

for your heart's sake

Advice for those keen to lower
their cholesterol



Committed to helping



www.heartuk.org.uk



H·E·A·R·T UK...

- Provides information on coronary heart disease and its management by diet, lifestyle and medication
- Is committed to the early detection of families with genetic lipid disorders
- Is advised by an eminent Medical Advisory Panel which includes some of the world's leading specialists in the field
- Produces the H·E·A·R·T UK Digest – with information on the latest news and research in the lipids and cholesterol field
- Is staffed by health professionals who respond to telephone, email and postal enquires
- Hosts annual scientific and medical conferences for health professionals, patients and lay members
- Participates in the post-registration education and training of students, nurses and doctors

Introduction by
Dame Judi Dench, DBE
Honorary President of H·E·A·R·T UK

My long term interest in H·E·A·R·T UK has given me sufficient insight to know that its staff really do care for those with high blood cholesterol in general, and in particular for patients with familial hypercholesterolaemia - FH.



The pace of life, as I am only too well aware, shows no sign of slowing down; indeed the time that you and I can spend caring for our own and our families' health, appears to be under constant pressure.

Time for good health, a better lifestyle, sensible diet and exercise, is time well spent. H·E·A·R·T UK can help you if you are concerned about any of these aspects. Please consider becoming a member – like me, you will receive the excellent H·E·A·R·T UK Digest. It's a magazine full of up-to-date items, lifestyle guidance, advice on food, recipe cards, health and news reports from around the world plus special offers.

Make use of their support services and please give yourself better opportunities for good health and a greater peace of mind.

Judi Dench
Judi Dench

Lipids and coronary heart disease

What is coronary heart disease?

The heart is a pump which pushes blood around the body. Blood carries oxygen and fuel to the muscles, including the heart muscle

The blood vessels that carry blood to the heart are called coronary arteries. The coronary arteries can become narrowed and partially blocked when deposits of cholesterol and fats (together called lipids) build up. Frequently fibrous tissue is also incorporated into the fatty deposits making the coronary arteries less flexible. This is called atherosclerosis or hardening of the arteries.

The narrowing of blood vessels can reduce the blood supply to the heart, causing cramp-like pain in the chest. This is called angina and can occur during physical activity, emotion or extremes of temperature. A blood clot can form at the site of atherosclerosis and block a coronary artery completely, causing the heart muscle to become so short of blood that severe chest pain occurs at rest. This is called a heart attack. The process of narrowing and blockage is called coronary heart disease (CHD), and it is a major health problem in the UK.

Fats in the blood

Cholesterol and triglycerides are the two main fats in the blood. In excessive quantities they are harmful. Lower levels are, however, important because they have essential functions in the body.

Cholesterol

Cholesterol is a structural component of all cell membranes and is used as a building block in the cell. Cholesterol is present in the diet and is also manufactured in the liver. It is used by the body to make certain hormones and vitamin D which regulates calcium levels in the body. Cholesterol is also used for making bile acids which help in the digestion of food.

Triglycerides

Triglycerides are fats which are found in certain foods and are also made in the liver. Triglycerides eaten in foods are absorbed in the intestine and transported to the tissues where they serve as the body's major energy store. This store of energy is released to provide food for the muscles and brain. A diet high in refined carbohydrate, such as sugar, contributes to high triglyceride levels as does a high consumption of alcoholic drinks.

Please refer to the useful terms section on page 15.

A diet rich in staple foods and fruit and vegetables offers many health benefits

Elevated blood cholesterol

Cholesterol is vital for healthy cells. However, if the body accumulates too much, cholesterol will deposit in the walls of arteries which become damaged and may become blocked. If this happens, a heart attack could result.

Cholesterol levels may rise due to lifestyle factors, such as eating a diet rich in saturated fat. High blood cholesterol may also be inherited, as in the disorders Familial Hypercholesterolaemia (FH) and Familial Combined Hyperlipidaemia (FCH). People diagnosed with an elevated cholesterol level are encouraged to follow a cholesterol lowering food plan and engage in healthy lifestyle behaviours. Drug treatment may also be essential to lower cholesterol, if the risk of CHD is to be effectively reduced.

