup> , OJ and supplements
Soy Proteins:	Tofu, soy milk, edamame and fermented soybean
Soluble fibre:	Oats, barley, psyllium, beans, soy nuts, tofu and avocado
Nuts:	Almonds, peanuts, pecans and walnuts

Each of these nutrients are described in detail within this guideline. Support patients to make healthy changes to their diet that can help improve their health and lower their risk for CVD.

**Why are vegetables and fruits recommended for heart health?**

Encourage patients to consume vegetables and fruits according to *Eating Well with Canada's Food Guide*.<sup>3</sup> Vegetables and fruits are low in calories and high in nutrients such as vitamins, minerals and fibre. They can promote a feeling of fullness without adding extra calories. This can be helpful with weight management. Diets high in vegetables and fruit have been shown to lower blood pressure and improve other risk factors of CVD.<sup>1,24</sup>

*Eating Well with Canada's Food Guide* recommends up to 7 to 10 servings of vegetables and fruit per day.<sup>25</sup> One serving is ½ cup (125 mL) fresh, frozen, canned vegetables and fruit, and cooked leafy green vegetables and 1 cup (250 mL) of raw leafy green vegetables.<sup>25</sup> Encourage patients to choose produce prepared with little or no added fat, sugar, or salt.<sup>25</sup> Here are a few practical tips for helping your patients increase their vegetable and fruit intake:

- Aim for 7 to 10 servings each day.
  - 1 serving is ½ cup (125 mL) fresh, frozen, canned vegetables and fruit, and cooked leafy green vegetables or fruit juice and 1 cup (250 mL) of raw leafy green vegetables.
- Emphasize vegetables or fruit that are deeply coloured. Examples are leafy dark greens, berries, carrots, squash and peaches. Eat at least one dark green and one orange vegetable each day.
- Choose vegetables and fruit prepared with little or no added fat, sugar or salt.
- Have whole vegetables and fruit more often than juice.
- Have 1 or 2 servings of vegetables with every meal.
- Include fruits for snacks. Aim for 2 to 3 fruits per day.
- Take vegetables for snacks.
- Add extra vegetables into dishes like casseroles, soups, spaghetti sauce or meat loaf.

**How do plant sterols lower LDL-Cholesterol?**

Plant sterols (plant stanols and phytosterols) are similar in chemical structure to cholesterol.<sup>26</sup> They compete for absorption with cholesterol causing 50% reduction in cholesterol absorption into the blood stream.

Plant sterols are found in vegetable oils, nuts, fruit, vegetables, legumes and seeds. Unfortunately the average western diet contains about 150 to 400 mg/day of sterols.<sup>27</sup> For patients with dyslipidemia, taking 2000 mg/day of plant sterols reduces LDL-C by 9% of LDL-C.<sup>2,3</sup> Fortunately, foods have been enriched with plant sterols including margarines and orange juice. Supplements or natural health products are available with plant sterols added.

Plant sterols work best when consumed with meals (multiple times throughout the day), and especially when fats are consumed.<sup>28</sup> Plant sterols are more effective in patients with higher baseline LDL-C levels.<sup>3</sup>

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Note the following considerations to consuming plant sterols:

- Some patients may have a rare and often unknown autosomal-recessive disorder called sitosterolemia which causes increased intestinal absorption of plant sterols. This leads to high serum plant sterols and cholesterol levels and can lead to premature atherosclerosis.<sup>27</sup> Plant sterols are not recommended in patients with good cholesterol levels as identifying those with sitosterolemia is difficult.<sup>28</sup> There is currently no evidence that plant sterols can lower CVD risk in the healthy population.<sup>28</sup>

#### How do soy products lower LDL-Cholesterol?

The mechanism of how soy proteins lower cholesterol remains unclear. Soy may increase bile acid excretion, upregulate LDL-C receptors, and inhibit the synthesis of endogenous cholesterol.<sup>26</sup> Soy proteins contain isoflavones which inhibit the oxidation of LDL particles, therefore reducing the risk for premature atherosclerosis.<sup>26</sup>

Encourage patients to consume a minimum of 20 to 25 grams of soy proteins daily for the management of dyslipidemia and to lower LDL-C by 3 – 5%.<sup>2,3,26</sup>

The following common soy foods are listed with the serving size to achieve 20 to 25 grams of soy protein:

- 3/4 cup (175 mL) boiled soybeans
- 1 cup (250 mL) edamame, shelled
- 1 cup (250 mL) tofu
- 1/2 cup (125 mL) soybean (nut), roasted
- 3 cups (750 mL) soy beverage (milk alternative)
- 2/3 cup (150 mL) tempeh (fermented)

Patients may consume more soy protein than observed from the foods listed above. Soy protein is often an ingredient in baked products, breakfast cereals, pasta, beverages, toppings, meat products (e.g. sausages, canned tuna, meatless chili) and imitation dairy products such as cheese and milk.<sup>29</sup>

Note the following considerations to consuming soy proteins:

- Soy is a common allergen for patients and may need to be avoided.<sup>29</sup>
- Soy and isoflavones may have controversy in that they have estrogen-like properties called phytoestrogens. Due to these properties they have the potential to disrupt hormonal balance; however, the studies on isoflavones activity and these phytoestrogens are almost exclusively on *in vitro* and animal research.<sup>29</sup>
- Soybeans can be genetically modified (GMO). Health Canada has determined that Roundup Ready<sup>®</sup> soybeans are as safe and nutritious as the other commercially available soybean varieties and are suitable for food use.<sup>29</sup>

### How do nuts lower LDL-Cholesterol?

As recommended in the Mediterranean dietary pattern, a diet higher in fat (greater than 35% of total calories coming from total fat, primarily mono and polyunsaturated fats (MUFA and PUFA) and low in saturated fat) can decrease total cholesterol, TG, and LDL-C in patients with and without dyslipidemia.<sup>3</sup> Nuts such as almonds, walnuts, pecans and peanuts are high sources of MUFA and PUFA.

