

Cholesterol

Cholesterol blood tests are done to help assess your risk of developing heart disease or stroke. If your risk is high then you will usually be advised to take a statin medicine to lower your cholesterol level. Lowering your cholesterol level reduces your risk, even if your cholesterol level is normal. Other factors that can reduce your risk include: not smoking, choosing healthy foods, a low salt intake, regular physical activity, keeping your weight and waist size down and drinking alcohol in moderation. Ensuring your blood pressure level is not raised (or taking medication to lower it if it is high) is also important.

What is cholesterol?

Cholesterol is a lipid (fat chemical) that is made in the liver from fatty foods that we eat. A certain amount of cholesterol is present in the bloodstream. You need some cholesterol to keep healthy. Cholesterol is carried in the blood as part of particles called lipoproteins. There are different types of lipoproteins, but the most relevant to cholesterol are:

- Low-density lipoproteins carrying cholesterol - LDL cholesterol. This is often referred to as bad cholesterol. This is the one mainly involved in forming atheroma. Atheroma is the main underlying cause of various cardiovascular diseases (see below). The majority of cholesterol in the blood is LDL cholesterol, but how much varies from person to person.
- High-density lipoproteins carrying cholesterol - HDL cholesterol. This is often referred to as good cholesterol. This may prevent atheroma forming.

What are atheroma and cardiovascular diseases?

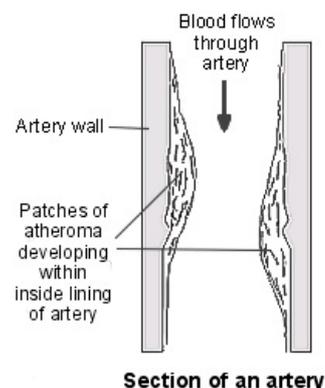
Patches of atheroma are like small fatty lumps that develop within the inside lining of arteries (blood vessels). Atheroma is also known as atherosclerosis and hardening of the arteries. Patches of atheroma are often called plaques of atheroma.

Over months or years, patches of atheroma can become larger and thicker. So in time, a patch of atheroma can make an artery narrower. This can reduce the blood flow through the artery. For example, narrowing of the coronary (heart) arteries with atheroma is the cause of angina.

Sometimes, a blood clot (thrombosis) forms over a patch of atheroma and completely blocks the blood flow. Depending on the artery affected, this can cause a heart attack, a stroke, or other serious problems.

Cardiovascular diseases are diseases of the heart (cardiac muscle) or blood vessels (vasculature). However, in practice, when doctors use the term cardiovascular disease they usually mean diseases of the heart or blood vessels that are caused by atheroma.

In summary, cardiovascular diseases caused by atheroma include: angina, heart attack, stroke, transient ischaemic attack (TIA) - sometimes called mini-stroke - and peripheral vascular disease. In the UK, cardiovascular diseases are a major cause of poor health and the biggest cause of death.



What factors affect the blood level of cholesterol?

In most people your cholesterol level reflects the amount of fat that you eat. This is not the full story, as different people who eat the same amount of fat can make different amounts of cholesterol. In general, however, if you eat less fat your cholesterol level is likely to go down.

In some people a high cholesterol level is due to another condition. For example, an underactive thyroid gland, obesity, drinking a lot of alcohol and some rare kidney and liver disorders can raise the cholesterol level.

In some people a very high level of cholesterol runs in the family, due to a genetic problem with the way cholesterol is made. One example is called familial hypercholesterolaemia.

Risk factors

Everybody has some risk of developing atheroma which then may cause one or more cardiovascular diseases. However, some situations increase the risk. These include:

- Lifestyle risk factors that can be prevented or changed:
 - Smoking.
 - Lack of physical activity (a sedentary lifestyle).
 - Obesity.
 - An unhealthy diet - including eating too much salt.
 - Excess alcohol.
- Treatable or partly treatable risk factors:
 - High blood pressure (hypertension).
 - High cholesterol blood level.
 - High triglyceride (another type of fat) blood level.
 - Diabetes.
 - Kidney diseases that affect kidney function.
- Fixed risk factors - ones that you cannot alter:
 - A strong family history. This means if you have a father or brother who developed heart disease or a stroke before they were 55, or in a mother or sister before they were 65.
 - Being male.
 - An early menopause in women.
 - Age. You are more likely to develop atheroma as you get older.
 - Ethnic group. For example, people who live in the UK whose family came from India, Pakistan, Bangladesh, or Sri Lanka have an increased risk.

However, if you have a fixed risk factor, you may want to make extra effort to tackle any lifestyle risk factors that can be changed.

Note: some risk factors are more risky than others. For example, smoking and a high cholesterol level probably cause a greater risk to health than obesity. Also, risk factors interact. So, if you have two or more risk factors, your health risk is much more increased than if you just have one.

