High Cholesterol

Cholesterol is a type of fat called a lipid. The body uses it for many things, such as making new cells. Your liver makes the cholesterol that your body needs. You also get cholesterol from the foods you eat.

Your body needs some cholesterol. But if you have too much, it starts to build up in your arteries. (Arteries are the blood vessels that carry blood away from the heart.) This is called hardening of the arteries, or atherosclerosis. It is usually a slow process that gets worse as you get older.

To understand what happens, think about how a clog forms in the pipe under a kitchen sink. Like the buildup of grease in the pipe, the buildup of cholesterol narrows your arteries and makes it harder for blood to flow through them. It reduces the amount of blood that gets to your body tissues, including your heart. This can lead to serious problems, including heart attack and stroke.

To find out how you are doing, compare your total cholesterol number to the following:

- **Best** is less than 200.
- **Borderline-high** is 200 to 239. Even borderline-high cholesterol makes you more likely to have a heart attack.
- **High** is 240 or above.

What Are the Symptoms?

High cholesterol doesn't make you feel sick. But if cholesterol builds up in your arteries, it can block blood flow to your heart or brain and cause a heart attack or stroke.

By the time you find out you have it, it may already be clogging your arteries. So it is very important to start treatment even though you may feel fine.

What Are the Different Kinds of Cholesterol?

Cholesterol travels through the blood attached to a protein. This package of cholesterol (a lipid) and protein is called a lipoprotein. Lipoproteins are either high-density or low-density, based on how much protein and fat they have.

- **Low-density lipoproteins (LDL)** are the "bad" cholesterol. LDL is mostly fat with only a small amount of protein. It can clog your arteries. If you have high cholesterol, your doctor will want you to lower your LDL.
- **High-density lipoproteins (HDL)** are the "good" cholesterol. HDL is more protein than fat. It helps clear the bad cholesterol from your blood so it does not clog your arteries. A high level of HDL can protect you from a heart attack.
- **Triglycerides** are another type of fat in the blood that can affect your health. If you have high triglycerides and high LDL, your chances of having a heart attack are higher.

It may help to think of HDL as the "Healthy" cholesterol and LDL as the "Lousy" cholesterol. Or you could remember that HDL should be High and LDL should be Low.

Experts have come up with the best level for each type of cholesterol. Compare your numbers to these targets:

- **LDL** should be less than 100. LDL increases your risk of heart problems, so the lower your LDL, the better. A level of 160 or above is high.

- **HDL** should be more than 40. HDL over 60 helps protect against a heart attack. HDL below 40 increases your risk of heart problems. The higher your HDL, the better. A high HDL number can help offset a high LDL number.
- **Triglycerides** should be less than 150. A level above 150 may increase your risk for heart problems.

What Causes High Cholesterol?

Many things can cause high cholesterol, including:

- **Diet**. Eating too much saturated fat and cholesterol can raise your cholesterol. Saturated fat and cholesterol are in foods that come from animals (such as beef, pork, veal, milk, eggs, butter, and cheese), many packaged foods, stick margarine, vegetable shortening, and snack foods like cookies, crackers, and chips.
- **Weight**. Being overweight may raise triglycerides and lower "good" HDL.
- **Activity level**. Not exercising may raise "bad" LDL and lower HDL.
- **Overall health**. Diseases such as hypothyroidism can raise cholesterol. Smoking may lower HDL.
- **Age**. Cholesterol starts to rise after age 20. In men, it usually levels off after age 50. In women, it stays fairly low until menopause. After that, cholesterol levels rise to about the same levels as in men.
- **Family**. Some people inherit a rare disease called a lipid disorder. It can cause very high total cholesterol, very low HDL, and high triglycerides. If you have this problem, you will need to start treatment at a young age.

How Is High Cholesterol Diagnosed?

Doctors use a blood test to check cholesterol.

- A fasting cholesterol test (also called a lipoprotein analysis) is the most complete test. It measures total cholesterol, HDL, LDL, and triglycerides. You cannot have food for nine to 12 hours before this test.
- A simple cholesterol test can measure total cholesterol and HDL. You can eat before this test. Sometimes doctors do this test first. If it shows you have high cholesterol or low HDL, then you will get a fasting cholesterol test.

