

Heart disease is largely due to poor nutrition and lifestyle

A diet low in flavonoids leaves arteries constricted and inflamed (also known as endothelial dysfunction), leading to hypertension and coronary artery disease

Without Vitamin C the body can't repair the inflammatory lesions in the arteries which are involved at the start of heart disease

Without other anti-oxidants, LDL, the 'bad' cholesterol, is oxidised causing further damage to the arteries

Without B vitamins, another major risk factor, homocysteine levels, increase

A bad diet and too little exercise reduces HDL, the 'good' cholesterol which is protective

Poor food storage and cooking techniques can produce oxidised compounds which damage arteries further

A micro-nutrient programme which addresses all these factors should give 90%+ protection

Chapter 14

Heart of the matter

In the West, heart disease is the number one killer. In some other countries, however, coronary artery disease is almost unknown.

Why should this be so? It's now possible to say not only what causes it, but, more importantly, what will prevent it – and even reverse it.

This chapter outlines the lifestyle and diet which should, I believe, render you immune to heart disease.

Factors beyond your control

Let's start with those things you cannot change. There are not many, which shows just how much lies in your own hands.

Genetics

Apolipoprotein E is a molecule found in the blood. Which type you have is genetically determined. Apolipoprotein E4 contributes to increased blood cholesterol levels. More Finns have E4 than do Japanese, which may be one reason why the Finns have more heart disease. The E4 gene increases the risk of coronary artery disease (CAD), but by how much is not yet known^(1, 2).

Low birth weight

Generally this is caused by foetal malnutrition, which in turn is caused by maternal malnutrition in the three to six months before conception and during pregnancy.

Low birth weight has been shown to increase the risk of hypertension, diabetes, obesity and CAD in later life⁽³⁾.

Sex and age

Overall, men are about three times more likely to develop heart disease than women. Women's relative immunity may be due to their sex hormones, which are anti-oxidants and protect the blood vessels^(50, 105). This would explain why women are more at risk after the menopause. By age 80, the risk is the same for both sexes⁽⁴⁾. In the UK (one of the highest risk countries), CAD caused 170,000 deaths in 1992; killing 1 in 3 men, and 1 in 4 women⁽⁵⁾.

Factors which you can change

OVERWEIGHT – avoid

A body mass index (see table on page 170) greater than 25 increases the risk of CAD nearly three times⁽⁶⁾. However, this statistic conceals more than it reveals; because the degree of risk associated with overweight depends on how you get there. Piling on the pounds on a diet rich in saturated fats and low in anti-oxidants (the British diet) is a recipe for CAD. Getting fat on a diet rich in anti-oxidants and mono-unsaturates such as olive oil, is probably not a risk – as the Mediterranean figures show⁽²¹²⁾.

SMOKING – stop

Men who smoke more than 20 cigarettes daily increase the risk of dying from a heart attack three-fold. Women who combine smoking with oral contraception increase their risk of a heart attack and/or a stroke by ten times⁽⁸⁾.

Body shape

The 'apple-shaped' overweight – those fat around the waist and abdomen – are more at risk than the pear-shaped, whose fat has accumulated around the buttocks and thighs⁽¹⁷⁾.

Not by E alone

Recent intervention trials have shown that Vitamin E used alone is ineffective in reducing risk; but when combined with Vitamin C, disease progression is significantly slowed⁽²¹³⁾ – in Finns, who have a high selenium and flavonoid diet.

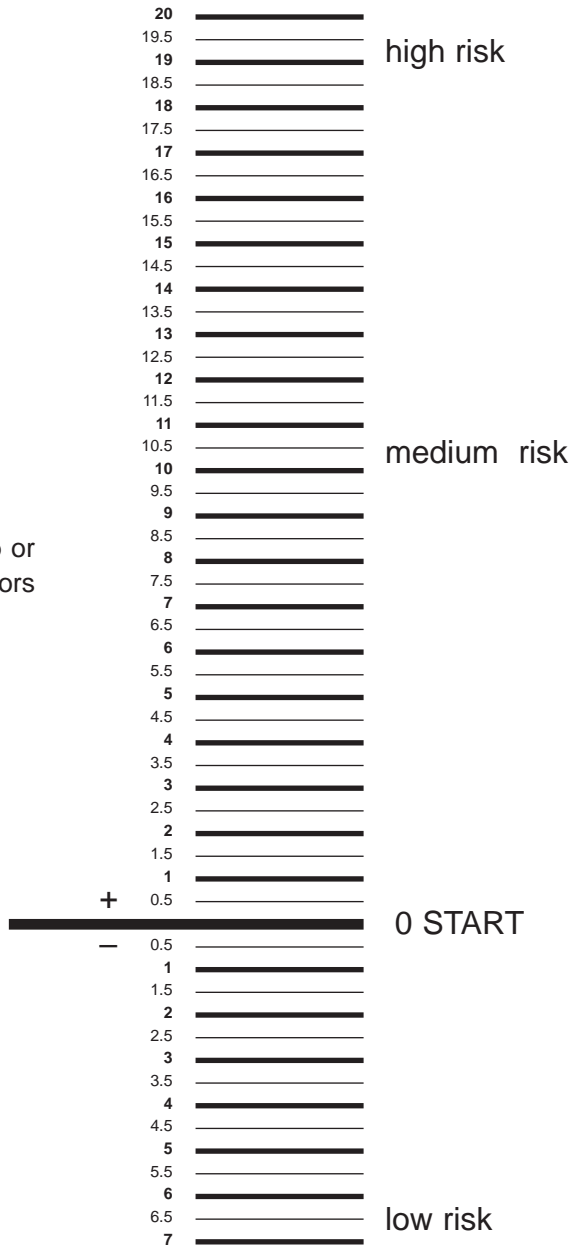
It's never too late!