For example, a middle aged male smoker who has high blood pressure and a high cholesterol level has a high risk of developing a cardiovascular disease, such as a heart attack, before the age of 60.

Cholesterol blood levels

The following levels are generally regarded as desirable:

- Total cholesterol (TC) - 5.0 mmol/L or less. However, about 2 in 3 adults in the UK have a TC level of 5.0 mmol/L or above.
- Low-density lipoprotein (LDL) cholesterol after an overnight fast: 3.0 mmol/L or less.
- High-density lipoprotein (HDL) cholesterol: 1.2 mmol/L or more.

- TC/HDL ratio: 4.5 or less. That is, your total cholesterol divided by your HDL cholesterol. This reflects the fact that for any given TC level, the more HDL, the better.

As a rule, the higher the LDL cholesterol level, the greater the risk to health.

However, your level of cholesterol has to be viewed as part of your overall cardiovascular health risk. The cardiovascular health risk from any given level of cholesterol can vary, depending on the level of your HDL cholesterol and on other health risk factors that you may have.

Calculating your cardiovascular health risk

A risk factor calculator is commonly used by doctors and nurses. This can assess your cardiovascular health risk. A score is calculated which takes into account all your risk factors such as age, sex, smoking status, blood pressure, cholesterol level, etc.

The calculator has been devised after a lot of research that monitored thousands of people over a number of years. The score gives a fairly accurate indication of your risk of developing a cardiovascular disease over the next 10 years. If you want to know your score, see your practice nurse or GP.

Who should have their cardiovascular health risk assessed?

Current UK guidelines advise that the following people should be assessed to find their cardiovascular health risk:

- All adults aged 40 or more.
- Adults of any age who have:
 - A strong family history of early cardiovascular disease. This means if you have a father or brother who developed heart disease or a stroke before they were 55, or in a mother or sister before they were 65.
 - A first-degree relative (parent, brother, sister, child) with a serious hereditary lipid disorder. For example, familial hypercholesterolaemia or familial combined hyperlipidaemia. These diseases are uncommon.

If you already have a cardiovascular disease or diabetes then your risk does not need to be assessed. This is because you are already known to be in the high-risk group.

What does the assessment involve?

A doctor or nurse will:

- Do a blood test to check your cholesterol and glucose (sugar) level.
- Measure your blood pressure and your weight.
- Ask you if you smoke.
- Ask if there is a history of cardiovascular diseases in your blood relations. If so, at what age the diseases started in the affected family members.

A score is calculated based on these factors plus your age and your sex. An adjustment to the score is made for certain other factors, such as strong family history and ethnic origin.

What does the assessment score mean?

You are given a score as a percentage chance. So, for example, if your score is 30% this means that you have a 30% chance of developing a cardiovascular disease within the next 10 years. This is the same as saying a 30 in 100 chance (or a 3 in 10 chance). In other words, in this example, 3 in 10 people with the same score that you have will develop a cardiovascular disease within the next 10 years. **Note:** the score cannot say if you will be one of the three. It cannot predict what will happen to each individual person. It just gives you the odds.

You are said to have a:

- High risk - if your score is 20% or more. That is a 2 in 10 chance or more of developing a cardiovascular disease within the next 10 years.
- Moderate risk - if your score is 10-20%. That is between a 1 in 10 and 2 in 10 chance.
- Low risk - if your score is less than 10%. That is less than a 1 in 10 chance.

Who should be treated to reduce their cardiovascular health risk?

Treatment to reduce the risk of developing a cardiovascular disease is usually offered to people with a high risk. That is:

- People with a risk assessment score of 20% or more. That is, if you have a 2 in 10 chance or more of developing a cardiovascular disease within the next 10 years.
- People with an existing cardiovascular disease (to lower the chance of it getting worse, or of developing a further disease).
- People with diabetes. If you have diabetes, the time that treatment is started to reduce cardiovascular risk depends on factors such as: your age, how long you have had diabetes, your blood pressure and if you have any complications of diabetes.
- People with certain kidney disorders.

The following people should also have medication to lower their cholesterol level, *regardless* of any calculated risk. The risk calculator may not necessarily take these people into account who have a high risk of developing atheroma:

- People with a total cholesterol (TC) to HDL ratio of 6 or more (TC/HDL = 6 or more).
- People with inherited lipid disorders.

What treatments are available to reduce the risk?

If you are at high risk of developing a cardiovascular disease then treatment with medication is usually advised along with advice to tackle any lifestyle issues. This usually means:

- A medicine to lower your cholesterol level, usually with a statin medicine. No matter what your current cholesterol level, treatment is advised. There are several different statin medicines. They work by blocking an enzyme (chemical) which is needed to make cholesterol in the liver. See separate leaflet called '*Statins and Other Lipid-lowering Medicines*' for details.