For patients with dyslipidemia, the Canadian Cardiovascular Society suggests:<sup>3</sup>

- 50 to 100 g of nuts at least 5 times per week.
- This is equivalent to:
  - 1/3 to 2/3 cup (40 – 85 g) almonds or peanuts daily
  - 1/2 to 1 cup (65 – 125 g) of walnuts or pecan halves daily

Encourage patients to substitute snacks like muffins or granola bars, for nuts. This can be helpful in improving satiety without adding additional calories to the whole day.

## Fibre

### Why is dietary fibre important for heart health?

A high fibre diet is associated with a lower risk of CVD and a lower rate of mortality from CV related events.<sup>1,30</sup> Fibre reduces total cholesterol and LDL-C which reduces the formation or progression of atherosclerosis.<sup>30</sup> Fibre from whole grain cereals and fruits has the most impact on CVD.<sup>1,3,30,31,32</sup> All adults with and without dyslipidemia should aim for 25 g to 38 g of dietary fibre each day.<sup>18</sup>

### How does soluble fibre help lower LDL-Cholesterol?

Fibre can be defined in two categories: insoluble and soluble. Most fibre containing foods will contain both insoluble and soluble fibre.

- Insoluble fibre improves regular bowel movements and prevents constipation. It also helps to control pH balance in the intestine, improving the health of the digestive system.
- Soluble fibre turns to a gel during digestion which slows the absorption of nutrients.<sup>33</sup>
  - Cholesterol: Soluble fibre binds to fatty acids and has been shown to lower total cholesterol and LDL-C. Soluble fibre decreases the amount of cholesterol produced by the liver.<sup>30</sup>
  - Weight management: This helps with feelings of fullness after a meal and can help to reduce the total calories consumed at a meal.
  - Diabetes and inflammation: The slow digestion and absorption allows carbohydrates (starch and sugar) to be absorbed slowly and improves blood glucose control. This improves insulin sensitivity and reduces inflammation.<sup>30</sup>

Consider that patients may experience gastric symptoms when increasing fibre in their diet. Symptoms of gas and flatulence are usually mild in the recommended doses of soluble fibre.<sup>34</sup> Encourage a gradual increase to ease symptoms.

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#### How can patients get 7 to 13 grams of soluble fibre per day?

Emphasize foods that are high in soluble fibre. To reduce LDL-C and total cholesterol, suggest 7 to 13 gram of soluble fibre each day.<sup>2,3,33</sup> Food sources of soluble and insoluble fibre can be found below:<sup>35</sup>

#### Soluble Fibre (*grams of soluble fibre*)\*

##### Psyllium

Husks - 3.5 g per 1 tbsp  
AllBran® buds with psyllium – 2.7 g per 1/3 cup  
Metamucil® - 3.4 g per 1 tbsp

##### Beta-glucan

Oat bran – 2.2 g per ¾ cup cooked  
Oatmeal – 1.4 g per ¾ cup cooked  
Barley – 0.8 g per ½ cup cooked

##### Nuts and seeds

Hazelnut – 1.1 g per ¼ cup  
Sunflower seeds – 1.0 g per ¼ cup  
Flax seed, whole – 0.6 – 1.2 g per 1 Tbsp  
Flax seed, ground – 0.4 – 0.9 g per 1 tbsp

##### Legumes

Black beans – 5.4 g per ¾ cup cooked  
Lima beans – 5.3 g per ¾ cup cooked  
Navy beans – 3.3 g per ¾ cup cooked  
Kidney beans – 2.6-3.0 g per ¾ cup cooked  
Chickpea – 2.1 g per ¾ cup cooked

##### Vegetables

Brussels sprouts – 2.0 g per ½ cup  
Sweet potato, no skin – 1.8 g per ½ cup cooked  
Asparagus – 1.7 g per ½ cup cooked  
Turnip – 1.7 g per ½ cup cooked  
Broccoli – 1.2 – 1.5 g per ½ cup cooked  
Eggplant – 1.3 g per ½ cup  
Okra – 1.0 g per ½ cup cooked

##### Fruits

Purple passion fruit – 6.5 g per ½ cup  
Avocado – 2.1 g per ½ fruit  
Dried figs – 1.9 g per ¼ cup  
Orange – 1.8 g per medium fruit  
Pear – 1.1 – 1.5 g per medium fruit  
Apricot – 1.4 g for 3 fruits  
Nectarine – 1.4 g per medium fruit  
Apple, with skin – 1.0 g per medium fruit