How Is High Cholesterol Treated?

The two main treatments are lifestyle changes and medicines. The goal of treatment is to lower your "bad" LDL cholesterol and reduce your risk of a heart attack. You may also need to raise your "good" HDL cholesterol. A high level of HDL helps reduce your risk of heart problems.

Some lifestyle changes are important for everyone with high cholesterol. Your doctor will probably want you to:

- Follow the Therapeutic Lifestyle Changes (TLC) diet. The goal is to reduce the amount of saturated fat you eat. Eating saturated fat raises your cholesterol. The TLC diet helps you learn to make better food choices by picking lean meats, low-fat or nonfat products, and good fats like olive and canola oils.
- Lose weight, if you need to. Losing just five to 10 pounds (2.3 to 4.5 kilograms) can lower your cholesterol and triglycerides. Losing weight can also help lower your blood pressure.
- Be more active. Exercise can raise your "good" HDL and may help you control your weight.
- Quit smoking, if you smoke. Quitting can help raise your HDL and improve your heart health.

Sometimes lifestyle changes are enough on their own. But if you try them for a few months and they don't lower your cholesterol enough, your doctor may prescribe a cholesterol-lowering medicine called a statin. You also may need medicines to lower triglycerides or raise HDL.

You may need to start taking medicine right away if your cholesterol is very high or if you have another problem that increases your chance of having a heart attack. People who have a high risk for heart attack benefit from taking higher doses of statins to lower their LDL cholesterol

as much as possible. The more these people can lower their LDL, the less likely they are to have a heart attack.

It is important to take your medicine just the way your doctor tells you to. If you stop taking your medicine, your cholesterol will go back up.

You will need to have your cholesterol checked regularly. Your results can help your doctor know if lifestyle changes have helped or if you need more or different medicines.

Causes

High cholesterol may run in your family. The foods you eat may also cause high cholesterol. Causes include:

- **What you eat**. Eating too much saturated fat can cause high cholesterol. You will find this unhealthy fat in foods that come from animals. Beef, pork, veal, milk, eggs, butter, and cheese contain saturated fat. Packaged foods that contain coconut oil, palm oil, or cocoa butter may have a lot of saturated fat. You will also find saturated fat in stick margarine, vegetable shortening, and most cookies, crackers, chips, and other snacks.
- **Your weight**. Being overweight may increase triglycerides and decrease HDL.
- **Your activity level**. Lack of physical activity, which may increase LDL and decrease HDL.
- **Your age and gender**. After you reach age 20, your cholesterol levels naturally begin to rise. In men, cholesterol levels generally level off after age 50. In women, cholesterol levels stay fairly low until menopause, after which they rise to about the same level as in men.
- **Your overall health**. Having certain diseases, such as diabetes or hypothyroidism, may cause high cholesterol.
- **Your family history**. If family members have high cholesterol, you may also.
- **Cigarette smoking**. Smoking can lower your good cholesterol.

In rare cases, high cholesterol is caused by an inherited problem called a lipid disorder that changes the way the body handles cholesterol. People with lipid disorders may have total cholesterol levels well over 250 milligrams per deciliter. Certain types of inherited lipid disorders may be more difficult to treat.

Symptoms

High cholesterol does not make you feel sick. It is usually found during a routine cholesterol and triglycerides test, a blood test that measures cholesterol levels. You may first discover it when you are diagnosed with a condition that is caused in part by high cholesterol, such as coronary artery disease (CAD), stroke, peripheral arterial disease, or inflammation of the pancreas.

Some people with lipid disorders, such as familial hypercholesterolemia, may have other distinct symptoms such as deposits of excess cholesterol that collect in the skin. These cholesterol deposits can also cause bumps in tendons in the hands or feet.

