



Cholesterol

WHAT IS CHOLESTEROL?

Cholesterol is a fat-soluble crystalline steroid alcohol found in animal fats and oils and egg yolks.

- It is widely distributed in the body especially in the bile, blood, brain tissue, liver, kidneys, adrenal glands and myelin sheaths of nerve fibers.
- It facilitates the absorption and transport of fatty acids.
- It also acts as the precursor for the synthesis of Vitamin D at the surface of the skin.
- Synthesizes various steroid hormones (cortisol, cortisone and aldosterone in the adrenal glands).
- Synthesizes sex hormones (progesterone, estrogen and testosterone).
- Sometimes crystallizes in the gallbladder to form gallstones.
- Women typically have a dramatic increase in cholesterol levels following menopause.

The *BAD* cholesterol is called **LDL**. This harmless lipid transports 75% of the blood's cholesterol to the body cells. **LDL** penetrates the artery walls where it interacts through a process of oxidation caused by oxygen-free radicals (*unstable oxygen molecules with extra electrons*). These particles are released naturally during the body's chemical processes but increase when the body is exposed to environmental toxins (*CIGARETTE SMOKE*). Free radicals are essential in fighting bacteria but are harmful if found in excess. Due to the missing of an electron they tend to bind with any other molecule in the body. If LDL collects on arterial walls, free radicals released from the wall membranes attack and modify its' form. The oxidized form of LDL triggers white blood cells to come together at the site, forming a fatty substance called *PLAQUE*. As the plaque builds up, the arterial walls slowly constrict, reducing the blood flow. This results in **ATHEROSCLEROSIS**. Vital heart tissues don't receive much needed blood-borne oxygen, so are damaged.

The *GOOD* cholesterol **HDL**: This lipoprotein removes cholesterol from the walls of the arteries and returns it to the liver, thus protecting them from dangerous narrowing - and *prevention of heart attacks*. High triglycerides are often associated with obesity and diabetes. Exercise, low fat diet and a diet of simple sugars usually decrease them, also decreasing the risk for coronary complications.

SOME CAUSES OF HIGH CHOLESTEROL

1. HEREDITY

- Predisposition to heart attacks and strokes
- Hypercholesterolemia (too much cholesterol in the blood) and other inherited cholesterol disorders are responsible for 10 million deaths, worldwide, in middle age men and women.
- Certain thyroid disorders and diabetic conditions may elevate cholesterol levels.
- Lack of LDL receptors on the liver at birth causes limited ability of the organ to take up circulating LDL.

2. DIET

- Fatty foods - cholesterol lurks in animal based foods. The more MEAT, CHEESE, FAST FOOD you eat the higher your absorption of saturated fats and cholesterol.

3. SEDENTARY LIFE STYLE

- People who exercise rarely often have lower levels of HDL (less of the good cholesterol)

4. OBESITY

- Overweight people often tend to lead a sedentary life style and indulge in fatty foods ensuring heavy plaque build up on arteries.

5. SMOKING

- Weakens the arterial walls and makes the surface membranes more receptive to plaque. Smoking directly reduces good cholesterol (HDL) up to 15 %.
- Many smokers have an inactive lifestyle.
- Combination of lower HDL and the damage caused by tobacco smoke toxins in the circulatory system ACCELERATE the risk of STROKE and HEART ATTACKS.

6. TOO MUCH ALCOHOL

- Excessive drinking damages the liver and causes cholesterol and triglyceride levels to rise.

7. AGING

- Cholesterol levels usually increase steadily in men as they age, while women have a *dramatic* increase in cholesterol levels following menopause.
- Levels need to be checked yearly.

8. GENDER

- Doesn't increase your odds for increased cholesterol but *when* it may occur. Men have higher LDL (bad cholesterol) after 45 years of age, but women on hormone replacement therapy (HRT) after menopause have decreased cholesterol levels. Unfortunately, hormone replacement therapy carries it's own set of risks.

9. STRESS

- Researchers speculate that many people under stress console themselves with fatty foods, alcohol and tobacco.

10. HIGH BLOOD PRESSURE (HYPERTENSION)

- Damages the arteries walls and can accelerate atherosclerosis (hardening of the arteries).
- More pressure is needed to force the blood through restricted passages causing the heart to over-work and become enlarged.
- Arteries have to contend with greater strain. This causes the vascular system to become scarred, hardened and less elastic.
- Some prescription medications for high blood pressure can increase bad cholesterol (LDL); increase triglycerides and lower good cholesterol (HDL).