##### Soy products

Soy nuts – 3.5 g per ¼ cup  
Tofu – 2.8 g per ¾ cup cooked  
Edamame – 1.5 g per ½ cup cooked

\*Adapted from the Dietitians of Canada: Food sources of soluble fibre available at:  
<http://www.dietitians.ca/Downloads/Factsheets/Food-Sources-of-Soluble-Fibre.aspx>

## Dietary Fat

#### How much total fat is recommended daily?

Dietary fat in food is categorized into four types including MUFA, PUFA, saturated fat and trans fat. Each fatty acid has different influences on health and disease. To prevent CVD, it is suggested that total fat intake should be between 20% and 35% of total calories.<sup>3</sup> However, as with the Mediterranean dietary pattern, higher amounts of fat can be beneficial to heart health if they are low in saturated fat and trans-fats, and higher in the healthy unsaturated fats (MUFA and PUFA).

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- If total fat is >35% of total energy, ensure calories are appropriate to prevent weight gain, and that saturated fat intake is low.<sup>17</sup>
- If total fat is <20% of total energy, an increase in carbohydrate intake may occur. This is associated with increased levels of triglycerides and reduced HDL-C.<sup>17</sup>

When making dietary fat recommendations, rather than suggesting the patient reduce their total fat intake, suggest that they reduce their saturated fats and trans-fats intake and replace this with MUFA and PUFA (see below for a list of foods). It is more beneficial to replace unhealthy fats like saturated and trans fat, with healthy fats like MUFA and PUFA, compared to replacing the unhealthy fats with carbohydrates.

#### What does 20-35% of calories from fat look like?

Patients consuming a smaller diet may require about 30 – 50 grams of total fat daily, and those consuming a higher calorie intake would need about 50 – 85 grams of total fat. Look on nutrition facts tables to determine if a food product is high or low in total fat.

Example of grams of total fat:

- 1 Tbsp (15 mL) butter: 12 g
- 15 almonds: 9 g
- 1 Tbsp (15 mL) olive oil: 14 g
- 50 g cheddar cheese: 17 g
- 1 whole avocado: 29 g
- 2 chicken wings: 21 g

#### How do saturated fats affect heart health?

Saturated fats are known to raise both LDL-C and HDL-C but the effects on CVD endpoints are unclear. Some saturated fats (stearic acid found in lard and beef fat) do not negatively affect serum cholesterol levels. Compared to red meat, the consumption of the same amount of fish, poultry, dairy products, and nuts are associated with a lower risk of heart disease and increased levels of HDL-C.<sup>17</sup>

By reducing saturated fat to <7% of total calories, LDL-C is reduced by 5% to 10% and CVD mortality is reduced by 14%.<sup>22</sup> Encourage patients to limit intake of saturated fat to <7% of total calories.<sup>2,3</sup> To lower LDL-C reduce saturated fat even further to 5% to 6% of total calories.<sup>2</sup> Rather than consume a low fat diet, encourage patients to replace the saturated fat with moderate amounts of PUFA and MUFA to keep total fat intake between 20 to 35% (or even higher if PUFA and MUFA intake is predominant in the diet).<sup>1</sup>

Patients consuming a smaller diet may require about <12 grams of saturated fat daily, and those consuming a higher calorie diet would aim for <16 grams of saturated fat daily.

Dietary Sources of Saturated Fat:

- Animal origin: fat in beef, lamb, pork, chicken, poultry skin, processed meats, dairy (cheese, cream, milk, yogurt), and lard
- Plant origin: cocoa butter, coconut oil, and palm or palm kernel oil

Example of grams of saturated fat:

- 1 Tbsp (15 mL) butter: 7.4 g
- 15 almonds: 0.7 g
- 1 Tbsp (15 mL) olive oil: 2 g
- 50 g cheddar cheese: 9.7 g
- 1 whole avocado: 4 g
- 2 chicken wings: 5.7 g

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The following tips can help patients decrease the saturated fat in their diet:

- Use the Nutrition Facts table and ingredient list on the labels of food packages to choose foods with less than 2 grams of saturated fat per serving.
- Avoid or reduce the use of solid fats like butter or lard. Instead, use liquid vegetable oils such as olive, canola, avocado, or peanut oils, and non-hydrogenated margarine.
- Choose 0% (skim), 1% milk and yogurts.
- Choose cheese that is less than 20% M.F.
- Use lean cuts of meat, trim the fat, and remove skin from poultry before eating.
- Prepare food with less fat and avoid deep frying. Bake, broil, steam, grill, sauté, poach or barbeque.
- Avoid or limit processed meats like bologna, wieners, bacon, sausages and pepperoni.
- Replace higher fat foods in the diet with lean meats and alternatives like chicken and turkey breast, extra lean ground beef and chicken, eggs, legumes (beans, peas, and lentils), vegetables and fruits and whole grain products.

#### How do polyunsaturated fats affect heart health?

The American Heart Association and Dietitians of Canada recommend that for good health, a high proportion of the total fat in a person's diet should be from MUFA and PUFA.<sup>3,4</sup> Replace saturate and trans fats with these healthy fats.<sup>4</sup>

#### Omega-6

Omega-6 PUFA help to decrease total cholesterol and LDL-C when replacing saturated and/or trans-fats. They help lower the risk for heart disease and stroke.<sup>4</sup> Aim for 3% to 10% of total calories.