Not all cholesterol in the blood is harmful to the arteries. The major component, called 'LDL cholesterol' (low density lipoprotein cholesterol) is harmful, but a more minor component called 'HDL cholesterol' (high density lipoprotein cholesterol) represents a form of cholesterol which has been removed from the arteries rather than deposited there and is thus beneficial. Before the menopause higher HDL cholesterol in women accounts for their tendency to have a lower risk of CHD than men with similar risk factors.

Cholesterol is present in foods of animal origin. The amount of cholesterol made in the liver can be affected by diet. People tend to make too much cholesterol when consuming a diet rich in saturated fat

What causes CHD?

The development of CHD is influenced by a number of risk factors. When several risk factors exist together, the risk of CHD is much increased

CHD is more likely:

- With increasing age
- In men rather than in women before the menopause
- If there is a strong family history of CHD
- In people of South Asian origin

These risk factors cannot be changed. But there are others that can be modified by leading a healthy lifestyle.

These include:

- Elevated blood cholesterol
- High triglyceride with low HDL*
- Elevated blood pressure
- Diabetes
- Smoking
- Physical inactivity



Lipids & coronary heart disease

High triglyceride with low HDL: Having too much of another fat in the blood, triglyceride, is often coupled with having too little HDL. A high triglyceride level can also increase the risk of CHD by making the blood more likely to clot. This combination is often associated with premature coronary heart disease. It may be inherited but also occurs in individuals who are obese. Weight reduction and regular exercise may help to reduce triglyceride levels and increase HDL levels. Drug therapy may be necessary.

Elevated blood pressure: High blood pressure is harmful to the arteries and increases the risk of heart attack, heart failure and stroke. The condition tends to run in families but blood pressure is also influenced by lifestyle. To prevent blood pressure from rising, people are encouraged to achieve and maintain a healthy body weight, keep alcohol intake moderate, avoid adding or cooking with salt, reduce stress and be physically active. If these measures fail, there are drugs that are effective in reducing elevated blood pressure, in combination with healthy lifestyle measures.

Diabetes: Having diabetes puts people with the condition at a much higher risk of CHD. People with diabetes have a two to five fold risk of developing heart disease and have the same risk of developing heart disease as a person who has had a heart attack who doesn't have diabetes.

Lipid profiles in people with diabetes tend to be characterised by elevated very low density lipoproteins, small low density lipoproteins and low levels of high density lipoprotein. This combination is commonly termed the diabetic dyslipidaemia and is particularly atherogenic,

i.e. the furring up process is accelerated. People with diabetes with a raised cholesterol level experience an even greater risk of heart disease than those without diabetes with the same level of cholesterol.

Diabetes and diabetic tendencies can be managed by diet, which emphasises complex carbohydrates and is low in fat. Good choices are foods rich in starch and fibre, such as potatoes, bread and other cereal foods, pasta, beans, vegetables and fruit. Be active, maintain a healthy body weight and, above all, do not smoke.

Smoking: Cigarette smoking, even a few a day, increases the risk of heart disease. It can also cause cancer of the lungs and several other parts of the body (tongue, mouth, cervix, etc.), lung failure, stroke and gangrene. There are thus many health benefits from being a non-smoker. Even after having smoked for many years, stopping smoking now will reduce CHD risk.

Obesity: Being overweight increases the chances of having a heart attack. This is in part because overweight individuals are more likely to have high blood pressure, diabetes and high blood fats. Consuming less fat, sugar and alcohol in the diet is helpful for weight control. In order to achieve a healthy body weight, it is also important to build regular, moderate exercise into a daily routine.

Inactivity: Physical inactivity is an important contributor to CHD. Cardiovascular benefits of regular physical activity include reduced blood pressure and less likelihood of obesity which help reduce the risk of developing CHD. At least 30 minutes of steady activity at

At least 30 minutes of steady activity at least five days a week is recommended. Brisk walking, swimming, cycling and dancing are all excellent choices

least five days a week is recommended. Brisk walking, swimming, cycling and dancing are all excellent choices. Those who have CHD or feel they are at risk, should consult their doctor before starting an exercise programme.

Alcohol: Alcohol in moderation may reduce the risk of CHD. However, consuming too much alcohol places one's health at risk in a number of ways. When taken to excess, alcohol is detrimental to the heart and other organs. It can directly damage the heart muscle and cause irregular beating of the heart. Alcohol can contribute to obesity, high triglycerides, high blood pressure, strokes and cancer, not to mention accidents and violence. Men are encouraged to drink no more than 21 units a week and women no more than 14 units. A unit is defined as a half-pint of beer, lager or cider or a pub measure of wine, sherry or spirits.