Within a year of stopping smoking, the risk of a fatal heart attack drops by about half. After three smoke-free years, the risk falls to that of a non-smoker^(9, 185).

A reduction in the risk of lung cancer takes about three times longer.

What's your risk?

Start on the rung indicated and climb or descend rungs according to the factors listed opposite which apply to you.



Sex

Male: +1

Post-menopausal female: +1

Age

Men over 50: +1

Women over 60: +1

Birth weight

If significantly low: +1.5

Genetics

If more than one member of your immediate family has or had CAD: +1.5

Weight

If overweight: +0.5

If obese: +2

Smoking

More than five cigarettes a day: +1

More than 20: +2

Smoke and take the Pill: +4

Diet

Rich in oily fish: -3

Rich in anti-oxidants (fruit and veg): -3

Eat a lot of processed food: +2

Drink alcohol in moderation (especially red wine): -1

Drink excessively: +1

Eat a lot of sweet and starchy foods: +2

Exercise

Exercise vigorously for 20 minutes, 3 times a week or more: -1
60 minutes every day -3

Cholesterol levels

Men – cholesterol 5.5-7mmol: +1

Men – cholesterol over 7mmol: +2

Women – raised triglycerides: +1

Blood pressure

If diastolic blood pressure more than 92 mm Hg: +2

Diabetes

If poorly controlled (HbA1C > 7.5%) see pages 226-227: +3

Each additional 1% increase in HbA1C: +1

Heart disease

If you have had angina or a heart attack: +2

Chlamydia or Helicobacter pylori infection

If positive: +0.5

Personality type

Type A: +1 (aggressive, ambitious, quick to anger)

Type B: -1 (calm, even-tempered, philosophical)

Chronic gum disease +1.

DIETS WHICH FIGHT DISEASE : Heart disease

Vitamin E for better recovery

If you do have a heart attack, Vitamin E supplementers will probably suffer less damage to the heart muscle⁽¹¹²⁾ – and are likely to make a better recovery. Remember to add Vitamin C!

95% reduced risk micro-nutrient programmes

One paper suggested that Vitamin E taken at 400-800IU a day would save \$578 million a year in US healthcare bills⁽¹⁸⁸⁾.

In fact Vitamin E on its own is not effective; but if used as one element in an integrated micro-nutrient programme, most heart attacks could be avoided (see box on page 240).

MICRO-NUTRIENT SUPPORT PROGRAMMES – take them

Many studies indicate that a high intake of micro-nutrients is protective, but while anti-oxidants and B vitamins confer some benefits^(10,11,181,182,213), optimal cardiovascular protection also requires flavonoids and isoflavones^(16, 203, 204), Omega 3 fatty acids, lutein, lycopene and Q10^(12-14, 185), selenium^(15, 183), and other food-derived compounds.

For example, a low intake of selenium is associated with an increased risk of CAD⁽¹⁸³⁾ and may even double it⁽¹⁵⁾. Phenolic anti-oxidants, such as those in black grapes and hence red wine, relax the coronary arteries⁽²⁰³⁾, raise HDL cholesterol, reduce platelet stickiness and confer considerable cardio-protection⁽¹⁶⁾. An oligo-proanthocyanidin (OPC) complex like grapeseed, pycnogenol or bilberry extract or isoflavones from soy⁽²⁰⁴⁾ is also effective – see Chapter 6, Flavonoids & isoflavones.

GLYCEMIC LOAD – reduce it

When sweet and starchy foods are digested, they pour glucose into your blood stream. The total amount of glucose delivered by your diet (the 'Glycemic Load') is about ten times higher today than the diet we were designed to eat⁽²³⁹⁾. This huge excess of glucose damages ('glycosylates') proteins in the blood and the blood vessels, contributing to cataract and arterial damage. It also damages insulin, rendering it ineffective⁽²⁴⁰⁾ and causing insulin resistance, the core of Type 2 diabetes.

As many diabetics know, the degree of protein damage is measured as glycosylated haemoglobin (HbA1C). 'Normal' levels of HbA1C today are around 4%. Recent work at Cambridge shows that as HbA1C rises, each additional 1% confers up to an additional 20% increase in risk of cardiovascular and other complications⁽²⁴¹⁾.

OILY FISH – eat more

A recent Welsh study found that oily fish (salmon, herring, mackerel etc) eaten twice weekly resulted in significantly fewer deaths in middle-aged men who had already had a heart attack. The effect of eating fish became apparent after as little as six

months. After two years on the diet, total mortality was 29 per cent lower in the fish eaters^(17, 164).

Fish oil reduces clotting and cardiac arrhythmias⁽¹⁷⁾. It reduces plasma triglyceride and LDL and increases production of HDL. In addition, it can lower blood pressure (slightly)⁽²⁰²⁾. Sadly, in the light of the obvious health benefits of fish, only a fraction of the Western population actually eat enough of this healthy food.

TRANS-FATS – avoid

Trans-fats are the chemically modified (hydrogenated) fats widely used in processed foods. Higher intakes of trans-fats increase levels of LDL cholesterol (the ‘bad’ cholesterol), and decrease HDL (the ‘good’) cholesterol⁽¹⁸⁾.

This helps to explain why epidemiological studies show that an increased consumption of trans-fats from hydrogenated vegetable oils is linked to an up to 66 per cent increase in the risk of CAD⁽¹⁹⁻²¹⁾.