What Happens

Either high LDL cholesterol or low HDL cholesterol may lead to the buildup of cholesterol (plaque) in artery walls. This buildup, called atherosclerosis, hardens and narrows arteries and reduces blood flow to body tissues, including the heart muscle. Atherosclerosis can lead to:

- Coronary artery disease (CAD), which can cause chest pain, heart attack, heart failure, or irregular heartbeat (arrhythmia).
- Stroke or transient ischemic attack (TIA). Atherosclerosis, when it affects arteries that supply blood to the brain, may lead to a stroke or TIA.
- Peripheral arterial disease, which is caused by atherosclerosis in blood vessels that supply blood to the legs, arms, and other parts of the body. Reduced blood flow to the legs may cause pain or cramps in the calf, thigh, or rear end (buttock).

Cholesterol levels naturally increase with age. They also increase after menopause in women and as a result of certain medical conditions such as diabetes.

What Increases Your Risk

Some things that increase your risk for high cholesterol are within your control; some are not. It is important to lower your risk as much as possible.

Things you can control include:

- Eating a high-saturated-fat, high-cholesterol diet, which may raise LDL cholesterol and lower HDL cholesterol.
- Being overweight, which lowers HDL and may raise LDL.
- Not getting enough regular physical activity, which may raise LDL and lower HDL.
- Smoking, which may lower HDL by as much as 15 percent.

You may be able to control some other conditions that can raise cholesterol, including diabetes and metabolic syndrome.

Things you cannot control include:

- Family history. If high cholesterol runs in your family, you may develop it, and it may be harder to treat.
- Age and gender. After you reach age 20, your cholesterol levels naturally begin to rise. In men, cholesterol levels generally level off after age 50. In women, cholesterol levels stay fairly low until menopause, after which they rise to about the same level as in men.

When to Call a Doctor

High cholesterol usually has no symptoms. Sometimes the first sign that you have high cholesterol or other risk factors for heart disease is a heart attack, a stroke, or a transient ischemic attack (TIA). If you have any symptoms of these, **call 911 or other emergency services**.

Symptoms of a **heart attack** include:

- Severe chest pain, also described as discomfort, pressure, squeezing, or heaviness.
- Pain or discomfort that radiates to the back, jaw, throat, or arm.
- Discomfort in the upper abdomen that is often mistaken for heartburn.
- Sweating, nausea, and vomiting.
- Difficulty breathing, palpitations, dizziness, and fainting.
- Weakness, numbness, and anxiety.

Symptoms of a **stroke or TIA** include:

- Numbness, weakness, or paralysis of the face, arm, or leg, especially on one side of the body.
- Vision problems in one or both eyes, such as double vision or loss of vision.
- Confusion, trouble speaking or understanding.
- Trouble walking, dizziness, loss of balance or coordination.
- Severe headache.

Call your health professional for an appointment if you:

- Think you may have diabetes.
- Have family members who have high cholesterol, coronary artery disease (CAD), or diabetes.
- Are concerned about your cholesterol.

Who to See

Any one of the following doctors, nurses, or specialists can order a cholesterol test and treat high cholesterol:

- Nurse practitioner (NP)
- Physician assistant (PA)
- Family medicine doctor
- Internal medicine doctor
- Cardiologist
- Endocrinologist

A registered dietitian can help you with a diet to lower your cholesterol.

People who have rare lipid disorders, which can be more difficult to treat, may need to see a specialist, often an endocrinologist.

You may need to see a cardiologist if you are diagnosed with heart disease.

Exams and Tests

You will need a blood test to check whether you have high cholesterol.

- A total cholesterol test measures whether your cholesterol is high or low. You can have this test done at any time, even if you recently had a meal or snack.
- A lipoprotein analysis is a more thorough test. It measures your total cholesterol as well as your LDL, HDL, and triglyceride levels. It is called a fasting test because you are not supposed to eat for 9 to 12 hours before having your blood drawn.

Although knowing your total cholesterol level is important, a lipoprotein test will help your doctor make certain decisions about your treatment. Knowing the levels of your good cholesterol (HDL), bad cholesterol (LDL), and triglycerides will help your doctor decide whether to prescribe medicine right away or whether you first can try making changes in your diet and lifestyle to lower your cholesterol.