#### Dietary Sources of Omega-6<sup>36</sup>

- nuts (pine, Brazil)
- seeds (safflower, sesame, sunflower, cotton)
- corn oil

#### Omega-3

- Prevents blood clotting, reduces risk of CVD including stroke, heart disease and lowers TGs.<sup>6</sup>
- Recommend patients replace saturated fat with PUFA to lower CVD risk
- Patients are recommended to have an intake of 2 or more servings of fatty fish each week. Each serving is about 3.5 ounces or 100 grams. This is equivalent to 200 – 500 mg/day of eicosapentanoic acid (EPA) and docosahexanoic acid (DHA).

Consider that some of the short-chain plant based omega-3 –  $\alpha$ -linolenic acid (ALA) can be converted in the body to the longer chain marine based omega-3 (EPA/DHA) but in very small amounts. Plant based omega-3 may be protective against CV events, however, the cardioprotective effects found in EPA/DHA cannot be found when relying on ALA conversion alone. The consumption of the marine based omega-3 EPA/DHA shows benefits of vasodilation, anticoagulation, reducing arrhythmias, fatal heart disease and progression of coronary atherosclerosis<sup>17,33</sup>

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#### Dietary Sources of Omega-3

- Long Chain Omega-3 (EPA/DHA): fatty fish, seaweed and kelp
- Short Chain Omega-3(ALA): walnuts, flaxseed, chia seed, hemp seed, canola oil, walnut oil, flaxseed oil
- Foods fortified with omega-3 (including ALA, EPA, DHA or a combination of omega-3's): some eggs, juice, milk, margarines and yogurts

#### How do monounsaturated fats affect heart health?

MUFA help decrease total cholesterol and LDL-C and therefore lowers the risk of heart disease and stroke.<sup>17</sup> Aim for 15% to 20% of total calories.<sup>17</sup> Encourage patients to use MUFA as a replacement for saturated fats in the diet. Ensure MUFA are not replacing other healthy fats like PUFA.

#### Dietary sources of MUFA<sup>4</sup>

- Avocado, olives
- Vegetable oils made from olives, canola, safflower, sunflower and sesame
- Nuts or nut butters made from peanuts, sunflower and sesame seeds (nut butters without hydrogenated oils/fats and added salt/sodium are recommended)

#### How do trans-fats affect heart health?

Trans fats increase LDL-C, lower HDL-C, and increase the total cholesterol : HDL-C ratio.<sup>3</sup> Another negative effect trans fats have on lipids is that they increase levels of lipoprotein-a which increases risk for atherosclerosis, heart disease and stroke by stimulating thrombosis.<sup>17</sup>

Patients at increased risk for CVD are recommended to limit trans fats to <1% of total calories and to replace the trans fats with PUFA or MUFA.<sup>3</sup> Adults at high risk for CVD or for secondary prevention should eliminate all trans fats from their diet.<sup>3</sup>

- Trans fats are made from changing liquid vegetable oil to solid fat through hydrogenation.
- Dietary sources include hard and some soft margarine, vegetable shortening, packaged and processed foods (cookies, crackers, fries, donuts and muffins), imitation creamers, cheese puffs and microwave popcorn.
- Aim for less than one or two grams per day of trans fats.

The following tips can help patients decrease trans fats in their diet:

- Eat fast food and fried foods less often.
- Eat fewer pastries and high-calorie bakery products (e.g. muffins, doughnuts, cookies).
- Read labels:
  - Use the Nutrition Facts table on packaged food to choose foods with little or no trans fats (<2g/day)
  - Avoid foods containing hydrogenated or partially-hydrogenated oil, hydrogenated margarine, or shortening, in the ingredient list. These include packaged crackers, cookies, biscuits, pies, waffles, snack foods, deep fried foods, sauces and dressings.
- Avoid or reduce the use of solid fats like hard margarine or shortening. Instead, use liquid vegetable oils such as olive, canola, avocado or peanut oils and non-hydrogenated margarine.

**How does coconut oil affect heart health?**

Medium chain triglycerides (MCT) are dietary fats that have carbon chains 8, 10 and 12 carbons in length. Oils that contain MCT include coconut oil and palm oil (palmitic-rich palm olein oil, not palm kernel oil). The long term side-effects of a diet rich in MCT is still unknown at this time.<sup>17</sup>

**Coconut Oil:** Consuming 2 tbsp (30 mL) per day is associated with a high HDL-C in patients without dyslipidemia. MCT - lauric acid is known to increase HDL-C and coconut oil is made primarily of this fat. The concern is that coconut oil is 87% saturated fat which is known to increase total cholesterol and LDL-C. The effects of coconut oil on lipids is more than vegetable oils but less than butter.<sup>37</sup> Although coconut oil has positive effects on HDL-C, it has negative effects on LDL-C therefore cannot be recommended as a fat substitute for plant based unsaturated fats.<sup>3</sup> MCT including coconut oil have body composition benefits in small but significant amounts.<sup>17</sup> Waist and hip circumferences, total body fat, subcutaneous fat and visceral body fat were all improved along with a 0.5 kg weight reduction in a 10 week period.<sup>38</sup>