EXERCISE – do it

Exercise reduces LDL (the ‘bad’ cholesterol), raises HDL (the ‘good’ cholesterol, see Chapter 16, Diabetes) lowers the blood pressure, and makes the blood less likely to clot. Twenty minutes of exercise three times a week is reckoned to reduce the risk of CAD by up to 50 per cent⁽⁵⁾: Health Canada’s recommended 60 minutes a day should do more.

ALCOHOL – in moderation

Alcohol consumption in excess of 21 units per week (men) and 14 units (women) is reckoned to increase the risk of hypertension and obesity – leading in turn to an increased risk of CAD. Moderate consumption, however, and particularly if it’s red wine, is cardio-protective^(31, 32).

B VITAMINS (INCLUDING BETAINE) – supplement

Supplementing with B vitamins and/or betaine reduces levels of the toxic metabolite homocysteine – which could, in turn, reduce your risk by up to 50 per cent^(143, 184).

Varying your cholesterol levels

LDL cholesterol levels can be reduced by exercise or by consuming soy protein, citrus juice or a pre-biotic (see Chapter 7, Pre-biotic fibre).

Red yeast rice extract may have even more to offer. A dietary staple in Asian countries⁽²²⁵⁾, this reduces LDL cholesterol **and** triglycerides, and calms inflamed arteries – a highly cardio-protective response^(225-228, 243-245).

Finally, monoterpenes – these are a group of pungent compounds such as menthol, which gives mint its characteristic taste. 200mg of menthol a day, possibly combined with pinene (from pine needles), has the remarkable effect of raising the ‘good’ cholesterol by up to 40%^(168-170, 172, 173, 195) – which is very cardio-protective indeed.

Factors to check with your doctor

Blood cholesterol

As a rough guide, levels below 5.5 mmol are considered to be low risk. Levels between 5.5-7mmol denote a moderate increase in risk, and over 7 mmol is a zone of steeply increasing risk⁽¹⁵⁹⁻¹⁶¹⁾.

HOWEVER: the above relates mostly to men. In women, cholesterol levels are not an important risk factor – raised triglycerides and low HDL are thought to be more important⁽³³⁾. Very high triglycerides increase the risk of CAD by up to five times^(22, 23).

This means that a very low fat diet may not be the answer for women. Even in men, low fat diets don't bring cholesterol down by very much⁽²⁴⁾, although certain foods will. A more productive approach may be to raise levels of HDL, by de-stressing⁽²⁶⁾, exercise⁽⁵⁾, lecithin or betaine; HRT⁽²⁵⁾ or menthol⁽¹⁶⁸⁻¹⁷⁰⁾.

Blood pressure

High blood pressure exacerbates any damage to the artery walls, making it more likely that atheroma will form. The MRFIT trial showed that in men with diastolic pressure over 92mm Hg, death from CAD doubled⁽²⁷⁾. High blood pressure is usually a sign of inflamed arteries, which are very prone to atheroma. Switching from salt to a low sodium seasoning can lower blood pressure by 10mm Hg⁽²⁰⁰⁾; adding flavonoids will damp the inflammation and rejuvenate the circulatory system^(43, 216, 217).

Blood sugar control

Diets with excessive glycemic load damage proteins in the body, measured in the blood as HbA1C. If your HbA1C is over 6%, cut back on sweet and starchy foods, and take flavonoids, nature's anti-glycosylants. (See Chapter 16).

Chronic infection

Chronic infections release inflammatory chemicals into the bloodstream, promoting inflammation in the vessel walls. Chlamydia is under suspicion⁽²⁸⁻²⁹⁾; as are H pylori, C pneumoniae and the bacteria that cause gum disease.

Vitamin C and flavonoids

Without Vitamin C and flavonoids, the tiny lesions in the arteries cannot be repaired.

Serious C deficiency (scurvy), now rare, causes bruising and bleeding as the blood vessels spring a leak.

Milder but chronic C plus flavonoid deficiency is far more common. It doesn't cause gross bleeding, but in the long term it is just as lethal, because it allows heart disease to get started by damaging the extra-cellular matrix in blood vessel walls causing a local inflammation.

At these sites red blood cells may break down more easily – releasing iron which causes additional inflammation.

INFLAMED ARTERIES: QED

When doctors first examined atheroma in affected arteries, they found it contained cholesterol. Assuming this came from cholesterol in the blood – ultimately, from the diet – they invented the low-cholesterol/low-fat ‘healthy heart’ diets.

In fact, cholesterol levels are a remarkably poor indicator of risk, as half of all heart attacks occur in subjects with normal cholesterol. The cholesterol hypothesis is now regarded as simplistic, and merely a small part in a more complex model, termed ‘Endothelial Dysfunction’ (ED).

ED is a sub-clinical, chronic inflammation of the arteries. It is worsened by smoking, a high-fat, anti-oxidant-poor diet, and homocysteine; and improved by high intakes of flavonoids ^(37, 42, 43, 216-224). Inflamed arteries are prone to atheroma, and resistant to dilators. This is why ED leads to heart disease and hypertension, and why these conditions are linked.

How heart disease develops

One of the unsung successes in the field of CAD has been the recent and substantial progress in understanding how atheroma develops. Along with this understanding has come a new idea of atheroma. It is seen no longer as an irreversible endpoint, but a dynamic entity which is constantly being built up and worn away; an entity, therefore, which can be treated by encouraging the body’s own artery clearing systems.

These new ideas have freed us from our fixation with surgery and drugs, and have laid the ground for a far-reaching nutritional approach which offers the hope of achieving, even in old age, a young heart and blood vessels.