The following will help you understand the results of your test:

Total Cholesterol	
Best	Less than 200 milligrams per deciliter (mg/dL)
Borderline high	200 to 239
High	240 or above

LDL (bad) Cholesterol	
Best	Below 100 mg/dL
Near best	100 to 129
Borderline high	130 to 159
High	160 to 189
Very high	190 and above

HDL (good) Cholesterol	
Best	60 mg/dL or higher protects against heart disease
Good	40 and above
Bad	Below 40

Triglycerides	
Borderline high	150 to 199 mg/dL
High	200 or more

During your doctor visit, it will be important to discuss other things that increase your risk for heart problems, such as smoking, diabetes, high blood pressure, and a family history of high cholesterol and heart attack.

You may need other tests to determine whether another health problem, such as low thyroid, is causing your high cholesterol. Some medicines may also cause high cholesterol, so it is important to tell your doctor about everything you take.

Along with your cholesterol levels, your doctor will use this information to determine your risk for coronary artery disease (CAD) and heart attack. If you have a high risk of heart disease, or if you already have heart problems, your doctor will be more likely to prescribe medicine.

If you have high cholesterol or high blood pressure, you should get tested regularly for diabetes. Studies show that finding and treating diabetes early can lower the risk of heart attack.

The American Heart Association (AHA) and the U.S. Centers for Disease Control and Prevention (CDC) recommend C-reactive protein (CRP) testing for some people who are at risk for getting coronary artery disease. There are two types of CRP tests: the older CRP measurement and a newer, high-sensitivity CRP, often called cardiac CRP. The high-sensitivity test helps find out the chances of a having a sudden heart problem, such as a heart attack.

Two studies on CRP levels and statin treatment show that testing CRP levels may help predict heart attack risk even when a person has a normal or low level of LDL cholesterol Another study found higher CRP levels in people who have health problems related to metabolic syndrome. These problems include too much fat around the waist, elevated blood pressure, high triglycerides, elevated blood sugar, and low HDL cholesterol.

Ask your doctor if CRP testing would be helpful in guiding your treatment.

Early Detection

Some doctors and health organizations recommend that everyone older than 20 be checked for high cholesterol. How often you should be checked depends on whether you have other health problems and your overall chance of heart disease.

- When to have cholesterol testing
- What you should know about public cholesterol tests

Treatment

The goal in treating high cholesterol is to reduce your chances of having a heart attack or stroke.

Most people need to adjust their lifestyles to eat less saturated fat, be more active, and lose weight if needed. Others also need to take one or more medicines.

No matter what approach you need, your treatment will focus on lowering your "bad" LDL cholesterol.

You may also need to raise your "good" HDL cholesterol at the same time. Although it may seem odd to raise a type of cholesterol, HDL can help remove the LDL from your arteries.

Initial Treatment

After your doctor has looked at your cholesterol test, he or she will base your treatment on your cholesterol levels and overall health.

First, you will need some guidance on how to eat. Your doctor may suggest that you follow a cholesterol-lowering diet that cuts back on saturated fat while still allowing good fat such as olive and canola oils.

Increasing your activity is very important. Exercise can raise your HDL and may help you lose weight, if you need to. If you smoke, quitting will also help you raise your HDL.

If you have diabetes, high blood pressure, or coronary artery disease (CAD) or if your cholesterol is very high, you may need to start on medicine right away. This is because your chances of having a heart attack are high, and medicines can reduce this risk.

If you need medicine, it likely will be a statin. These drugs reduce the body's natural production of cholesterol. They are proven to lower the risk of heart attack, stroke, and death in people who have high cholesterol.

Statin Medicines

Brand Names	Generic Names	How They Work
Lipitor, Mevacor, Pravachol, Zocor, Lescol, Crestor	atorvastatin, lovastatin, pravastatin, simvastatin, fluvastatin, rosuvastatin	Reduce how much cholesterol your liver makes

Your doctor may prescribe other medicines. Some are used with a statin.