Stress: A certain amount of stress may be desirable, in that it keeps people alert and motivated. However, as the stress level builds, and especially if prolonged, it can be counter-productive by being injurious to health. Stress can exacerbate symptoms in people with pre-existing heart disease and can contribute to high blood pressure. For people with a high cholesterol level stress can lead to neglect of a healthy lifestyle, such as poor diet or not taking prescribed medication.

It is important to find time for relaxation. Simple breathing exercises, sports, music, meditation, reading, engaging in hobbies, taking a walk... there are many ways to reduce stress. Choose those which appeal and make time for them every day.

Weblinks

Blood pressure www.bpassoc.org.uk

Diabetes www.diabetesuk.org.uk

Smoking www.ash.org.uk

Obesity www.bda.uk.com

Inactivity www.whi.org.uk

Stress www.stress.org.uk



Healthy heart

Diet is central to the management of high levels of fat in the blood

A 'cardio-protective' diet is an important tool for controlling blood cholesterol and triglyceride levels. While the guidelines described on these pages are especially useful for reducing blood lipids, they can apply also to those watching their weight, controlling high blood pressure, or who simply have an interest in healthy eating.

Food choice

Variety and moderation in food choices are the guiding principles for healthy eating. A diet rich in staple foods and fruit and vegetables offers many health benefits, including intake of soluble fibre and antioxidant vitamins which may play a protective role against coronary heart disease. One target to strive for is at least five servings of fruit and vegetables a day.

From the chart choose mainly from the two left hand columns which emphasise a pattern of eating which is lower in total fat, saturated fat, cholesterol, salt and sugar. Choose fewer foods from the two right hand columns.

And finally - do enjoy this way of eating - it can be easy, fun and delicious...

...so bon appetit!

Dietary fats

Dietary fats fall into three main groups: saturated, polyunsaturated and monounsaturated fats. Saturated fat is solid at room temperature and found mainly in foods of animal origin, such as meat, dairy products, butter and lard. It is also found in most margarines, coconut and palm kernel oils and many convenience snack foods. Foods that are high in saturated fat also generally contain cholesterol. As saturated fat tends to raise blood cholesterol levels, an important part of a cardio-protective diet is to limit consumption of saturated fat.

The unsaturated fats are usually liquid at room temperature and do not raise blood cholesterol levels. Polyunsaturated fat is found in sunflower oil, corn oil and soyabean oil, polyunsaturated margarines and fish oils. Monounsaturated fat is widely distributed in all animal products and vegetables. Particularly rich sources are olive oil and rapeseed oil which are also now available in margarines.

However, there is some individual response to cholesterol in foods partially influenced by genetic factors such as Familial Hypercholesterolaemia (FH). H·E·A·R·T UK recommends that people with FH have individual dietary advice about diet and FH from a state registered dietitian.

The following chart aims to provide a guide to eating in a balanced and healthy way for your heart.



For your heart's sake

Cholesterol and how to reduce it

What is cholesterol?

Cholesterol is a white waxy substance, vital for good health as it helps form cell membranes, various hormones, bile salts and vitamin D. It only becomes a problem if you have too much of it, as too much increases your risk of heart disease.

There are two main types of cholesterol, low-density lipoprotein (LDL) cholesterol and high-density lipoprotein (HDL) cholesterol. The LDL cholesterol is thought of as the 'bad' cholesterol as it is the main carrier of harmful cholesterol to your arteries where it builds up and causes narrowing. The HDL is the 'good' cholesterol as it picks up excess cholesterol and takes it away from the arteries.

So the ideal situation is to have a low LDL and a high HDL.

What are normal levels of cholesterol?

The average total cholesterol level in the UK is about 5.8mmol/l but in countries where heart disease is rare the levels are much lower. UK guidelines for 2006 recommend a cholesterol level of less than 4.0mmol/l and LDL cholesterol of less than 2.0mmol/l, to reduce the risk of heart disease. Any reduction in an individual's cholesterol levels through diet and lifestyle measures will have health benefits.

What else can I do to reduce my risk?

- Take regular physical activity – at least 30 minutes on most days of the week. Brisk walking is ideal
- If you smoke, give up!
- Have your blood pressure checked regularly
- If you have diabetes, keep it under good control
- See your GP if you have a family history of heart disease
- Reduce your stress levels

Why is cholesterol important?