So just how does coronary artery disease start, and how does it end? There are a number of links in the chain which culminate in a heart attack, but according to the evidence we have, one starting point is a tiny lesion in the inner lining of an artery; triggered in most cases by flavonoid depletion.

Arteries experience considerable physical stresses as blood is pumped through them, and are also exposed to toxins formed in the body in our diet⁽³⁷⁾. The artery linings are continually being damaged and repaired. If damage and repair are in balance, or if repair mechanisms are impaired (ie insufficient Vitamin C or flavonoids), arterial damage, inflammation and constriction

Vitamin K

Oxidation in arterial walls causes the local (oxidative) destruction of Vitamin K. Oxidation in inflamed arterial walls destroys local Vitamin K; and as K2 is essential for preventing unwanted calcification ^(205, 206), this leads to calcification (hardening) of the arteries. K2 supplements prevent this⁽²²⁹⁻²³¹⁾.

Many heart patients are given warfarin, an anti-K drug! It prevents blood clots, but probably makes arterial calcification worse. Flavonoids (anti-platelet and anti-inflammatory agents) **plus** K2 would be far more logical – and effective⁽²³²⁻²³⁴⁾.

DIETS WHICH FIGHT DISEASE : Heart disease

B vitamins can cut heart attack risk by 50%

High levels of an amino acid called homocysteine increase the risk of heart attacks.

Folic acid, B6 and B12 work together to lower homocysteine. People with the highest levels of B vitamins (especially folic acid) have a 50% lower risk of heart attack – according to a study published in 1995 in the New England Journal of Medicine⁽⁹⁴⁾.

It's possible to test your homocysteine levels.

If it's above 14 micromoles per litre (14mm/l) for men and 8.5mm/l for women, you should take a B vitamin supplement.

Not everyone responds to B vitamins, so betaine should always be added to the micro-nutrient programme (see Chapter 11, Betaine).

ensue. This condition, known as endothelial dysfunction, is considered to be the root of both atheroma and hypertension.

If the body cannot repair the arteries properly it puts a temporary 'sticking plaster' over the damage called apolipoprotein B – an extremely 'sticky' molecule. This solves the immediate problem, but it's not physically strong and it leaves the artery wall rough, with a tendency to promote thrombosis (blood clots).

This is when atheroma can start to form. Turbulence in the blood stream breaks up older red blood cells, releasing free iron – a powerful oxidant. The iron oxidises the cholesterol on the apolipoprotein 'sticking plaster', and produces Cholesterol Oxidation Products, or COPs^(155, 190). These are extremely toxic to arteries, and tear micro-holes in the lining of the artery – which attract more apolipoprotein, and more cholesterol^(34, 37).

The tiny lesions draw in white blood cells which oxidise the COPs still further before dying off⁽¹⁹¹⁾. As they die, they create more

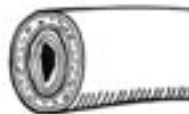
THE STEPS IN HEART DISEASE



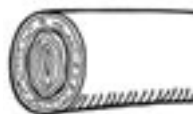
1 Normal artery.



2 Minimal atheroma. Cholesterol builds up in the walls of the artery.



3 Advanced atheroma. The diameter of the artery becomes smaller and blood flow is restricted. Calcium deposits make the arteries 'harder'.



4 Severe atheroma. Blood clots can form and cause a complete blockage which may stop the heart beating.

inflammation and tissue breakdown⁽⁴³⁾. This releases yet more iron into the site⁽⁴²⁾, attracts more apolipoprotein, more cholesterol, and more white cells, which turn into foam cells⁽¹⁹¹⁾.

It is a vicious circle leading to yet more local oxidation, inflammation, and tissue destruction⁽⁴³⁾. In other words, CAD can be thought of as a chronic inflammatory disease, rather like arthritis^(37,42,43,131,165).

At this point we have to step back from the artery wall and look at events in the bloodstream.

Cholesterol vs anti-oxidants

All this time, LDL cholesterol has been circulating in the blood. If protected by fat-soluble anti-oxidants like Vitamin E, Q10 or lycopene, it remains in the circulation, and is delivered only where required.

But if it is oxidised, it is taken up by white blood cells which migrate into damaged sites, attracted by the inflammation building up there. This additional source of COPs (Cholesterol Oxidation Products) makes the situation even worse.

As the inflammation builds, oxidation increases to the point where the immune cells break down, forming a thick, oxidising, gruel in the artery wall.

The atheroma grows and muscle cells in the artery wall multiply in a last gasp attempt to prevent a blow-out. The space through which the blood can travel steadily shrinks.

At the same time, the oxidative stress slows production of EDRF, a substance which normally relaxes the arteries⁽¹³¹⁾. This makes the arteries constrict, and encourages blood clot formation.

Angina may be an early warning, but if a blood clot forms on the atheroma site, the first symptom may well be the last – a fatal heart attack.

Keep cool

High temperature cooking produces advanced glycation end-products ('AGEs'), toxins which inflame arteries⁽²⁴²⁾. Cook cooler for longer to produce safer foods.

HDL cholesterol

HDL cholesterol may be our protection against COPs and LOPs. It not only carries anti-oxidant vitamins⁽⁴⁹⁾, but also the specialised anti-oxidant enzyme paraoxonase, which may play a key role in detoxifying the artery-damaging COPs and LOPs⁽¹⁴⁵⁻¹⁴⁷⁾.

You can raise your HDL levels with exercise and betaine – another reason to take this valuable supplement.

ARTERY WEAK POINTS

All arteries are stressed by changes in blood pressure as the heart beats, but some sites are more prone to atheroma than others. The coronary arteries are subject to physical stresses caused by the abrupt changes in blood pressure as the heart beats. But looking at just where atheroma forms reveals that some sites are more at risk than others.