**Palm Oil:** Palm olein oil has a reddish tint (it is high in carotenoids) and is about 40% saturated fat. Do not confuse this with palm kernel oil which is more >80% saturated fat and has no carotenoids. There is currently no evidence to recommend palm oil as beneficial or substitute for plant based unsaturated fats.<sup>3</sup>

**Dietary Cholesterol**

**Does dietary cholesterol affect heart health?**

Traditionally, it was thought that dietary cholesterol increased heart disease risk, and therefore limitations were set on foods higher in cholesterol such as meats, poultry, shellfish, egg yolks and milk products and the total dietary cholesterol intake was limited to <300 mg/day for healthy adults.<sup>18</sup> The extent of this intervention and its effectiveness on CVD outcomes remains unclear. Studies suggest that patients who consume less dietary cholesterol are linked to reduced CVD risk.<sup>18</sup> Saturated fat and other components of dietary intake have a greater effect on CVD outcomes and changes in LDL-C than the effect of dietary cholesterol.

In general, there is no limit for dietary cholesterol in the healthy population, however, the recommendation is to consume as little dietary cholesterol as possible while still consuming a healthy diet.<sup>18</sup> Foods that are high in cholesterol are also high in saturated fat. Therefore when patients are consuming foods lower in saturated fat, they are also reducing their total dietary cholesterol intake.

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#### What is the heart healthy recommendation for dietary cholesterol?

##### Healthy Population

There is no restriction of dietary cholesterol set for the general population;<sup>2</sup> however, the recommendation is to consume as little dietary cholesterol as possible while still consuming a healthy diet.<sup>18</sup>

##### Patients With or at Risk for CVD and Dyslipidemia

Dietary cholesterol recommendations are:<sup>2</sup>

- <300 mg/day to lower LDL-C by 10-12%
- <200 mg/day to lower LDL-C by 12-16%

##### Foods high in cholesterol:

- Organ meats, whole eggs or egg yolk, fish roe, shellfish (squid [calamari], shrimp, crab, lobster), higher fat dairy (cheese, yogurt, cream), beef fat, sardines, pork fat, poultry skin, and desserts, sauces and baked foods made with egg yolk.

Assess the dietary cholesterol intake in each patient individually, by determining if they are consuming too many foods high in cholesterol. If they require a dietary cholesterol limit, then adjustments to their diet can be suggested.

#### Are there limitations to eating eggs?

Whole eggs and egg yolks contain higher amounts of cholesterol (while containing low amounts of saturated fat). Egg whites do not contain cholesterol. Although eggs are high in cholesterol, new research suggests that they may have less of an impact on serum lipid levels.<sup>3</sup> It remains important to support patients in the management and prevention of heart disease, including those with diabetes, to consider all the foods in the diet, rather than focusing on one single food such as eggs, therefore individualized recommendations are encouraged. As eggs are an affordable, lean source of complete proteins, referral to a dietitian may be suggested to help manage dietary intake of cholesterol.

## Omega-3 Fatty Acids

#### What are the benefits and risks to eating fish?

##### Benefits

Omega-3 fatty acids are important nutrients to consider in CV health. There are two types of omega-3 fatty acids:

##### Short-Chain Plant derived: $\alpha$ -linolenic acid (ALA)

$\alpha$ -linolenic acid (ALA) is found in nuts (walnuts), seeds (hemp, flax and chia), oils (flax, walnut, canola and soybean) and soy products (tofu, vegetable soy proteins and edamame). While ALA is an important essential source of omega-3, the cardioprotective effects of EPA and DHA cannot be obtained by consuming ALA alone.<sup>17</sup>

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#### Long-Chain Marine derived: Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA)

EPA and DHA are important to CV health as they are the precursors to vasodilators (preventing tightening and narrowing of the artery walls) and anticoagulants (preventing the formation of blood clots).<sup>17</sup> Fatty fish are a major source of the marine omega-3 EPA and DHA.

The healthy population can benefit from dietary omega-3 long-chain EPA/DHA to help reduce CVD risk by improving CV risk markers such as lowering serum TGs, reducing blood pressure, and inhibiting the inflammatory process.<sup>17</sup> Studies show that EPA and DHA are associated with a reduction in arrhythmias and fatal heart disease and reduced progression of coronary atherosclerosis.<sup>33</sup>

One of the primary therapies for elevated TGs is 1000 mg of EPA/DHA daily from fish, fortified foods, or fish oil supplements.<sup>2</sup> Patients with elevated TGs may benefit from doses up to 2000 to 4000 mg/day EPA/DHA to lower TG by 25% to 30%.<sup>34,39</sup> The beneficial effects of EPA/DHA is dose dependent, and is most effective in patients with baseline elevated triglycerides.<sup>3</sup> Supplements should be in consultation with health care team.

#### Risks

There are risks for possible exposure to heavy metals such as mercury. Mercury is a toxic substance found in the muscle tissue of fish and shellfish. All patients should limit their intake of predator fish, such as fresh or frozen tuna, escolar, marlin, orange roughy, shark and swordfish (does not include canned tuna).<sup>40</sup>

- General population should limit these predator fish to <150 g a week
- Women who are pregnant, planning pregnancy, or who are breastfeeding should limit these predator fish to <150 g a month.
- Women (specified above) should also limit canned albacore “white” tuna to <300g a week.

