CHOLESTEROL

What is cholesterol?

The word "cholesterol" has two different—but related—meanings. One meaning refers to dietary cholesterol, which is a molecule that is found in animal foods. When someone says "Egg yolks have a lot of cholesterol" they are referring to dietary cholesterol. It has several important functions and it is essential for life.

Another meaning refers to lipoproteins, which are a group of compounds that circulate in the blood. They are composed mainly of fat and protein combined with cholesterol molecules. When a doctor orders blood tests to check your cholesterol, she is assessing the levels of lipoproteins in your blood. There are two main types of lipoproteins: low-density lipoproteins (LDL) and high-density lipoproteins (HDL).

Cholesterol and Cardiovascular Disease

Low-density lipoproteins (LDLs) transport cholesterol molecules to the body's cells. As they circulate in the bloodstream, some LDL particles interact with the walls lining the arteries which creates "plaques". As plaques grow, the arteries narrow and blood flow is reduced. When blood flow is greatly reduced, the tissues beyond the narrowing become deprived of oxygen and can even "die". A heart attack (cardiac infarct) occurs when some heart tissue dies. A stroke (cerebral infarct) occurs when brain tissue dies. LDL has a reputation as "bad cholesterol" because it increases the risk for cardiovascular disease.

High-density lipoprotein has received a reputation as "good cholesterol" because high levels of these particles in the blood is associated with a decreased risk of heart attack and stroke. HDL particles pick up cholesterol that has been deposited on artery walls and bring it back to the liver to be reprocessed or excreted. In essence, HDL acts as a scavenger and prevents plaque formation.

Cholesterol Testing

A physician can request a blood test to measure the level of lipoproteins in your blood—including total cholesterol, HDL and LDL. These levels are measured in units of millimoles per liter of blood (mmol/l). Results provide information on risk for cardiovascular disease. High total cholesterol (above 5.2 mmol/L), low HDL (below 1.0 mmol/L) and high LDL (above 3.4 mmol/L) are associated with an increased risk for cardiovascular disease.

The ratio of total cholesterol to HDL can also identify risk. A lower ratio indicates a greater proportion of good cholesterol, which translates to a reduced risk for cardiovascular disease. The ratio should be below 5. Ideally, it should be below 3.5.

Physicians recommend lifestyle changes for those at increased risk for disease from high cholesterol. They may also prescribe medications to bring cholesterol levels into a desirable range.

Lifestyle measures are preferred since medications have side-effects. Also, the lifestyle measures offer many additional benefits beyond their impact on cholesterol. However, for some with a genetic propensity for elevated cholesterol, lifestyle measures may not be sufficient to reduce risk and medications may be added to the treatment.

Lifestyle Measures to Reduce Your Risk of Cardiovascular Disease

What follows are lifestyle strategies that are proven to reduce the risk for cardiovascular disease. Most of these strategies are related to diet. Following the advice in the Canada Food Guide will ensure that you meet the dietary recommendations below. For information on how to use the Food Guide consult the document ***Healthy Eating: A practical guide*** available on the Health Services website (concordia.ca/health).

Strategies to Decrease LDL

- **Decrease saturated fats.** Experts recommend keeping saturated fats to 7% or less of daily calories. For the average Canadian—who needs about 2,000 calories a day—this translates to just over 15 grams of saturated fat. Saturated fats are found predominantly in "junk" foods, desserts, and animal products, especially red meat and dairy products such as milk, cheese,

Sources of Cholesterol

Cholesterol molecules can be manufactured by your body or they can come from the food you eat. Up to 80% of the body's cholesterol is made by the liver and is influenced by genetic factors. Therefore, high cholesterol can "run in the family" as some people are genetically inclined to produce more of it.

The remainder of the body's cholesterol is obtained through the foods we eat. Cholesterol is found only in animal products: plant sources of food contain no cholesterol. Foods high in cholesterol include egg yolks, organ meats (e.g. liver), fatty meats, shrimp and whole milk dairy products. For cholesterol levels of selected foods see the table on the next page.

cream, ice cream and butter. Some ways to decrease saturated fat include:

- consult food labels for saturated fat content;
- choose lower fat dairy products (reduced fat cheese, skim or 1% milk, low-fat or fat-free sour cream etc.);
- reduce meat consumption, and when you do eat meat choose leaner cuts and remove the visible fat or the skin;
- use non-hydrogenated margarines rather than butter; and
- avoid or limit junk food (e.g. chips) and fast foods (e.g. McDonald's).