The coronary arteries are subject to additional physical stresses as they are squeezed flat by the heart muscle every time it contracts.

The other high risk sites are where turbulence occurs – at arterial junctions, where an artery divides.

Towards a unified theory of CAD

There are many links in the chain of events which culminates in a heart attack. There are also various defence mechanisms. It is the balance between the forces of decay and regeneration which determines whether atheroma builds, leading to a heart attack – or shrinks, leading to a renewal of the arteries.

One of the most important regenerative factors is HDL. HDL is the 'good' cholesterol, and its function is to remove cholesterol from the atheroma site and take it to the liver where it can be metabolised into, among other things, bile salts.

HDL cholesterol not only contains anti-oxidants⁽⁴⁹⁾ but also carries a rather specialised enzyme, paraoxonase, which may be involved in detoxifying the artery-damaging COPs and LOPs⁽¹⁴⁵⁻¹⁴⁷⁾.

In addition to HDL, there is a wide range of cardio-protective anti-oxidants in our diet.

Risk factors

- Smoking⁽⁸⁾ – this causes chronic mild Vitamin C deficiency. It also reduces plasma anti-oxidants such as E and lycopene, and increases the rate of LDL oxidation.
- Hypertension⁽⁹⁾ (high blood pressure) increases stresses on the blood vessel walls and increases the number of damage sites on the arteries.

- Diabetes⁽¹⁰⁾ – the blood vessels are more vulnerable to micro-damage and anti-oxidants are depleted.
- Lack of exercise⁽¹¹⁾ not only leads to a fall in HDL levels, it also makes the blood more likely to clot.
- Saturated fats⁽¹²⁾ – a diet high in saturated fat produces LDL cholesterol which is harder to oxidise: but it increases the rate at which inflammation develops in the artery walls; and it also tends to be low in anti-oxidants.
- Living in the developed West⁽¹³⁾ – where people have a relatively poor anti-oxidant status and excessive cholesterol levels. If there aren't many anti-oxidant molecules in the blood then, as cholesterol levels increase, more of it will be unprotected and hence prone to oxidation, forming COPs. These, and ...
- ... Excessive homocysteine – damage the blood vessel walls.

Protective factors

- HDL^(3,4,5)
- Anti-oxidants⁽¹⁵⁾
- B vitamins or betaine
- Exercise
- Omega 3
- Vitamin K
- Flavonoids

Fat fit for a heart attack

There are two more major components in the risk equation – and both have to do with the fats we eat in our diet.

Trans-fats (which are labelled in margarines and processed foods as either vegetable fat, or hydrogenated vegetable oil), appear to be a substantial risk factor for CAD⁽³⁵⁾ and diabetes⁽³⁴⁾.

They lead to an increase in LDL cholesterol, but they also interfere with the body's ability to metabolise poly-unsaturated oils (PUFAs) such as fish oil, and vegetable oils^(34, 36). They can make a PUFA depletion worse, leading to an increased susceptibility to inflammation in the artery walls and elsewhere. Trans-fats should be avoided, and are being phased out in some countries such as Sweden.

The other major sources of danger in our diet are COPs and LOPs. These – you may remember from Chapter 8, Essential oils – are Cholesterol and Lipid Oxidation Products respectively; and are produced by inappropriate food storage and cooking practices. Because they are formed outside the body and then consumed, anti-oxidants cannot protect you against them. (The flavonoid quercetin⁽¹⁸⁰⁾ or high doses of Vitamin B6 may be protective⁽¹⁴⁸⁾, but this is by no means proven.)

But that's just the start of a healthy eating programme ...

The Hearty Eating Diet

Oily fish

Oily fish (or fish oil) has a marked protective effect – so eat more herring, mackerel, sardines, salmon, etc. The effects of fish oil, which reduces inflammation of the arteries, cuts platelet stickiness and lowers triglyceride levels, can reduce the risk of a heart attack by around a third⁽⁵⁵⁻⁶²⁾ (see Chapter 8, Essential oils).

Anti-oxidants

Vitamin E helps to prevent LDL cholesterol oxidation⁽¹⁵⁴⁾. It also prevents the accumulation of inflammatory cells that contribute to

Reversing heart disease

The Lancet recently published a study which showed that a combination of Vitamins C and E, together with the B vitamin niacin, put the process of atheroma into reverse, unblocked the affected coronary arteries, and cured the patient's symptoms of angina⁽¹²⁰⁾.

Safe herbs

When cooking hamburger, add rosemary. This will prevent the formation of COPs and LOPs⁽¹³⁷⁻¹³⁹⁾.

Combined defence

The flavonoids also stabilise LDL cholesterol. They are not lipid-soluble, but support the other anti-oxidants in the plasma.

DIETS WHICH FIGHT DISEASE : Heart disease

Lycopene

This carotenoid appears to be very cardio-protective; it lowers LDL and is a good anti-oxidant⁽²⁰⁷⁾.

A high lycopene intake (over 20mg a day) has been linked to a 47% reduction in heart attacks⁽¹⁸⁵⁾.

If CAD already exists ...

In cases of known and advanced CAD, it would be advisable to combine the E, C and Q10 with Omega 3 fish oil, flavonoids and, if you do not have high blood pressure, low dose aspirin.

These agents are highly effective in reducing platelet stickiness and the risk of thrombus formation^(69, 129, 163).



LOOK FOR FIBRE ...

such as a resistant starch supplement at about 8g a day.

tissue damage and atheroma^(104, 197), and is a mild anti-clotting agent^(168, 187, 188), which is why it reduces the risk of stroke.