For more information about advice for various populations and age groups, refer to the Health Canada web page *Mercury in Fish – Questions and Answers*, available at: [http://www.hc-sc.gc.ca/fn-an/secureit/chem-chim/environ/merc/merc\\_fish\\_qa-poisson\\_qr-eng.php](http://www.hc-sc.gc.ca/fn-an/secureit/chem-chim/environ/merc/merc_fish_qa-poisson_qr-eng.php)

#### How much omega-3 fats are recommended?

The amount of EPA/DHA recommended to the healthy population is based on the association of a lower risk of coronary events including CVD death, myocardial infarction, and ischemic heart disease.<sup>17</sup>

Table 5. Recommended Omega-3 Fats for Healthy Adults and for the Prevention of Primary or Secondary Heart Disease<sup>33</sup>

	Every day	Every week	Attained from food
EPA and DHA	200 – 500 mg	1400 – 3500 mg	≥2 servings/week (3.5 – 4 oz or 100 g each) fatty fish
ALA	1100mg for women 1600mg for men	8000mg for women 11000mg for men	Food sources found in the common diet

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Patients with heart disease who consume adequate fish or through omega-3 EPA/DHA supplementation can see improvements in: <sup>41</sup>

- Reduce cardiac mortality from coronary heart disease
- Sudden death and re-infarction in patients with CVD
- Consuming fish regularly can reduce the risk for arrhythmias and fatal heart disease
- Reduced progression of coronary atherosclerosis in post-menopausal women

#### Are there dietary alternatives to eating fish?

Some patients do not consume fish (vegetarians, patients with allergies or a personal preference to avoid). For these patients, the ALA can be obtained from plant sources such as nuts (walnuts), seeds (hemp, flax and chia), oils (flax, walnut, canola and soybean) and soy products (tofu, vegetable soy proteins and edamame). Unfortunately ALA only converts to EPA and DHA at a rate of 5 – 15%. <sup>AND fat 2014</sup>

There are vegetable sources of EPA and DHA which include kelp and seaweed (wakame). Some foods are fortified with EPA/DHA or ALA such as eggs, milk, margarines, yogurts and juice. Check the Nutrition Facts table on the package. There are vegan supplements containing kelp and seaweed, which provide EPA and DHA however in lower amounts than a fish oil supplement. It is important to discuss this with patients, both as a good alternative to animal sources of EPA/DHA as well as a sustainable resource in comparison to fish oil.

#### Are omega-3 fat supplements recommended?

Consuming fish in the diet has more benefits than fish oil from supplements. <sup>42</sup> This benefit is seen after foods higher after adjusting for displacement of foods higher in saturated fats such as meat. If patients are unable to consume adequate fish, an omega-3 fish oil supplement may be beneficial.

Supplementing EPA and DHA omega-3 fats may cause gastrointestinal side effects. <sup>43</sup> EPA/DHA supplements may reduce clotting time. The increased time to clot is not significantly more time than the normal clotting time. <sup>44</sup> When combined with blood thinning medications the time to clot is still not significantly more than normal, however caution is advised and should be discussed with the healthcare team prior to individual use of EPA and DHA medications.

If a person chooses to take a supplement with EPA/DHA to help reduce their risk of CVD, advise them of the following: <sup>33</sup>

- Studies have not been done on patients without CVD and therefore outcomes are unknown.
- Patients who have CVD (without angina or implantable cardioverter defibrillators) can take 850 mg per day of EPA and/or DHA daily to reduce sudden death by 45%.
- Patients with CVD (with angina or implantable cardioverter defibrillators) should know that supplementing EPA/DHA may be contraindicated.
- Non-marine-based omega-3 (ALA) has not demonstrated consistent reductions in TG. <sup>39</sup>

**Sugar**

**What is the effect of added sugar on triglycerides and heart health?**

Sugar in the diet is converted to fatty acids and TGs through lipogenesis. Excess sugars can increase the production of serum TGs.<sup>7,45,46</sup> Excess sugar (>10% of total calories) may also increase total calories and therefore weight gain which increases CVD risk. Excess sugar may also increase blood glucose levels which increases inflammation and insulin resistance.

**How much added sugar is acceptable daily?**

Added sugars are sugar that are either added during the processing of foods, or are packaged as such, and include sugars, syrups, and fruit juices.<sup>41,46</sup> Naturally occurring carbohydrates include whole grains, legumes, fruits, starchy vegetables, milk and alternatives and yogurt. These are part of a healthy diet and should be consumed according to *Eating Well with Canada's Food Guide*.

The average dietary intake of added sugar in America is about 16% of total energy.<sup>41</sup> The World Health Organization recommends that all adults reduce their intake of added sugar to <10% of total calories and a further reduction to <5% is suggested.<sup>46</sup>

Ensure the recommended maximum intake of added sugar is not exceeded. Patients consuming a lower calorie diet would limit their added sugar to about 30 – 40 grams per day or 7.5 – 10 tsp. Patients consuming a higher calorie diet would limit their added sugar to about 50 – 55 grams per day or 12 – 14 tsp. For example, on a lower calorie diet, sugar would be reduced to 30 – 40 g (7.5 – 10 tsp). Encourage patients to reduce the portion and frequency of foods that are high in added sugars. The table below provides some guidance on added sugar in common foods.