11. COFFEE

- The caffeine in the coffee, tee or hot chocolate is an oxidant (bad).
- Drinking tea of coffee with a meal destroys the iron content of whatever you are eating. 80 – 90% of the iron you take in does not get absorbed if you have tea or coffee with or immediately after a meal. Tea is worse for this than coffee.
- Do not take iron supplements with a glass of milk, as this also hinders the absorption.
- Herbal tea is ok! (it does not have as much caffeine in it).

SATURATED FATS

Lard, Butter and animal Fats are examples of saturated fats. These have adverse effects on cholesterol. They can increase the cholesterol uptake from the intestines into the blood, as these fatty particles appear to attach better to the vessel walls, forming and making the arteries narrower. Some saturated fats tend to increase the LDL (bad cholesterol) in the blood.

- **Polyunsaturated Fat is the best type of fat to eat. (i.e. olive oil, flaxseed oil)**
- **Monounsaturated Fat is ok too.**
- **Stay away from saturated fats.**
- Be sure to limit total amount of fats or oils because they contain high amounts of calories!

Healthy Tip: *the more liquid a fat product is (i.e. olive oil) the more unsaturated it is, and therefore the better it is for you. Stay away from hard forms of fat (i.e. lard, butter).*

Shopping Tip: *Only animal products contain cholesterol. Watch out for vegetable products that make a big deal about being “cholesterol free”. They always have been, and always will be free of cholesterol (because it’s not an animal source).*

TRANS-FATTY ACIDS

These are formed when vegetable oils undergo a chemical process during commercial processing called HYDROGENATION, to make fats into solids (think of MARGARINE and LARD). Trans-fatty acids act like saturated fats by increasing LDL (bad) and reducing HDL (good).

BASIC NUTRIENTS (VITAMINS AND MINERALS) HELP IN THE PROMOTION OF CARDIOVASCULAR HEALTH

Antioxidants

Strong evidence has emerged from research to show that a group of nutrients known as antioxidants are able to inhibit, or even entirely stop, the formation of cholesterol plaque in coronary arteries by their ability to neutralize free radicals. Beta-carotene is an important antioxidant found in yellow-orange fruits and vegetables and in some deep-green leafy vegetables. Beta-carotene is the chemical parent of vitamin A. Supplemental vitamin A is harmful in large amounts but it is impossible to overdose on beta-carotene. The body simply draws on this nutrient, as it is needed. A daily intake of 25mg of beta-carotene provides adequate protection. A single carrot supplies 15 to 20mg of beta carotene per day. Not all of this is absorbed however; therefore it is a good idea to eat 2-3 carrots (cooked only slightly).

Good sources of beta-carotene

- Carrots, sweet potatoes, pumpkin, yellow squash, spinach, kale, broccoli, collards romaine lettuce, red peppers
- Apricots, pink grapefruit, mangoes, peaches, papaya, cantaloupe
- Supplement form

Vitamin C is one of the most effective antioxidants in blocking LDL oxidation (and therefore preventing artery plaque formation). Higher dietary intake of vitamin C is invariably associated with higher levels of HDL (good) cholesterol. Tests have revealed that heart attack victims and people with high blood pressure tend to have low blood serum levels of vitamin C.

Good sources of vitamin C

- Broccoli, Brussels sprouts, tomatoes, green peppers
- Cantaloupe, papaya, strawberries, kiwi, oranges (including fresh orange juice)

Vitamin E, the principal fat-soluble antioxidant, functions wherever fat is present in the body. According to the World Health Organization, **a low blood level of vitamin E is the single most important risk factor in death from ischemic heart disease** (oxygen starvation of the heart muscle due to artery blockage). Vitamin E may reduce the tendency of platelets to form blood clots, a major cause of heart attack and stroke.

The principal dietary sources of vitamin E

- Fatty foods, such as nuts (especially almonds), seeds and vegetable oils
- Wheat germ, sweet potatoes and kale also contain appreciable amounts of Vitamin E.
- Supplements usually preferred (200-400 IU/day). **Recent studies show that supplementation at levels of 800 IU per day can decrease blood cholesterol levels substantially!**

Selenium

Is a mineral (present in some grains), which maintains levels of glutathione peroxidase (a good thing). 50-100 micrograms per day is suggested. Selenium and vitamin E work together as antioxidants.

Vitamin B-6

Metabolizes homocysteine (a bad thing), and inhibits platelet aggregation.