Vitamin E at this level has been shown to reduce the rate of atheroma growth in patients by two thirds, and halt it altogether when combined with lipid lowering agents⁽⁷⁰⁾. So Vitamin E supplements sound like a good idea, but there's a note of caution. If you don't have enough Vitamin C and Q10, the E can become a pro-oxidant and increase the rate of cholesterol oxidation^(51, 67, 68).

So Vitamins E and C should always be taken together. C not only 'supports' Vitamin E^(51, 52, 153) but it also prevents inflammation of the blood vessels^(163, 178), is essential for their repair, and may help to raise levels of HDL in the bloodstream^(47, 48).

Vitamin C⁽⁵⁴⁾ and the carotenoids^(53, 127, 185) are also linked to a reduced risk of CAD, so add carotenoids to your anti-oxidant mix⁽¹⁵²⁾, starting with lutein, which is an extremely potent anti-oxidant^(63, 64), and lycopene, which appears to be highly cardio-protective⁽¹⁹⁰⁾.

Co-enzyme Q10 may be the most effective LDL protector of them all⁽¹⁶²⁾ (see also Chapter 9, Co-enzyme Q10).

There are approximately 6-8 molecules of Vitamin E per LDL particle, making it the most common anti-oxidant in LDL cholesterol.

Beta carotene is less common – there is only 1 molecule per 2-5 LDL particles. This suggests that it is less important in preventing atheroma and this has been confirmed by recent work⁽⁹³⁾. Q10 is in the middle of the range, with one molecule per 2 LDL particles, rising to 1 per particle after supplementation^(66, 67).

Q10's importance is hinted at by the fact that when LDL is oxidised, Q10 is the first anti-oxidant to be sacrificed. After the Q10 has been used up, the LDL quickly starts to oxidise, even while much of the E is still there, and long before the beta carotene has started to go⁽⁶⁶⁾. In fact, once the Q10 is gone the E is more likely to act as a pro-oxidant^(67, 68, 177). The best results are obtained by combining Q10 with E and C^(68, 208).

Fruit and vegetables

The risk of CAD is considerably reduced by a diet rich in plant

foods. Fruit and vegetables contain hundreds of anti-oxidant compounds, and many also contain compounds which stimulate the body into producing more of its own anti-oxidant enzymes.

Go for fresh, ripe (but not overripe) produce. Levels of anti-oxidants in fruit and vegetables increase as part of the ripening process, as the oxidisable sugar or lipid content of the plant increases⁽⁷¹⁾. Wash but don't discard the outer layers, which are likely to contain the highest concentrations of anti-oxidants (see Chapter 6, Flavonoids & isoflavones).

Walnuts, almonds and hazelnuts contain Omega 6 fatty acids, which lower blood cholesterol, and improve the HDL/LDL cholesterol ratio⁽¹⁰⁷⁾. Onions, kale, broccoli, apples and cherries all contain, amongst other good things, quercetin, a flavonoid which may protect against COPs⁽¹⁸⁰⁾.

Dietary fibre

Eat more artichokes, or oats; alternatively take a resistant starch supplement. Both strategies generate a wide range of cardio-protective effects. They lower post-meal glucose and insulin levels, LDL cholesterol and blood pressure; and can increase HDL cholesterol and levels of B vitamins which keep heart-damaging homocysteine in check (see Chapter 7, Pre-biotic fibre).

Added ingredients

All the anti-oxidants we have discussed so far can be highly effective in protecting LDL from oxidation while it is in the plasma. But they cannot protect it once it has accumulated in the damaged arterial wall⁽⁷²⁾, because they do not enter the arterial wall in significant amounts.

Luckily there is another group of anti-oxidants in food sources which do. They are a group of flavonoids called the oligomeric procyanidins, found in grapeseed and skin, pine bark and tea, green more than black. Red wine is a particularly good source of these compounds.

The Wine List

Some wines have more flavonoids than others. As a rule of thumb, go for the deepest red colour and a good tannic structure.

High: Merlot, Cabernet Sauvignon, Chianti

Intermediate: Rioja, Pinot Noir

Low: Côtes du Rhone, Beaujolais, most rosé wines, whites

Hawthorn

Hawthorn is amazingly cardio-protective. Its procyanidins calm inflammation in the artery walls⁽¹⁷⁴⁾. They also inhibit angiotensin-converting enzyme and relax the blood vessel walls⁽¹⁷⁵⁾.

Finally, hawthorn strengthens the heart beat; unlike any other heart strengthener ('inotrope'), it does not increase the risk of cardiac arrhythmias, but actually protects against them⁽¹⁷⁶⁾.

DIETS WHICH FIGHT DISEASE : Heart disease

Chocolate

Chocolate contains flavonoids which protect LDL cholesterol from oxidation as effectively as red wine⁽⁶⁷⁾.

Green tea, which also contains similar flavonoids, is an acceptable alternative.

Reversing heart disease

The right mix of nutrients should not only effectively immunise you against heart disease, it should also remove atheroma from furred-up arteries if atheroma has already developed.

Red wine

Wine contains a rich mix of cardio-protective nutrients. These include salicylates, which have an anti-platelet effect; and ethanol, which can cause the blood vessels to dilate and give a slight reduction in blood pressure⁽⁷⁷⁾ and may increase levels of 'good' HDL cholesterol.

Red wine also contains a mix of flavonoids that dramatically reduces free radical formation and the risk of thrombosis⁽⁷⁵⁾.

