

Cholesterol 101

Lessons for the Heart

by Margy Squires

Quick. Think of one good thing cholesterol does for you. Can't come up with an answer? That's because most people think of cholesterol as harmful and something to watch out for, like the bogey man creeping up on you. Cholesterol has long taken the rap for the number one killer in the United States, heart disease. But the real heart of the matter involves more than cholesterol and tipping the numbers in your favor.

Who needs it?

You do. The truth is your body needs this waxy substance to form protective cell membranes, especially the myelin sheaths that surround nerve cells. Cholesterol helps the ovaries and testes form sex hormones (estrogen, progesterone, testosterone) and with a little sunshine, produces vitamin D for bones. Cholesterol is a precursor to bile acids that help in digestion and breaking down excess cholesterol and other fats. In fact, your body produces 80% of the cholesterol you need right in your own liver. The rest comes from the food that you eat. So why do you only hear the bad news?

Bloodlines

Your life depends on two things. The first is blood that supplies nourishment, hormones and oxygen to cells, tissues and organs throughout your body, and subsequently carries the waste by-products off for excretion. The second is a healthy heart to pump that blood. Your brain is especially vulnerable to a shortage of blood or oxygen via the carotid arteries. Blood flows through the heart via coronary arteries. Narrowed arteries or blood clots that stop blood flow to the brain can cause a stroke; within the heart, a heart attack. Keeping arteries clear by watching your cholesterol lowers your risk of these top two—often silent—killers.

Rocking the Boat

You've heard the old adage that "water and oil don't mix". Well, it's true for your body as well. Since blood plasma is made up of 90% water, cholesterol needs help to get around the arteries. So, your body neatly packages them up in handy protein "boats" called lipoproteins that are water based on the outside to float easily through arteries, carrying the lipid (cholesterol) on the inside. There are different kinds of lipoproteins, high density lipoprotein (HDL), low density lipoprotein (LDL), and very low density lipoproteins (VLDL). The VLDLs and LDLs transport cholesterol away from the liver and HDLs transport cholesterol back to the liver for disposal. This balanced system works quite well unless something rocks the "boat". While several factors are involved, let's look at the LDLs—often called the "bad" guys—first.

The LDL boat travels through the bloodstream, dropping off cholesterol where needed. Extra LDL may be left in the artery where, if not picked up by later HDL boats coming by, is subject to oxidation by free radical attacks. (Smoking and stress are two factors). If damaged, LDL is no longer recognized by the body and macrophages (blood cells that eat up harmful "foreigners") come along and try to engulf them, making foam cells in the process. Foam cells are very sticky particles that adhere to artery walls, causing fatty streaks that narrow the passageway. If you have enough "good guy" HDLs, they will keep excess cholesterol out of the arteries and out of harm's way, so oxidation does not happen.

A word about triglycerides, the source of most VLDLs. There are two kinds of VLDLs, one is large and buoyant and less likely to end up on artery walls, and the other is the small, dense (sticky)



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ones that do. A triglyceride level over 100 with HDL less than 40 raises your risk of producing the VLDL kind, which is bad news for your arteries.

The Diet Connection

When you ingest high cholesterol foods (meat, eggs, dairy, hydrogenated oils), your liver reduces the amount of cholesterol it makes. But making cholesterol is only part of the process. The liver “receives” cholesterol via special liver receptors sites. The number of these sites diminish as we age, plus may be impaired with certain diseases (diabetes, insulin resistance) and by genetic inheritance. Without receptors, cholesterol breakdown is impaired and stays circulating in the blood. In fact decreased or faulty receptor sites may play more of a role than diet. Clinical trials to date have not shown that cholesterol free diets significantly reduce total cholesterol levels with one exception: Elimination of saturated fats. Saturated fats turn on liver’s cholesterol making mechanism and turn off the removal of LDL cholesterol, thus increasing LDL numbers. Trans fatty acids (like margarine) may raise LDL levels almost as much as saturated fats.

The Numbers Game

It used to be that if you kept your total cholesterol under 240, your heart disease risk would be low. The famous Framingham Heart Study showed otherwise. People with “normal cholesterol” were having heart attacks and strokes. The Study began in 1948 and tracked two generations of heart history. Several discoveries about cardiovascular and other diseases were made. One was that people can take preventative measures to protect themselves. The roles of LDL and HDL were uncovered, leading to important guidelines for risk reduction. The study found that low HDL is a better indicator of overall risk than LDL or total cholesterol. According to William Castelli, M.D., director of the Study. “HDL measurements are almost three times better than LDL measurements at predicting heart disease when cholesterol is between 200 and 240, the range at which most heart attacks occur”. By keeping HDL numbers up compared to total cholesterol, the good guys offered a protective factor. This ratio (total cholesterol divided by HDL) should be 4.1 to be protective. Raise the protective HDL and you lower the damage LDL or total cholesterol may cause. See the fact box to see if your HDL is protective. Numbers and ratio are still not the whole story.