- **Avoid trans fats.** Experts recommend that we consume no more than 1% of our total daily calories from trans fat. This means no more than 2.5 grams a day of trans fat for the average Canadian. Trans fats are found in hydrogenated oils and products made with them or fried in them. To reduce trans fats avoid or limit fried foods, commercial baked goods (e.g. pies, cakes, cookies) and other foods made with hydrogenated or partially hydrogenated oils. Check the Nutrition Facts panel of foods.

- **Limit dietary cholesterol.** Dietary cholesterol is found only in animal products. Most people should aim for no more than 300 mg per day. However, those who have elevated blood cholesterol should get no more than 200 mg per day. See the box on this page for the cholesterol content of selected foods.

- **Eat a diet rich in fiber.** Dietary fiber is found only in plant products. Aim to get 10-25 grams of soluble fiber per day from food. Beans, oats, barley and some fruit and vegetables are good sources of soluble fiber. Fiber supplements don't appear to offer the same cardiovascular risk-reducing benefits as dietary fiber.

- **Achieve and maintain a healthy weight.** Overweight or obese people who lose 5-10% of their body weight can see a 15% decrease in LDL and an 8-10% increase in HDL. Weight loss also has a positive effect on triglycerides.

Research has identified other strategies that can reduce LDL, but they are impractical and the impact on cardiovascular disease is not as great as the strategies outlined above. They include increasing stanols and sterols in the diet (you need to eat fortified foods to get enough) and eating 30-50 grams of soy protein each day.

Strategies to Increase HDL

- **Engage in regular physical activity.** The impact of exercise on HDL is slight. None-the-less, engaging in 150 minutes of moderate- to vigorous-intensity physical activity per week is clearly associated with a significant decrease in the risk of cardiovascular disease through pathways other than a modification of lipoproteins. For more information on physical activity consult the Health Services website.

- **Omega-3 fatty acids.** Omega-3 fatty acids are found in marine food sources—especially fatty fish—as well as in some plant foods such as walnuts and flaxseeds. A diet rich in marine sources of omega-3's (known as DHA and EPA) is associated with a lower risk for heart attack and stroke, possibly through the effect of increased HDL. Plant sources of omega-3's (known as ALA) don't appear to have the same benefit. To increase the amount of heart-protective omega-3's in the diet consume fatty fish such as salmon, tuna, sardines, herring, mackerel and trout. It is recommended to eat at least 2 servings of fish a week.

- **Consume alcohol in moderation.** Many studies indicate that moderate alcohol consumption improves HDL levels and reduces the risk of cardiovascular disease. Moderate consumption is one or two standard drinks a day for men or one standard drink a day for women. A standard drink is 12 oz beer (335 mL), 5 oz wine (140 mL), or 1.5 oz liquor. If you don't drink alcohol, don't start just for your cholesterol as there are other lifestyle strategies that have a greater impact.

General Cholesterol Content of Selected Foods

Food*	mg cholesterol
Plant foods (fruit, vegetables, nuts, seeds, soy, beans, lentils, vegetable oils etc.)	0
Milk: skim,1%, 2%, 3.5%	4,10,18,33
Fish and shellfish (except shrimp)	25-45
Butter (1 Tbsp)	33
Cheese	35-40
Beef, chicken, pork	55-75
Shrimp	128-140
Egg (1 large)	212
Liver	250

* Serving sizes are consistent with the Canada Food Guide unless otherwise indicated. Meats and seafood=2.5 oz (75 grams), cheese=1.5 oz (50 grams).

Health Services

UNIVERSITÉ Concordia UNIVERSITY

SGW Campus
1550 de Maisonneuve W, GM-200
514-848-2424 ext. 3565

Loyola Campus
7141 Sherbrooke St. W., AD 131
514-848-2424 ext. 3575

concordia.ca/health

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