In particular red wine is a major source of the procyanidin flavonoids. They raise HDL cholesterol and inhibit LDL oxidation in the plasma so effectively^(73, 76, 92) that some scientists believe that the habit of drinking a glass or two of red wine with every meal is the main cause of the low rates of CAD in France⁽⁷⁴⁾. But they also get into the lining of the arteries, where they scavenge free iron, protect the extra-cellular matrix⁽¹⁹⁸⁾, prevent further oxidation of cholesterol already in the atheroma^(78-87, 192), reduce local inflammation, and help them open up⁽¹⁹⁹⁾.

Herbalists have known for years that both hawthorn and yarrow, plants exceptionally rich in procyanidins, can be used to treat angina and circulatory problems^(88-91, 174-176, 214).

Hesperidin, the major flavonoid in citrus fruit, also appears to be cardio-protective. Unlike the procyanidins, it doesn't seem to affect blood vessels but drinking a third of a litre of citrus juice a day lowers LDL cholesterol and triglyceride levels. The hesperidin, and perhaps other compounds in the juice, also increases the 'good' HDL cholesterol⁽¹⁵⁶⁾; as does menthol⁽¹⁶⁸⁻¹⁷³⁾.

Amino acids

The amino acids lysine and proline were a favourite of the late Linus Pauling. They are thought to act as a kind of arterial Teflon, stopping apolipoprotein B sticking to the artery wall. Used with high doses of Vitamin C and other anti-oxidants, they have reportedly achieved cures in patients with advanced CAD, relieving the symptoms of angina within a few months.

However, they don't protect the artery walls or prevent oxidation as the flavonoids do. I would only use them at the outset of an anti-atheroma programme, and replace them with the appropriate flavonoids within the first few days of treatment.

B vitamins (see Chapter 11, Betaine)

A recently identified risk factor is hyperhomocystenaemia^(94,102,116,117,126). This means having too much of an amino acid called homocysteine in the blood. Homocysteine is the opposite of an anti-oxidant – it is a pro-oxidant^(103, 150). Excess homocysteine is a significant risk factor^(108, 143,184, 235, 236), but can easily be avoided.

Levels of the amino acid build up if there is a depletion of Vitamins B6, B12 and folic acid in the diet – and deficiencies are very common^(110, 111, 115-119, 133). All you have to do is to take a strong B complex preparation, which reduces levels of homocysteine^(95, 96, 103, 115, 144) and should, by implication, reduce your risk of heart disease too⁽¹⁶⁴⁾. Betaine should be added at 500mg to 1g a day.

HOMOCYSTEINE

Homocysteine not only increases certain clotting factors^(149, 238), but also the synthesis of the artery-toxic COPs and LOPs⁽¹⁵⁰⁾.

The B vitamins are prone to oxidation, which means that if you have a diet low in anti-oxidants or have factors which increase oxidative stress, such as smoking, this will lead to B depletion and elevated homocysteine⁽¹⁵¹⁾ – another connection between poor anti-oxidant status and increased disease risk. Some people cannot metabolise folate⁽¹⁷⁹⁾, so betaine should be added – see Chapter 11, Betaine.

Folate deficiency is also linked to increased DNA damage, and an increased risk of cancer^(130,136).

Folate, B12 and betaine

Low folate levels increase the risk of fatal heart attack by up to 69%⁽¹⁵⁵⁾.

B12 is also critical; but its absorption is impaired by low gastric acid, common in the elderly⁽²³⁷⁾ and another reason why homocysteine levels increase with age.

Enriching basic foods with folate and Vitamin B12 could save thousands of lives^(128, 132). Betaine should always be added – see Chapter 11, Betaine.

Minerals

Sodium and potassium

The modern diet, which contains too much sodium and too little potassium, contributes to the age-related rise in blood pressure so common in the West. It is a major contributory factor to heart attacks and of stroke⁽¹⁹³⁾, particularly in the overweight.

Between 1972 and 1992 the Finns carried out a nationwide experiment, switching en masse from table salt to a mixed potassium and magnesium salt. The national average blood pressure fell dramatically, as did the incidence of heart attacks

DIETS WHICH FIGHT DISEASE : Heart disease

Below the salt

Salt reduction on its own is not very helpful; only 10% of the population are 'salt sensitive'.

Most hypertension is due to endothelial dysfunction, largely caused by flavonoid depletion. Long-term flavonoid programmes will generally normalise blood pressure, unless other pathology is present.

CAD and hypertension ...

begin with endothelial dysfunction. This is basically inflammation and hyper-contractility of the arteries; and is best treated with flavonoids which target the artery linings, reduce inflammation and help the blood vessels to dilate.

A significant number of cases of hypertension are due to excess salt intake; but the steep decline in dietary flavonoids is likely to be an even more important causative factor in both hypertension and coronary artery disease.

(55 per cent in men and 68 per cent in women), and strokes (62 per cent in men and women)^(200, 209-211).

NB The Finnish product is called PanSalt.

TOP POTASSIUM FOODS

Potassium rich foods include:-

Lentils	730mg	1 cup	Banana	450mg	medium
Kidney beans	700mg	1 cup	Avocado	550mg	half
Prune juice	700mg	8oz	Carrot (raw)	232mg	medium
Tomato juice	652mg	6oz	Milk	381mg	8oz
Chick peas	470mg	1 cup	Orange juice	474mg	8oz

Magnesium

Magnesium salts are a major component in hard water, and people who live in areas where the drinking water is 'hard' have a reduced risk of heart disease⁽⁹⁷⁾. Magnesium depletion causes atheroma in animals, and magnesium supplements clean the arteries out again⁽¹⁰⁰⁾. This is thought to be because a depletion leads to an increased free radical synthesis and increased oxidation in the tissues.