There is no actual target level for people who do not already have cardiovascular disease. However, for those who do have a cardiovascular disease, the aim, if possible, is to reduce TC to less than 4.0 mmol/L *and* LDL cholesterol to less than 2.0 mmol/L.

- Treatment to lower blood pressure if it is high. This is even if your blood pressure is just mildly high. See separate leaflet called '*High Blood Pressure (Hypertension)*' for details.

In addition, if you already have cardiovascular disease, a daily low dose of aspirin is also usually advised. Aspirin helps to prevent blood clots from forming on patches of atheroma. See separate leaflet called '*Aspirin and Other Antiplatelet Medicines*' for details.

In addition, everyone should aim to tackle lifestyle risk factors. This means to:

- Stop smoking if you smoke.
- Eat a healthy diet.
- Keep your salt intake to under 6 g a day.
- Keep your weight and waist in check.
- Take regular physical activity.
- Cut back if you drink a lot of alcohol.

If available (and if required) you may be offered a referral to a specialist service. For example, to a dietician to help you to lose weight and eat a healthy diet, to a specialist stop smoking clinic, or to a supervised exercise programme.

Can diet lower my cholesterol level?

Changing from an unhealthy diet to a healthy diet can reduce a cholesterol level. However, dietary changes alone rarely lower a cholesterol level enough to change a person's risk of cardiovascular disease from a high-risk category to a lower-risk category. However, any extra reduction in cholesterol due to diet will help. A healthy diet has other benefits too apart from reducing the level of cholesterol.

Briefly, a healthy diet means:

- AT LEAST five portions, and ideally 7-9 portions, of *a variety of* fruit and vegetables per day.
- THE BULK OF MOST MEALS should be starch-based foods (such as cereals, wholegrain bread, potatoes, rice, pasta), plus fruit and vegetables.
- NOT MUCH fatty food such as fatty meats, cheeses, full-cream milk, fried food, butter, etc. Use low-fat, mono-unsaturated or polyunsaturated spreads.
- INCLUDE 2-3 portions of fish per week - at least one of which should be oily (but if you are pregnant you should not have more than two portions of oily fish a week).
- LIMIT SALT to no more than 6 g a day (and less for children).
- If you eat meat, it is best to EAT LEAN MEAT, or poultry such as chicken.
- If you do fry, choose a VEGETABLE OIL, such as sunflower, rapeseed or olive.

Foods that contain plant sterols or stanols can reduce total blood cholesterol level and LDL cholesterol by about 10%. There does not seem to be much evidence, however, that this has an effect on preventing cardiovascular disease. The National Institute for Health and Clinical Excellence (NICE) therefore does not recommend that these products be used routinely until more information is available.

How much benefit do I get if my cholesterol level is reduced?

If you have a high risk of developing a cardiovascular disease, or you already have a cardiovascular disease, lowering your cholesterol level reduces your risk of developing future cardiovascular problems. For details on exactly how much risk is reduced by lowering and treating risk factors, see the Prodigy guidance, called '*Cardiovascular risk assessment and management*':
http://prodigy.clarity.co.uk/cvd_risk_assessment_and_management

What if I am at moderate or low risk?

Statin medicines are available on prescription and funded by the NHS if your risk is high. If your risk is moderate-to-low, it should be enough to concentrate on the lifestyle changes mentioned above. However, some people prefer to buy a low-dose statin as well. If you do decide to do this, make sure your doctor knows so this can be put on your medical record.

Further help and information

HEART UK (the Hyperlipidaemia Education and Atherosclerosis Research Trust UK)

7 North Road, Maidenhead, Berkshire, SL6 1PE
 Tel (Helpline): 0845 450 5988 Web: www.heartuk.org.uk

British Heart Foundation

Greater London House, 180 Hampstead Road, London, NW1 7AW
 Tel (Heart Help Line): 0300 330 3311 Web: www.bhf.org.uk

British Nutrition Foundation

Web: www.nutrition.org.uk

Further reading & references

- [Lipid modification, NICE Clinical Guideline \(May 2008\)](#); (Cardiovascular risk assessment and the modification of blood lipids for the primary and secondary prevention of cardiovascular disease.) amended May 2010
- [Guidelines for the Management of Dyslipidaemias](#), European Society of Cardiology (2011)
- [Cardiovascular risk assessment and management](#), Prodigy (December 2008)
- [No authors listed, JBS 2: Joint British Societies' guidelines on prevention of cardiovascular disease in clinical practice. Heart. 2005 Dec;91 Suppl 5:v1-52](#)

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