A number of risk factors contribute to developing heart disease. However a raised level of LDL 'bad' cholesterol in the blood is the single greatest risk factor for heart disease and contributes to almost half of all deaths from CHD.

- Cholesterol is also major risk factor in stroke and has greater health implications in diabetic and obese individuals
- Approximately two thirds of men and women have blood total cholesterol levels of 5.0mmol/l and above
- CHD is the most common cause of premature death in the UK
- Eight out of ten people in the UK don't know their cholesterol levels

Simple ways to lower cholesterol and keep your heart healthy

- Enjoy a balanced diet with plenty of fruit and vegetables, based on starchy wholegrain foods and low in fat especially saturated fat. Include good heart healthy foods such as oily fish, oats, beans, nuts, soya & plant stanols and sterols
- Aim for a healthy weight and shape! The more apple-shaped you are, the more at risk you are of heart disease. Try to keep to a waist measurement of less than 80cm (32") for a woman or 94cm (37") for a man. Serious health risks are associated with waist measurements above 88cm (35") and 102cm (40") for women and men respectively
- If you need to lose weight follow our 'heart healthy' dietary advice but decrease the portion sizes and take more physical activity

For those with high risk of developing CHD your doctor may decide that other treatments are also appropriate.

A top-down view of a kitchen scene. In the upper left, a white bowl contains a bright yellow liquid, likely oil or broth, garnished with fresh green herbs. Below the bowl is a black metal grill basket. Inside the basket, several green onions are laid out. A red bell pepper is partially visible. A large, flat vegetable, possibly a zucchini or eggplant, is being grilled, showing distinct dark char marks. To the right, a yellow squash is also visible. The background is a light-colored, textured surface, possibly a countertop.

Simple Cooking methods

to take when preparing foods

- It is best to steam, boil, poach, grill, bake, microwave, barbecue or stir-fry foods. Try to choose these methods instead of frying. Use only small quantities of oil when cooking and choose brands high in polyunsaturated or monounsaturated fat. Alternatively, try cooking in wine or water.
- If using oil, you may find it useful to measure it out using a teaspoon/tablespoon rather than just pouring it into the saucepan. Trim meat of all visible fat and remove skin from poultry before cooking.
- Certain dishes such as minced meat and traditional Asian dhals, can be made without fat. All ingredients and spices can be added together and cooked without the use of any oil.
- When grilling or roasting meat, use a trivet which allows the fat to drain off.
- Try substituting low fat yoghurt or low fat fromage frais in recipes that call for cream.
- Enhance the flavour of food by using herbs, spices, pepper, lemon juice, vinegar, mustard or ginger rather than salt.

FH is a genetic problem and can be passed from parent to child

Familial Hypercholesterolaemia

Familial Hypercholesterolaemia (FH) occurs in about one person in 500 and is one of the most frequently occurring inherited conditions. It is caused by an abnormal gene resulting in exceptionally high cholesterol levels, usually between 8 and 12 mmol/l but can be as high as 20 mmol/l. Triglycerides are generally not increased or, if they are, only moderately. High cholesterol levels start from birth and are present throughout life. People with FH are at high risk of early CHD.

More than 120,000 people in Britain have the problem, a similar number to those who need insulin to control their diabetes. However, unlike that type of diabetes, many people with FH go undetected with tragic consequences. People with FH may be disabled or die from CHD early in life, often in their 40's or 50's, sometimes earlier.

Family matters

FH is a genetic problem and can be passed from parent to child. Each family member has an even chance of inheriting the problem (like tossing a coin), so there may be relatives in the same family with the identical disorder. Whenever FH is diagnosed, it is essential that all close relatives have their cholesterol levels measured so they too can start preventive treatments.

Symptoms of FH

As well as a very high cholesterol level and a strong family history of CHD, FH can sometimes be recognised by outward signs, 'lumps and bumps', which need the expert eye of a doctor for accurate diagnosis. Not everyone with FH has these signs. They may result from cholesterol deposited in the tendons at the back of the hands overlying the knuckles and in the Achilles tendon at the back of the ankles. The resulting swellings are called tendon xanthomata (pronounced zan-tho-mata).