Drugs Combined With or Used With a Statin

Brand Names	Generic Names	How They Work
Zetia	ezetimibe	Lower the amount of cholesterol your body can absorb
Vytorin	ezetimibe with simvastatin	Lower how much cholesterol your liver makes and affect how your body absorbs cholesterol
Caduet	atorvastatin with amlodipine	Lower how much cholesterol your liver makes and lower blood pressure
Questran, Colestid, Welchol	cholestyramine, colestipol, colesevelam	Affect how your body removes cholesterol
Lopid, Tricor	gemfibrozil, fenofibrate	Raise HDL, lower triglycerides
Niacor, Niaspan, Nicolar	niacin	Affect how the liver makes cholesterol

Guidelines from the U.S. National Cholesterol Education Panel (NCEP) recommend higher doses of statins for people who have a moderate to high risk of heart attack. The goal is to lower your chances of having a heart attack or stroke. Side effects are more likely and may be more severe when higher doses of statins are used.

You are considered at very high risk if you have coronary artery disease and you also have diabetes, acute coronary syndrome, or metabolic syndrome or you smoke.

Work with your doctor to treat other diseases that you may have, such as high blood pressure and diabetes, and to stop smoking, if you smoke.

Ongoing Treatment

As you continue your treatment for high cholesterol, your doctor will check your cholesterol at times, to see how you are doing. If you have been trying lifestyle changes alone, another cholesterol test can show if those changes have helped or if you need to add medicine to your treatment.

If you are taking medicine already, a cholesterol test can show whether you need your dose lowered or increased or whether you need a different drug.

At this time you may also want to ask for help if you are having trouble changing how you eat. Your doctor can recommend a dietitian to help you plan meals.

Staying physically active is important. Managing your weight and exercising are important because they can help you raise your HDL and lower your LDL levels. Research shows that people who exercise longer have more improvement in their LDL and HDL levels.

Losing weight can also help lower high blood pressure.

Treatment If the Condition Gets Worse

It is important to follow your doctor's recommendations for making lifestyle changes and taking medicines, if prescribed. If high cholesterol is not treated, it can lead to coronary artery disease, heart attack, and stroke.

What to Think About

High cholesterol that is caused by inherited (genetic) lipid disorders usually is treated with medicines.

Prevention

Eating a diet low in saturated fat and cholesterol, getting plenty of exercise, managing your weight, and not smoking can help prevent high cholesterol. Because cholesterol levels tend to increase with age, paying attention to diet and exercise is particularly important as you get older.

Remember that high cholesterol is just one of the things that increase your risk for coronary artery disease (CAD) and heart attack. Controlling other health problems, such as high blood pressure and diabetes, is also important to reduce your overall risk.

Lifestyle Changes

Eating a sensible diet low in saturated fat and cholesterol, getting moderate exercise, and losing excess weight are important ways you can lower your high cholesterol level. For many people, these lifestyle changes may be all that is needed to decrease LDL cholesterol and raise HDL cholesterol.

If high cholesterol runs in your family, you may not be able to reduce your cholesterol level by following a strict diet and exercise routine only. In this case, you may need to take medicine.

As part of the treatment for high cholesterol, your doctor may recommend using the Therapeutic Lifestyle Changes (TLC) recommended by the National Cholesterol Education Program of the U.S. National Institutes of Health.

These lifestyle changes recommend:

- Following the TLC cholesterol-lowering diet.
- Getting plenty of exercise.
- Losing weight, if needed.

The TLC diet is low in saturated fat and cholesterol. Less than seven percent of your daily calories should come from saturated fat, and you should limit your cholesterol to no more than 200 milligrams per day.

Foods that contain saturated fat include most animal products, such as meat, poultry, shellfish, milk, cheese, and eggs. Other examples include butter, margarine, sour cream, salad dressings, marinades, mayonnaise, shortening, and many

snack foods and desserts. Many snack foods contain a lot of saturated fat and trans fat (hydrogenated oils). Doughnuts, french fries, and commercial baked goods like cookies contain trans fat.

