

# Understanding Cholesterol



written by Harvard Medical School



PR•MED  
Patient Education Center

[www.patientedu.org](http://www.patientedu.org)

Open a newspaper, turn on the TV, or log onto the web—no matter how you get your health information, it's bound to include something about cholesterol. But for many Americans, it's a confusing topic—and since about a third of all adults have unhealthy cholesterol levels, it's an important topic.

Understanding cholesterol can help you protect your heart and circulation. You'll be able to lower your chance of having a heart attack or stroke, and you'll learn how to achieve these benefits without making your diet a bore or your exercise a chore.

For more information about cholesterol from Harvard Health Publications, go to [www.patientedu.org/cholesterol](http://www.patientedu.org/cholesterol).



## Common Misunderstandings

**#1 Cholesterol is a fat.** It's actually a *sterol*, a waxy, fat-like substance. It's a technical detail, but it has practical value. Manufacturers can claim a food is "cholesterol-free" even if it has fat—or "fat free" even if it contains cholesterol.

**#2 Cholesterol is a killer.** The truth is, a certain amount is essential for health. Cholesterol is the building block of steroid hormones and a crucial part of our cell membranes. In fact, 25% of the body's cholesterol is in the brain, where it protects nerves. But too much cholesterol in the wrong place *is* a killer.

*While cholesterol is a crucial part of our cell membranes, too much in the wrong place can be a killer.*

**#3** *The cholesterol in your blood comes from your diet.* Only one-third of your cholesterol comes from your diet, the other two-thirds are produced by your liver. That's why strict vegetarians who don't eat any cholesterol still have all the cholesterol they need for health.

**#4** *Dietary cholesterol boosts blood cholesterol levels.* There is some truth in this—but the saturated fats and trans fats in your diet are a much bigger problem, since they prod your liver into making excess cholesterol.

**#5** *Some cholesterol is good, some bad.* In fact, all cholesterol molecules are exactly the same, whether they're packed in an egg yolk, clogging an artery, or protecting your brain cells. But there is some truth in this, too. In your blood, cholesterol is attached to carriers called *lipoproteins*. *Low-density lipoproteins* (LDLs) carry cholesterol to your arteries, where it builds up into blockages; LDL cholesterol is the "bad" cholesterol. But *high-density lipoproteins* (HDLs) snatch cholesterol away from blockages, then carry it to the liver that dumps it out into the intestines; HDL cholesterol is the "good" cholesterol.



## Cholesterol in Action

Cholesterol is a major cause of *atherosclerosis* ("hardening of the arteries"). Arteries damaged by smoking, high blood pressure, or diabetes are particularly vulnerable. That's why people with heart disease risk factors have to be extra careful about cholesterol.

When atherosclerosis strikes the coronary arteries, it leads to angina and heart attacks (see PEC brochure, 'Heart Disease'). When it hits arteries that supply blood to the brain, it leads to stroke; when it involves leg arteries, it causes peripheral artery disease (see PEC brochure, 'Peripheral Artery Disease'). To prevent these terrible illnesses, protect your arteries by controlling your blood pressure and your blood sugar (see PEC brochures, 'High Blood Pressure' and 'Diabetes'). And be sure to correct any problems with your cholesterol.



\* PEC Brochures can also be found online at [www.patientedu.org](http://www.patientedu.org)

# Your Cholesterol Goals

Your doctor will perform a blood test to measure your cholesterol levels. The results of the test will help you evaluate your cholesterol levels and develop a game plan based on two questions: “*Is my cholesterol normal?*” and “*What is my personal target?*” These questions might sound the same, but they have very different meanings and answers.

The first question is easier. The goals for healthy adults, based on the report of the National Cholesterol Education Program Adult Treatment Panel III, are as follows:

Table 1 Cholesterol goals for healthy adults		
	Result	Interpretation
Total cholesterol	Below 200 mg/dL	Desirable
	200–239 mg/dL	Borderline high
	240 mg/dL or above	High
LDL (“bad”) cholesterol	Below 100 mg/dL	Optimal
	100–129 mg/dL	Near or above optimal
	130–159 mg/dL	Borderline high
	160–189 mg/dL	High
	190 mg/dL or above	Very high
HDL (“good”) cholesterol	Below 40 mg/dL	Low (high risk)
	41–59 mg/dL	Desirable
	60 mg/dL or above	Optimal

Setting your personal goals is a bit more complex because you must take other cardiac risk factors into account. They include high blood pressure, diabetes, cigarette smoking, low HDL cholesterol levels, a strong family history of heart disease, and age (older than 45 in men, 55 in women). The more risk factors you have, the stricter your goals will be (see Table 2).