Cholesterol may also be deposited in the skin around the eye or eye lid. These deposits are usually yellow and are called xanthelasmas (pronounced zan-thel-as-mas). Another visible sign often seen in people with FH is a pale or white ring around the outside of the iris, the coloured part of the eye. The ring is called corneal arcus. Only tendon xanthomata are specific for FH. Xanthelasmas and corneal arcus can occur for other reasons as we get older.



Closeup on Familial Hypercholesterolaemia

External signs and what to look for

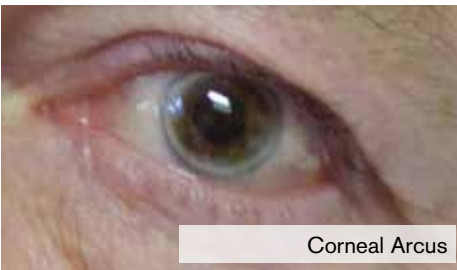
Corneal Arcus and **Xanthelasmas** may be present in people without FH

Corneal Arcus is common in older people but rare in those below 50 years

Xanthelasmas can occur at any age, and do not usually disappear following a reduction in the cholesterol level. In some cases they can be removed surgically

Tendon Xanthomata do not usually occur in people without FH

When the cholesterol level is reduced, the **Tendon Xanthomata** may have a corresponding reduction in size



Corneal Arcus



Achilles Tendon Xanthoma



Xanthoma on back of hand



Xanthelasmas

Photographs reproduced with kind permission of Dr Stephanie Matthews & Dr Michael Feher.

Our children

Testing of FH in children

A diet low in total and saturated fat can be followed by children over two years of age, provided there are sufficient calories and nutrients to support normal growth. Parents may wish to seek guidance from a dietitian experienced in lipid management. While opinions differ regarding the treatment of FH in children, it is recognised that they will be in a position to benefit early in adult life if their FH is diagnosed in childhood. Lipid-lowering drugs should only be prescribed by a specialist clinic.

Children should be encouraged to exercise regularly – up to five times a week in sessions lasting about 30 minutes. Smoking should be avoided at all costs.

Treatment of FH

Diet is an important element of the treatment and management of FH, although medication is generally also necessary at some stage. There are numerous cholesterol-lowering drugs available on prescription that are effective in treating the condition. It is important to maintain a heart-healthy diet even when prescribed medication as the two complement one another.

Sterols and stanols, which are available in food products like margarine spreads and yoghurts, work by blocking cholesterol absorption and thus reducing cholesterol levels.

Apheresis is a treatment similar to kidney dialysis whereby the patient is connected to a machine that removes LDL cholesterol (the bad cholesterol) from the patient's blood. After the LDL cholesterol is removed from the blood, the blood is returned to the patient. The process takes about 3 hours and has to be repeated at fortnightly intervals.

It is important to identify FH in childhood, particularly in families in which CHD is occurring early in adult life. Children should be tested before age ten, but generally not before the age of two years

In very extreme cases, complete or partial liver transplantation can be undertaken. The procedure is extremely difficult and the long term effect of the anti rejection drugs, such as cyclosporine, can shorten life expectancy.

Gene therapy is currently being investigated and explored for treatment of FH. Early trials have not been successful but there is hope that future procedures will succeed.

Familial Combined Hyperlipidaemia

Familial Combined Hyperlipidaemia (FCH) is another inherited disorder of cholesterol. It is characterised by having a high triglyceride level as well as a high cholesterol level. This condition is not as well understood as FH, but is also associated with premature coronary heart disease. The elevated blood fats may not be present in childhood and may not appear until the 20s or 30s. Tendon deposits are not present in FCH, and cholesterol levels tend to be not quite as high as in FH. Treatment generally consists of healthy lifestyle practices and medication as discussed above.

Drug treatment

Drug treatment is generally reserved for people at high risk of CHD for whom diet and lifestyle measures have failed to reduce blood lipids to acceptable levels. This will include many people with FH and most individuals who have already developed CHD. Increasingly other groups of people, particularly those who combine more than one risk factor, such as diabetes, are also being treated with lipid-lowering drugs. The following are the more commonly prescribed classes of drugs for treating disordered lipids:

Statins

Statins come in tablet form and work by slowing down the production of cholesterol in the liver which is where most of the body's cholesterol is made. Statins are thoroughly tested and very effective at lowering cholesterol, LDL in particular. They are generally well tolerated and, most reassuringly, have been shown to extend life by preventing CHD. If generalised muscle aches occur, this should be reported to the doctor, although it is rare for statins to be the cause of muscle inflammation. Statins should not be used to treat people with liver disease, and they are generally not used in pregnant women or women who might become pregnant.