The TLC plan also recommends increasing the amount of fiber you eat and adding plant stanols and sterols to your diet.

Plant sterols are found in small quantities in many fruits, vegetables, nuts, seeds, cereals, legumes, and other plant sources. Plant stanols come from some of the same sources. Vegetable oils, for example, contain both plant sterols and stanols. You can also find them in some salad dressings and margarines, such as Benecol and Take Control. They are safe for children who have genetic high cholesterol, but pregnant women need to avoid them.

Not Recommended for Reducing Cholesterol

- **Garlic**. Recent studies have shown that eating lots of garlic or taking garlic supplements does not effectively lower cholesterol levels. Eating too much garlic can have side effects, including allergic reaction, gas (flatulence), heartburn, garlic odor from the skin, interference with some drugs, and longer blood-clotting time.
- **Very low-fat diets**. Although very low-fat diets may indeed lower cholesterol levels, they are not recommended. Very low-fat diets usually allow less than 15% of total calories from fat. In comparison, a cholesterol-reducing diet allows 25 to 35 percent of calories to come from total fat, with seven percent from saturated fat. A diet with less than 25percent of its calories from fat can increase triglycerides and decrease HDL (good) cholesterol. Such a diet may deplete your body of other important nutrients and vitamins.

Medications

Statins are the most effective and widely used medicines to treat high cholesterol. Evidence shows that statins can reduce the risk for heart attack, stroke, and death. Other medicines also lower cholesterol, and some may be used to lower triglycerides or raise HDL.

- Some people can try diet and exercise for at least three months before medicines are started. However, people who have coronary artery disease (CAD) should start taking medicines immediately.
- Other people who may need to start taking medicine as soon as possible include those who have a strong family history of early CAD, those who have inherited forms of high cholesterol, and those who have peripheral arterial disease or diabetes or who have had a previous heart attack or stroke.

Your doctor may follow NCEP and American Heart Association medicine guidelines in deciding whether you should take medicine to lower your cholesterol. The guidelines base treatment on your LDL level and your risk for CAD.

Cholesterol treatment guidelines will continue to evolve as experts learn more about how best to treat heart disease. However, everyone can benefit from eating a balanced low-fat diet, getting regular exercise, and reducing other heart disease risks, such as smoking.

Medication Choices

The following medicines can be used to lower LDL and triglyceride levels in the blood and to raise HDL:

Statin Medicines

Brand Names	Generic Names	How They Work
Lipitor, Mevacor, Pravachol, Zocor, Lescol, Crestor, Altocor	atorvastatin, lovastatin, pravastatin, simvastatin, fluvastatin, rosuvastatin	Reduce how much cholesterol your liver makes

Your doctor may prescribe other medicines. Some are used with a statin.

Drugs Combined With or Used With a Statin

Brand Names	Generic Names	How They Work
Zetia	ezetimibe	Lower the amount of cholesterol your body can absorb
Vytorin	ezetimibe with simvastatin	Lower how much cholesterol your liver makes and affect how your body absorbs cholesterol
Caduet	atorvastatin with amlodipine	Lower how much cholesterol your liver makes and lower blood pressure
Questran, Colestid, Welchol	cholestyramine, colestipol, colesevelam	Affect how your body removes cholesterol
Lopid, Tricor	gemfibrozil, fenofibrate	Raise HDL, lower triglycerides
Niacor, Niaspan, Nicolar	niacin	Affect how the liver makes cholesterol
Advicor	niacin with lovastatin	Raises good HDL cholesterol

Surgery

Most people who have high cholesterol can be successfully treated with medicine and lifestyle changes. If high cholesterol causes coronary artery disease, you eventually may need surgery to open a blocked artery.

What to Think About

- Men younger than 35 and women who have not reached menopause are at lower risk for heart disease and often can try lifestyle changes before medicines.
- Medicine is always added to a diet and exercise plan (Therapeutic Lifestyle Changes), not substituted for it.
- Side effects are more likely and may be more severe when higher doses of statins are used.
- Doctors may also prescribe aspirin therapy if you have had a heart attack or have a high risk for heart attack.

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