**Table 6. Comparison of Naturally Occurring and Added Sugars in Common Foods and Beverages<sup>36</sup>**

Serving Size	Naturally Occurring Sugar	Added Sugar and Naturally Occurring Sugars	Difference in Added Sugar
¾ cup (175 mL)	Plain yogurt, low-fat 12.7 g	Fruit yogurt, non-fat 33.3 g	20.6 g
30 g	Bran flake cereal 3.9 g	Raisin bran flake cereal 8.4 g	4.5 g
2 cups (16 oz)	Café latte 18 g	Vanilla café latte 35 g	17 g
1 tbsp (15 mL)	Ketchup, low sugar 1.0 g	Ketchup, regular 4.0 g	3.0 g

**Supplements**

**Do patients with cardiovascular disease require vitamin or mineral supplements?**

Encourage adults to achieve a healthy balanced diet to attain the required nutrients (vitamins, minerals and antioxidants) from dietary sources first. The dietary recommendations for CVD include plenty of vegetables, fruits, whole grains and fish which are rich sources of antioxidants (Vitamin E, C and β-carotene), omega-3 fatty acids, fibre and B vitamins (folic acid, vitamins B<sub>6</sub> and B<sub>12</sub>).<sup>33</sup>

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It is not recommended to take an antioxidant supplements to prevent or treat CVD.<sup>33</sup>

- Supplementation of beta-carotene, Vitamin E (>400 IU/day) and Calcium ( $\geq$ 1000 mg/day) are not recommended due to the documented adverse effects.<sup>3</sup>

#### How does folic acid affect serum homocysteine levels and does this lower cardiovascular risk?

Homocysteine is an amino acid, but it is not obtained from the diet, but rather synthesized from another dietary amino acids - methionine. To metabolize homocysteine, the required B vitamins include folic acid (folate), vitamin B<sub>12</sub> and B.

There is a consistent correlation between high levels of serum homocysteine and increased CVD risk. Increased levels of homocysteine may lead to vascular damage and increases the risk for inflammation of the blood vessels, which leads to plaque formation (atherosclerosis).

Dietary or supplemental intake of folic acid (with or without vitamins B<sub>12</sub> and B<sub>6</sub>) does lower serum homocysteine levels.<sup>3,33</sup> Unfortunately, evidence is not consistently showing any benefits for CVD outcomes therefore folic acid supplementation is not recommended.<sup>33</sup>

- Foods highest in folic acid include whole grains and cereals as they have been fortified with folic acid.<sup>36</sup> Poultry and game meat liver is also a natural source of folic acid.<sup>36</sup>

#### What are some potential food and drug interactions that may occur for patients with heart disease?

**Grapefruit** (including the juice and extract) contains phytochemicals that interact with numerous medications and may cause adverse side-effects. Other fruits that also contain these phytochemicals include Seville oranges, pummelos, and some exotic orange varieties.<sup>47</sup> The phytochemicals in grapefruit decrease the metabolism and excretion of various medications such as atorvastatin (Lipitor<sup>®</sup>), cerivastatin (Baychol<sup>®</sup>), lovastatin (Mevachol<sup>®</sup>) and simvastatin (Zocor<sup>®</sup>).<sup>47</sup> This leads to higher concentrations of these medications which may cause adverse effects or toxicity.<sup>47</sup> Patients who take multiple medications should be advised to avoid grapefruit (and the other fruits listed here) in general due to risk of a food drug interaction. Some statins may be considered safe to use with grapefruit. These include rosuvastatin (Crestor<sup>®</sup>) and fluvostatin (Lescol<sup>®</sup>).<sup>47</sup>

**Vitamin K:** warfarin (Coumadin<sup>®</sup>) is a common anticoagulant used in the prevention and management of atrial fibrillation, artificial heart valves, thrombosis and pulmonary embolism.<sup>48</sup> Warfarin leads to a deficiency in vitamin K.<sup>49</sup> Vitamin K plays an important role in blood clotting, therefore the function of warfarin as an anticoagulation medication is affected by the intake of vitamin K rich foods.

Encourage patients to keep the intake of Vitamin K rich foods consistent when taking Warfarin (Coumadin) and other anticoagulants.<sup>50</sup> Avoiding vitamin K rich foods is not suggested, if consistency in diet is possible.

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Vitamin K2 is in very small amounts (1 – 20 mg per serving) therefore has minimal contribution to total vitamin K intake compared to vitamin K1 (100 – 600 mg per serving). Food sources of vitamin K include:

- Phylloquinones (K1): green leafy vegetables: kale, spinach, mustard greens, collard greens, beet greens, dandelion greens, Swiss chard, turnip greens, broccoli raab, broccoli, beets, Brussels sprouts, watercress and asparagus
- Menaquinones (K2): natto (fermented soybeans), soy yogurt, hard and soft cheese, egg yolk, butter, chicken/pork/beef liver, salami, chicken breast and ground beef.

Multivitamins (and other supplements) often contain vitamin K1 which may affect the anticoagulation effect of warfarin (Coumadin®). Assessing supplementation and ensuring consistency of intake is important to ensure medication dosing is accurate.