If taking cholesterol-lowering drugs as well as other medicines, it is important to discuss this with the doctor. Doses of other drugs, such as anticoagulants like warfarin, may need to be adjusted, particularly if a fibrate is prescribed.

Fibrates

Fibrates come in tablet form and are useful when both triglycerides and cholesterol are raised. Fibrates are well tolerated but should not be used during pregnancy or by individuals with liver or kidney disease.

Resins

Resins come in powder form and are taken by mixing with water, fizzy drinks, fruit juice or yoghurt. Resins prevent re-absorption of bile salts in the intestine which means that more cholesterol is used up in replacing them. Resins are safe for children because they are not absorbed into the body, although extra folic acid is recommended. Many people may experience side effects, such as flatulence and constipation, which limits the usefulness of resins.

Omega-3 fish oils

Fish oils (1-4g daily) reduce plasma triglyceride by reducing VLDL production in the liver (see page 16). Eating three portions of oily fish per week can provide the recommended amount to help prevent heart disease but, if you prefer, fish oil capsules (1g) daily can provide an alternative source.

Selective cholesterol absorption inhibitors

These drugs block absorption of dietary and biliary cholesterol in the gut. They work specifically at the brush border of the small intestine. They can help to reduce cholesterol levels by up to 18%. However, when they are combined with a low dose statin drug they can greatly enhance the cholesterol lowering effect.

Nicotinic acid

The major effect of nicotinic acid is to inhibit fatty acid release from fat cells in the body. This reduces the production of VLDL in the liver which results in reductions of IDL and LDL. There is a subsequent rise in HDL cholesterol. Flushing can be an irritating side effect – although recent dose titration packs are supposed to alleviate this problem.

Useful terms

and understanding them

Lipid is a term often used when referring to blood fats, such as cholesterol and triglycerides.

Lipoproteins contain protein bound to lipids. They transport cholesterol and triglycerides throughout the body. There are four main groups, described below.

Chylomicrons are the largest of the lipoproteins and are formed from fat and cholesterol in the diet. They are the main form in which triglycerides are carried from the intestine to the body's tissues, where they are used for energy.

Very Low Density Lipoproteins (VLDL) are produced mainly in the liver. VLDLs are converted to low density lipoproteins by the removal of triglycerides.

Low Density Lipoproteins (LDL) transport cholesterol from the liver to the tissues. More than 70% of cholesterol in the bloodstream is in this form. LDL cholesterol is commonly known as 'bad' cholesterol as it may be deposited in the arteries and veins. An increase in LDL is associated with an increase in the risk of coronary heart disease (CHD).

High Density Lipoproteins (HDL) transport excess cholesterol from the tissues back to the liver for removal from the body. This is important for the disposal of cholesterol as the peripheral tissues are incapable of breaking down cholesterol. HDL is commonly known as 'good' cholesterol, due to its role in transporting cholesterol away from the arteries to the liver for excretion. Increased levels of HDL are associated with a decrease in the level of risk of CHD.

Lipoprotein (a) or Lp(a) is similar in structure to LDL but also contains a potential clotting factor. A high concentration of Lp(a) is often inherited and particularly high levels are associated with an increased risk of CHD.

Complete Lipid Profile is a blood test performed by a GP or hospital specialist which measures a person's total cholesterol, LDL cholesterol, HDL cholesterol and triglyceride levels. A complete lipid profile can help to determine one's CHD risk and thus whether treatment is required. This test is especially important for people who have other risk factors for CHD or who already have CHD (angina or heart attack).

Helping H·E·A·R·T UK

What more can you do?

You can really make a positive difference to your own well being and to the future of H·E·A·R·T UK. Please help by joining H·E·A·R·T UK – for just £12 per year you will receive H·E·A·R·T UK's Digest every quarter – the magazine that keeps healthcare professionals and the public right up to date on coronary heart disease, with particular regard to cholesterol!

You could help H·E·A·R·T UK continue its important work and research on helping to prevent heart disease and increase awareness of the condition amongst the public by donating directly to H·E·A·R·T UK, fundraising or leaving a legacy.

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THE CHOLESTEROL CHARITY