Table 2 Personal Cholesterol Goals		
	LDL Cholesterol Goal	Better LDL Goal
<b>Low risk</b> 0–1 risk factors	Below 160 mg/dL	Below 130 mg/dL
<b>Moderate risk</b> 2 or more risk factors	Below 130 mg/dL	Below 100 mg/dL
<b>High risk</b> Coronary artery disease Atherosclerosis Peripheral artery disease High blood pressure Diabetes Multiple risk factors	Below 100 mg/dL	Below 70 mg/dL
<b>Very high risk</b> Recent heart attack or unstable angina	Below 70 mg/dL	

*The lower your LDL cholesterol, the better; the higher your HDL cholesterol, the better.*

## Another Complication: *Triglycerides*

So far, the main message is simple: The lower your LDL (“bad”) cholesterol, the better; the higher your HDL (“good”) cholesterol, the better. In round numbers, you’ll lower your risk of a heart attack by 2% to 3% for each 1% drop in your LDL cholesterol or 1% rise in your HDL cholesterol. But there is a third element to consider—your blood triglyceride level.

*Triglycerides* are particles that transport fatty acids through the bloodstream. High triglycerides can add to vascular damage in people who have diabetes, low HDL cholesterol levels, abdominal obesity, or high blood pressure.

To find out what your triglyceride level is you will need a blood test after a period of fasting since levels soar after meals. Table 3 shows how to interpret your results.

<i>Table 3</i> Triglyceride Results	
Triglyceride level	Interpretation
Below 150 mg/dL	Normal
150–199 mg/dL	Borderline high
200–499 mg/dL	High
500 mg/dL and above	Very high



## Improving Your Cholesterol: *Lifestyle*

A heart-healthy lifestyle is very important, even for people on cholesterol-lowering medication.

### Diet

A good diet is essential. Here are some tips:

- *Reduce your consumption of saturated fats*, which are found in many animal products (especially red meat, the skin of poultry, and whole dairy products) and some vegetable products (palm and palm kernel oils, coconut milk, and cocoa butter). Saturated fats raise your LDL cholesterol level, so limit them to less than 7% of your total calories.

- **Reduce your consumption of trans fats**, which are found in partially hydrogenated vegetable oils, stick margarine, fried foods, and many snack foods and baked goods. Trans fats increase your LDL cholesterol and also lower your HDL cholesterol. Limit your trans fats to less than 1% of your total calories (under 3 grams a day). New regulations require manufacturers to list the trans fat content of foods. A label is allowed to boast “No Trans Fat” if it contains less than 0.5 grams a serving. But it’s easy to exceed your goal with just a few “No Trans Fat” snacks. Read with care and eat with care. If a food label lists partially hydrogenated vegetable oil among the ingredients, some trans fat is present.



- **Limit dietary cholesterol to less than 300 mg a day** (or 200 mg a day if you have heart disease or risk factors). Cholesterol is found only in animal products; a single egg yolk has about 200 mg.
- **Limit your consumption of simple sugars** and rapidly-absorbed carbohydrates found in white bread and other refined grains, white potatoes, white rice, soft drinks, and sugary snacks and desserts. Refined carbohydrates lower your HDL and raise your triglycerides.



- **Eat lots of fish** (especially fatty fish), high-fiber and whole grain products (such as bran cereals), fruits, vegetables, and nuts. Cook with olive oil or canola oil. Moisten bread with olive oil or spreads such as Take Control and Benecol. Large amounts of soy protein may also help.

- **Manage your weight** by limiting your caloric intake of calorie-dense foods (especially sugars and fats) and limiting portion size.

## Exercise

Regular exercise can help boost your HDL cholesterol and, to a lesser degree, lower your LDL cholesterol. Furthermore, exercise will burn off unwanted calories and protect your heart by lowering your blood pressure and blood sugar; it will also help reduce stress. Walking just 30 to 40 minutes a day can have major benefits. Check with your doctor before beginning a serious exercise program.



## Weight Control

Losing excess weight will help lower your LDL cholesterol and raise your HDL cholesterol. Stick with a balanced diet and exercise plan for slow, but steady, weight loss. Don't waste your time and money on fad diets or radical schemes.