For more information on food-drug interactions, refer to Lexicomp online: <http://online.lexi.com/action/home>

## Alcohol

### What are Canada's Low-Risk Drinking Guidelines?

Caution should be taken when considering alcohol consumption in patients with associated health risks including liver disease and cancer as well as potential negative social effects.<sup>51</sup>

Alcohol recommendations below are to help promote a culture of moderate alcohol intake, to support a healthy lifestyle and to reduce long-term health risks by limiting alcohol intake. *Canada's Low-Risk Alcohol Drinking Guidelines* recommend:<sup>51</sup>

Men	0-3 per day	and 15 maximum per week
Women	0-2 per day	and 10 maximum per week

Examples of 1 standard drink:<sup>51</sup>

Liquor	Wine	Beer
43mL /1.5 fl. oz. (40% alcohol content)	142mL /5 fl. oz. (12% alcohol content)	341mL /12 fl. oz. (5% alcohol content)

Health Canada includes further recommendations to those patients who wish to consume alcohol:<sup>51</sup>

- Plan non-drinking days every week to avoid developing a habit
- Reduce the risk of injury and harm by drinking no more than three drinks or four drinks on a single occasion for women and men, respectively
- Have no more than two drinks in any three hours

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#### How does alcohol affect heart health?

Low levels of alcohol in patients 50 years or older, are associated with health benefits resulting in lower risks of illness and premature death from ischemic heart disease, ischemic stroke and diabetes.<sup>51</sup> The use of alcohol for health benefits should be discussed with patients on an individual basis.

Moderate alcohol intake is acceptable if no metabolic or clinical contraindications are present.<sup>34</sup> Moderate alcohol intake is associated with: <sup>2,3,34,52</sup>

- Increasing HDL-C by 5% to 10%
- decreasing heart disease risk
- decreasing stroke risk
- reducing CVD events and mortality
- reducing CVD risk when compared to not drinking at all or occasional drinking

Excessive chronic intake of alcohol may result in negative health effects, especially for CVD health and weight management. Chronic heavy drinking is associated with increased risk of:<sup>52</sup>

- heart disease
- atrial fibrillation
- cerebrovascular events
- hypertension
- pancreatitis
- pneumonia
- tuberculosis
- liver disease
- mental illness

#### Does alcohol affect triglycerides?

For patients with elevated triglycerides (hypertriglyceridemia), consuming 1 oz of alcohol per day corresponds to 5 to 10% higher triglyceride concentrations than nondrinkers.<sup>7</sup> In subjects with very high TG levels, complete abstinence is strongly recommended in concert with reduced saturated fatty acids to reduce the likelihood of developing pancreatitis.<sup>3,7</sup>

## Physical Activity

#### What type of physical activity is recommended?

Physical activity is one of the primary therapies for metabolic syndrome, elevated TGs, isolated low HDL-C levels, and for patients with diabetes who also have elevated TGs and low HDL-C levels.<sup>3,53</sup> Moderate-intensity activity reduces the risk for CVD events, decreases LDL-C and TGs as well as increasing HDL-C.<sup>33</sup> Attaining the recommended moderate intensity activity (or more) is expected to increase HDL-L by 5% to 10% and to reduce CVD events.<sup>2</sup> Moderate-intensity activities should be hard enough to break a sweat. Patients should be able to talk but not sing.<sup>54</sup> Physical activity should be recommended to all adults, as long as there are no contraindications leading to increased risk of harm to the patient.<sup>33</sup>

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Physical activities include:<sup>54,55</sup>

- Brisk walking
- Water aerobics
- Lawn mowing
- Riding a bike
- Jogging or running
- Cross-country skiing
- Swimming
- Riding a bike fast or on hills
- Aerobics
- Hockey
- Basketball

## What is the recommended amount of physical activity for prevention and management of CVD?

The more physical activity patients can achieve, the greater the health benefits.<sup>53</sup> Encourage patients to get the following:<sup>34,55</sup>

Aerobic activity

**30 minutes** of moderate-intensity aerobic activity **most days of the week**, if not all days of the week

Strength activity

Strength (resistance) activities at least **two days per week**

*Note: Daily physical activity goals can be achieved in bouts of 10 minutes or more*

The Public Health Agency of Canada (PHAC) and the Canadian Society for Exercise Physiology (CSEP) have detailed information about physical activity for all ages. These resources and handouts are available at:

<http://www.phac-aspc.gc.ca/hp-ps/hl-mvs/pa-ap/03paap-eng.php>

<http://www.csep.ca/en/guidelines/read-the-guidelines>

## Smoking

### Should patients with or at risk for cardiovascular disease avoid smoking and second hand smoke?

Smoking is a main lifestyle factor that contributes to the development of dyslipidemia.<sup>2,3</sup> Smoking cessation is associated with <sup>2,3</sup>

- reduced coronary artery disease mortality
- increase in HDL-C level

Encourage and support all individuals to avoid secondary exposure to tobacco products and to quit smoking despite concerns about weight gain.<sup>3</sup>

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## Patient Resources

Patient Resources are available to support patient care following the recommendations within these guidelines. Refer to approved provincial Alberta Health Services cardiology nutrition handouts to support patient education. For more information, contact [Nutrition.Resources@albertahealthservices.ca](mailto:Nutrition.Resources@albertahealthservices.ca)

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