Chromium

Helps to lower insulin levels, which in turn lowers cholesterol and triglycerides levels and increases good cholesterol (HDL). It should be taken with other minerals.

Magnesium

Emotional stress increases free fatty acids in the blood stream and reduces the magnesium level. Adrenaline (a stress hormone) depletes magnesium and raises blood pressure levels, thus protecting artery walls from damage. Magnesium and calcium are essential for regulating blood pressure (the recommended daily allowance for magnesium is 400mg; for calcium - 1000 mgs). Extra magnesium is typically given after a heart attack or difficult childbirth as magnesium levels are depleted with extreme stress.

Omega-3 oils

lower the liver's production of triglycerides and reduce the risk of several cancers. Usually found in fish and seafood. Cod liver oil is a good choice.

Garlic

Contains allicin, which changes how the body uses cholesterol. Helps to lower bad LDL and triglyceride levels, increase good HDL levels (2mgs of deodorized garlic oil or 1000 mgs of fresh garlic bulb each day).

Niacin (Vitamin B-3)

Is best known for lowering cholesterol but low doses aren't effective. Dosage must be 75-250 times the recommended daily allowance, thus becoming a drug used only under medical supervision. May cause flushing, headaches, itchiness, liver damage, kidney failure and breathing difficulties.

Basic Nutrients – Summary

To promote healthy cholesterol and triglyceride levels and to promote cardiovascular health, you should complement a healthy diet with the following antioxidants: foods containing vitamin A as beta-carotene, vitamin C, vitamin E and selenium. You should take the recommended daily allowances of the following minerals: chromium, magnesium, calcium, copper, and zinc. In your diet, you should also include foods containing garlic and omega-3 oils, such as fish and seafood, or dietary supplements containing omega-3 oils (flaxseed oil is a good choice for this).

- If your diet leaves a little to be desired, or if you wish to maximize the benefits of antioxidant therapy, you should take a quality multi-vitamin. Be sure to check the label, and compare it with this outline!

The Canadian Consensus Conference on Cholesterol provides the following guidelines:

	Desirable	Borderline	Increased Risk
<i>Cholesterol</i> (If under 30 years)	under 5.2 under 4.7	5.2 – 5.6	over 6.2
<i>HDL (good)</i>			
Men	over 1.42	0.91 – 1.42	under 0.91
Women	over 1.68	1.76 – 1.68	under 1.16
<i>LDL</i>	under 3.4	3.4 – 4.1	over 4.1

TRIVIA

- Cholesterol is found only in animal tissues with high amounts in meat, dairy products, egg yolks and shellfish. You should not ingest more than 300mgs of cholesterol per day. One egg yolk = 200mgs.
- 75-80% of our cholesterol is synthesized in the body, mainly in our liver and adrenal cortex. Cholesterol production is stimulated by saturated fat.
- On average, 3% of the calories we eat come from trans-fatty acids. Major sources are vegetable shortening; hard margarine and foods that contain these products, such as commercially prepared baked goods. These foods should be eaten in limited quantities.
- Atherosclerosis is a silent condition with no symptoms until complications such as chest pains (angina pectoris) or leg cramps show up. High cholesterol levels can also lead to a heart attack or stroke - when a tear occurs at an atherosclerosis plaque. The clot that forms can block blood flow completely.

GLOSSARY

ANGINA PECTORIS

heart pain, often felt in the chest area caused by partially blocked arteries.

ARTERIOSCLEROSIS

hardening of the arteries (thickening and loss of elasticity and calcification of arterial walls).

ATHEROSCLEROSIS

a disease of the blood vessels, which narrows them or causes complete blockage by accumulation of plaque.

CARDIOVASCULAR DISEASE

generic term that covers a wide range of vascular and heart-related diseases and disorders.

CHOLESTEROL

a substance found in animal based foods and manufactured by the liver. It is an essential building block for healthy nerves, cells, and the production of some hormones, but high levels carry the risk of developing atherosclerosis.

HDL

High Density Lipoprotein, "good" HDL transports cholesterol from tissues back to the liver.

LDL

Low Density Lipoprotein. High levels of "bad" LDL cholesterol increase the risk for atherosclerosis.

LIPOPROTEINS

Particles that are a combination of proteins, cholesterol and triglycerides (i.e. HDL, LDL).

TRIGLYCERIDES

An energy source composed of 3 fatty acid chains attached to a glycerol base.

If you have any questions, please ask your health care professional!