Beyond Cholesterol

Several other risks factors emerged from the Study such as homocysteine, infectious agents and Lp(a). Homocysteine is an amino acid that requires the B vitamins (B6, B12 and folic acid) to break it down. Too much homocysteine results in damage to the lining of arteries, leaving walls inflexible and increases the stickiness of blood platelets that leads to clots. The cytomegalovirus (CMV) and H. Pylori bacteria are two infectious agents that play a role in damaging healthy blood vessels. Lp(a) is an extra protein carrying LDL that Castelli believes is 10 times more harmful than LDL due to its stickiness. Lp(a) should be 20 mg/dL or lower.

Other studies uncovered more facts. C-reactive protein is a marker of inflammation. Higher levels are found in cancer, heart disease and arthritis. If you have diabetes, low thyroid, liver or kidney disease, your ability to process fats is decreased due to decreased or faulty liver receptor sites. Fibrin, a sticky substance that helps you repair cells and tissues, may break off and enter the bloodstream contributing to clots. Inflammation also increases fibrin. Oxidative damage from excess free radicals due to lifestyle habits—poor diet, smoking and so forth—are potential threats not only to LDL oxidation but to the health and well being of the blood vessels.

Syndrome X or insulin resistance is another scenario in which normal cholesterol hides a high risk person. High blood pressure, too much insulin, sugar and VLDLs are signposts of syndrome X. Since VLDL is the kind that sticks to your arteries, syndrome X people have trouble breaking down blood clots. Jean Pierre Despres, Ph.D., director of Lipid Research Center at Laval University Hospital in St. Foy, Quebec suggests measuring your waist. A waist over 39 inches in both men and women usually indicates the presence of too much abdominal fat and syndrome X.

Now What?

Although cholesterol is not the whole picture when it comes to heart and stroke matters, knowing your numbers is a start. In fact, you can pick up a cholesterol kit at your local drugstore. Although these kits are good for home monitoring, for the most accurate results, have your doctor order a lipid panel that individually checks each lipid (versus one that measures HDL and total and calculates LDL). Most results will include your total to HDL ratio as well. Armed



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with that knowledge, you can then determine your risk and take appropriate measures. Given the other contributing factors, you may also want to test C-reactive protein, blood sugar and homocysteine levels as well.

If all “scores” are normal across the board, remember that age will increase your risk, especially after 45 (women more than men!). Taking preventative measures now is the healthy way to grow older. Remember that lifestyle plays an important role, especially the 3 S's: saturated fat, smoking and stress. You can even add sedentary to that list.

On the other hand, if scores are less than perfect, you may be offered a lipid lowering drug. While some of these drugs are efficient in lowering total cholesterol, they do not raise protective HDL levels. Supplements, on the other hand, offer a more natural approach in helping you change risk factor numbers in your favor. *Caution: Women who are pregnant, considering pregnancy or breast feeding should not take supplements without medical advice.* Note: If you're a woman on oral contraceptives, progestins affect lipids in an opposite way than estrogens and may raise levels.

JUST THE FACTS

What's your number?

Across all ethnic groups, studies done after age 20 and older show that beginning at age 45, a 37-51% have total blood cholesterol of 200 mg/dL or higher, women moreso than men.

Total Cholesterol Level

Less than 200 mg/dL
200-239 mg/dL
240 mg/dL and above

Category

Desirable
Borderline High
High

LDL Cholesterol Level

Less than 100 mg/dL
100-129 mg/dL
160-189 mg/dL
190 mg/dL and above

Optimal
Near optimal/above optimal
High
Very High

HDL carries off excess LDL before it oxidizes for disposal. Higher numbers are better. A level less than 40 mg/dL increases risk, but check your ratio!

LDL transports cholesterol through arteries to other areas of body. If damaged by oxidation, LDL turns “bad”, clogging arteries.

Triglycerides over 130 mg/dL are risky, especially with high blood sugar.

Source: www.americanheart.org

A Supplement Guide

Antioxidants. Alpha lipoic acid is specifically good for the liver, clearing out toxic metals, protecting liver cells from damage and thus strengthening liver's capabilities (50-100 mg/day). Vitamin C lowers Lp(a) (500 mg/day or more) that causes sticky plaques. There is a direct

correlation between higher levels of vitamin C and higher levels of HDL (Jacques, 1993). Vitamins E and C counter the release of triglycerides, the blood fats that hinder the release of nitric oxide. Nitric oxide helps keep blood vessels open for healthy blood flow. CoQ10 plays a dual role in boosting the heart muscle and more importantly as a fat and water soluble antioxidant (100-300 mg/day). Vitamin E helps clear out clogged arteries, especially the carotids (400-800 IU/day). Take in divided doses throughout the day. LDL is made up of proteins, lipids and antioxidants, including vitamin E and beta carotene. Boosting the antioxidant components may better fortify LDL against oxidation, which trigger events of plaque, tissue damage and foam cells. Tocotrienols from rice bran oil inhibits the action of the enzyme (HMG-CoA) that increases cholesterol production.