## Avoid Tobacco

Smoking has the double whammy of raising your LDL cholesterol and lowering your HDL cholesterol. It will also damage your heart, lungs, and many other organs. The only safe “dose” of tobacco is zero.



## Improving Your Cholesterol: *Medication*

Even with a healthy lifestyle, many people need medication to reach the strict new LDL cholesterol goals. Your doctor will decide which medications are best for you, and will explain the pros and cons of each drug. Here is a quick summary of the basics:

**Statins.** Statins are the most common cholesterol-lowering drugs. They work by reducing the liver's production of cholesterol, and all appear to have other beneficial effects on arterial blockages. Depending on the drug and dose, statins can lower LDL cholesterol levels by 20% to 60% and raise HDL cholesterol levels by 5% to 15%. Some statins can also lower triglycerides. Side effects may include muscle and liver inflammation.

**Fibrates.** The fibrates lower the body's cholesterol production. They can reduce LDL cholesterol levels by 10% to 30%, boost HDL levels by 10% to 35%, and reduce triglycerides by 10% to 50%. Side effects may include muscle inflammation, liver damage, gallstones, and interactions with other drugs, including statins.

**Resins.** Instead of being absorbed into the blood, these medications remain in the intestinal tract, where they block the absorption of bile acids that the liver uses to produce cholesterol. Resins lower

LDL cholesterol levels by 15% to 30%; and nudge HDL levels up 3% to 5%. Triglycerides are usually unchanged, but levels may rise in some patients. Bloating, nausea, and constipation are the major side effects.

**Ezetimibe.** Ezetimibe blocks the absorption of dietary cholesterol. It can lower LDL cholesterol levels by up to 20%, and it does even better when combined with a statin. It does not affect HDL cholesterol levels, but may lower triglycerides by up to 8%. Mild diarrhea is an occasional side effect.

**Niacin.** This natural vitamin (vitamin B3) is sold over-the-counter as a "dietary supplement." In high doses, niacin can lower LDL cholesterol by 10% to 25%, raise HDL cholesterol by 15% to 35%, and reduce triglycerides by 20% to 50%. Side effects may include flushing, itching, headaches, liver inflammation, and gout. Non-prescription formulations vary in potency and purity. Niacin should always be used under a physician's supervision. Prescription formulations are more reliable and may have fewer side effects.

**Omega-3 fatty acids.** Found in fish oil, omega-3 fatty acids can lower triglyceride levels by about 30%. High doses (about 3 grams a day) are required.

## The Lowdown on Cholesterol

Cholesterol is complex, but it's important to understand how to set your personal goals. To achieve these goals, you'll need to follow a heart-healthy lifestyle and you may need to see your doctor for prescription cholesterol-lowering medication. Your doctor will also help you identify and control other risk factors such as high blood pressure, diabetes, stress and depression, smoking, and obesity.

*Although cholesterol gets most of the attention, the whole package is important for good health and a long life.*

**For more information about cholesterol, your heart, and your diet, visit the following Web sites:**



**National Heart, Lung,  
and Blood Institute**

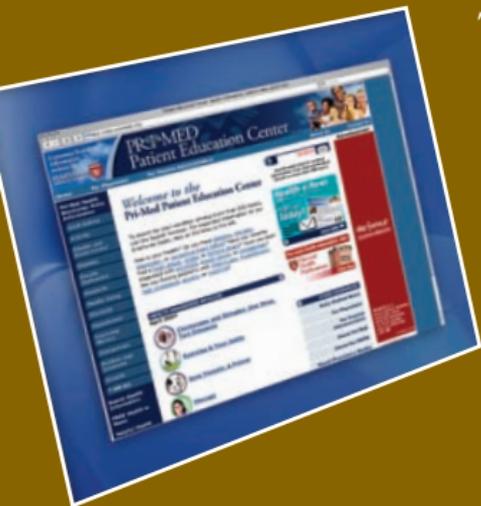
[www.nhlbi.nih.gov](http://www.nhlbi.nih.gov)  
301.592.8573



**The American  
Heart Association**

[www.americanheart.org](http://www.americanheart.org)  
1.800.AHA.USA.1  
(1.800.242.8721)





To learn more about cholesterol, visit the **Pri-Med Patient Education Center** at [www.patientedu.org/cholesterol](http://www.patientedu.org/cholesterol).

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