B Vitamins. High plasma homocysteine is associated with low levels of folic acid, B₆ and B₁₂. Biotin also assists in breaking down homocysteine. Niacin lowers Lp(a). Since “flushing” occurs at the higher-than-normal levels needed, non-flush niacin is a good choice. Take as directed on the label. Niacin lowers total cholesterol while stimulating HDL. In a study of 34 men with heart disease and low levels of HDL (below 30), 3 months of niacin therapy (2400 mg daily) resulted in 30% increase in HDL levels. (Am J of Cardiol, 4/91). High level niacin should be under the supervision of a physician. Inositol hexaniacin is a safer form of niacin that lowers cholesterol by removing fatty deposits from blood tissues. Taking chromium GTF with niacin may reduce the needed doses.

Phytosterols. It's been known since the 50's that plant sterols (vegetable oils, pine trees) reduce total cholesterol while increasing HDL but they were abandoned for cholesterol blocking drugs. Phytosterols bind to receptor sites in the intestines, forcing cholesterol to be excreted. David Kritchevsky, PhD, an expert at the Wistar Institute, in Philadelphia recommends 1.5-3.3 g/day in divided dose, taken 30 minutes before a meal or as directed on the label. Gugulipid and policosanols are two examples of phytosterols that increases the uptake of LDL cholesterol from the blood by the liver without the toxicity and side effects of drugs.

Omega 3. Eicosanoids are hormone-like substances that regulate inflammatory processes as well as blood clotting, blood vessel construction and the contraction of smooth muscles. Your body uses linoleic (omega 6) and omega 3 fatty acids to make eicosanoids. Unfortunately these fatty acids need to be supplied in a balanced ratio of 4:1 in your diet but with processed foods, this ratio is more 45:1 in the modern diets. When omega 6 and 3 are out of balance, eicosanoids increase inflammatory and other harmful processes. Flaxseed oil is a rich source of omega 3, along with other helpful monosaturated oils like olive and plant oils. Fish oil is one of the few substances known to lower triglycerides.

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Flavonoids. These colorful plant pigments (grapeseed, lycopene, etc) prevent the oxidation of bad LDL cholesterol. If LDL does not get oxidized, it reduces plaque and fatty streaks on artery walls. Flavonoids also increase the potency of vitamin C.



Fiber. About 15 grams of fiber a day can reduce LDL 5-10% by binding cholesterol containing bile acids in the intestines and excreting them. Drink plenty of water as you increase fiber intake slowly with fruits, veggies, complex grains, beans and brown rice. It may be difficult to get enough fiber without supplementing. Psyllium, oat bran, guar gum and apple pectin add natural fiber. Beta glucan, which is found in oats, surrounds cholesterol and lowers their reabsorption so they end up excreted in stool. The liver, in turn, makes more bile acids (and receptor sites) which uses up more cholesterol floating around in blood. Chitosan is a form of fiber that absorbs dietary fat in the gut and inhibits LDL cholesterol, plus boosts desirable HDL levels.

Herbs. Curcumin has been shown to lower total and LDL cholesterol 11% while increasing HDL 29% by reducing oxidation of LDL cholesterol. Chinese red yeast (cholestin) contains unsaturated fatty acids that appear to lower triglycerides and increase HDL (1200 mg, 2x/day). It does this by reducing the enzyme that produces cholesterol (Heber et al). Milk thistle

supports and cleanses the liver, plus offers antioxidant protection. Garlic offers anti-viral, anti-inflammatory and antioxidant properties as well.

Systemic Enzymes. Inflammation causes damage to arteries and increases risk. Systemic enzymes quench inflammation, remove excess fibrin and scar tissue and speed healing.

Magnesium. Magnesium also plays a healthy role. In more than 18 studies, supplemental magnesium lowered total cholesterol 23%, dropped LDL 10-18% and triglycerides 10-42% and increased HDL 4-11%. No small matter! Since magnesium is involved in regulating more than 300 enzyme activities, it can have an effect at any point along the production path that requires an enzyme. Magnesium and vitamin D also optimize calcium metabolism to reduce calcium deposits in arteries.

JUST THE FACTS

A High Risk Profile

A combination of these factors increases risk.

- Alcohol in Excess
- Apple Midsection (Greater Than 39")
- Diabetes
- Elevated C-Reactive Protein, Fibrin
- Elevated Homocysteine
- Elevated LP(a)
- HDL Levels lower than 40
- Heredity
- High Saturated Fat Diet
- LDL Levels above 140
- Obesity (More Than 30% Overweight)
- Sedentary Lifestyle
- Smoking

Source: Clinical Studies, Framingham Heart Study Statistics

JUST THE FACTS

What's YOUR Ratio?

To determine ratio, fill in the blanks below.

Total Cholesterol ÷ HDL Cholesterol = Ratio

_____ ÷ _____ = _____

A ratio of 4.1 is considered optimal.
A ratio over 4.1 increases risk.

Source: www.americanheart.org

Summary
When it comes to the heart of the matter, cholesterol plays a big part but it does not have to be a scary thing. Being informed is being forewarned and makes it easier for you to be proactive. Know your numbers and the other risk factors involved in heart disease and stroke. Change your lifestyle to a more healthier one by limiting saturated fats, reducing stress and stop smoking. Exercise more. Remember, cholesterol is good for your brain, nervous system, cell membranes and you need it to live. Live well.

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References available upon request.

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