The heart is uniquely sensitive to low magnesium levels and magnesium depletion is linked to a high risk of sudden cardiac (arrhythmic) death⁽¹⁰¹⁾.

Magnesium supplements have also been shown to make the platelets less likely to form clots⁽⁹⁸⁾. Although this would have little effect on atheroma formation, it would help to reduce the risk of thrombus formation, the last stage before the heart attack.

Calcium

Calcium intake is probably also important. A high calcium diet appears to lower the blood pressure^(134, 135, 165, 166), which is a good idea in anyone at risk of a heart attack.

Copper

Copper may be involved too. Copper depletion is quite common, and has been linked to an increased risk of heart disease⁽⁹⁹⁾,

possibly because one of the key anti-oxidant enzymes (SOD) depends on copper to work effectively.

Selenium

Selenium depletion is likely to have a similar effect. Veterinarians are familiar with heart problems caused by selenium depletion in cattle and other livestock. Humans are equally susceptible – although it is only in areas with an extremely low intake of selenium, such as Keshan in China, where cause and effect are relatively easy to single out. In the UK, the Scots are particularly likely to be low in this essential trace element.

Aluminium

Aluminium is intrinsically toxic to cells. It also displaces iron from its carrier molecules, and increased free iron could contribute to increased tissue damage in vessel walls. Chronic aluminium exposure is likely, therefore, to be cardio-toxic.

Iron

Some scientists have suggested that too many iron supplements could increase the free radical load, and contribute to heart disease and other illness^(113, 114, 121). This is a difficult issue.

In most cases, and except for gross iron overload (as can happen after multiple blood transfusions, or in a genetic disease called haemochromatosis), most iron absorbed from the gut is safely bound to carrier molecules. Total body iron doesn't seem to be a common risk factor^(106, 109), but when tissue damage such as chronic inflammation leads to the release of free iron, problems are more likely to develop⁽¹²⁵⁾.

However, iron deficiency anaemia is widespread, especially in women. It's a common cause of fatigue and contributor to illness, and iron depletion during pregnancy may damage the brain of the growing foetus⁽¹²³⁾. Iron supplements are therefore generally recommended for women of child-bearing age.

Men and post-menopausal women should be more cautious: there is some evidence that in men with very high iron levels in the blood, the risk of heart disease can be increased by as much

Iron absorption

Iron in the diet or in supplements is best absorbed in the presence of Vitamin C, and meat. Absorption is reduced by phytates (in cereals), by calcium, and by flavonoids which occur in tea, coffee, red wine and some vegetables⁽¹²²⁾.

Avoid iron oxide

Iron oxide is not well absorbed and is a potent generator of free radicals in the gut⁽²¹⁵⁾ – and could therefore increase the risk of gastrointestinal cancer.

It is slightly worrying that many pills and tablets still use iron oxide as a colouring agent, especially when other safer colours are available.

DIETS WHICH FIGHT DISEASE : Heart disease

The new garlic?

Guggulipid seems able to raise HDL and lower LDL – perhaps even better than garlic.



LOOK FOR ...

a daily supplement to reduce heart disease risk that has at least:

- Vitamin E* 100-265mg
- Vitamin C 500mg
- Folic acid 200mcg
- Calcium 100mg
- Magnesium 50mg
- Mixed carotenoids (lutein/lycopene/beta carotene, etc) 20-25mg
- OPC complex 500mg
- Q10 30-60mg
- B vitamins 300% of RDA
- Copper as a chelate 2mg
- Selenium 150mcg
- Betaine 450mg
- Vitamin K 50mcg

*Vitamin E should be either 100mg mixed tocopherols (best) or 265mg natural Vitamin E.

as 100 per cent^(113-114, 121). Men should probably only take iron supplements if there is clear evidence of iron deficiency anaemia.

Herbs

Hawthorn, yarrow and rosemary have already been mentioned, but herbal medicine has more to offer. Garlic is well-known as a cholesterol-lowering agent, and is almost as effective as some cholesterol-lowering drugs.

However, despite being a vital and much-loved element in southern and central European cuisine, many people dislike its pungent odour. If you are one of these, don't despair. There is at least one other herb which is probably more effective, and which has an array of quite well-documented properties which lower the risk of coronary artery disease dramatically.

The oddly named guggulipid (an extract of *Commiphora mukul*) is already marketed in some countries as a lipid lowering agent. And although it does lower cholesterol and triglyceride levels, its more important effect may be to raise HDL (the 'good' cholesterol) by a highly significant 60 per cent^(140, 141), via its phospholipid content. Guggulipid also has anti-clotting properties⁽¹⁴²⁾.

I have not yet been able to obtain safety data on *Commiphora mukul*, but the trial data, and its traditional use in Ayurvedic medicine, suggests that it is probably reasonably safe.

Regime for a healthy heart

The information is all here. By combining these nutritional ingredients, I believe we can reduce the risk of CAD almost to zero.

We can do for coronary artery disease with nutrition what we did to cholera with public sanitation – banish it from the health statistics. And where arteries are already blocked, we can use the nutritional approach to open them again; to regain function, and health.

Levels of heart disease are already falling, because of lifestyle changes. Since 1968, the risk of dying from a heart attack in the USA, Australia and Finland has fallen by half, and in the UK the

risk of heart attacks has dropped almost as dramatically in professional men – who are smoking less, and eating more fruit and vegetables. But smokers, diabetics (see Chapter 16, Diabetes) and those with chronic renal failure^(157, 158), and indeed the rest of the population, remain particularly vulnerable.

If you or someone you love is carrying too many risk factors, why wait to take (or recommend) a nutritional insurance programme? Do it now!

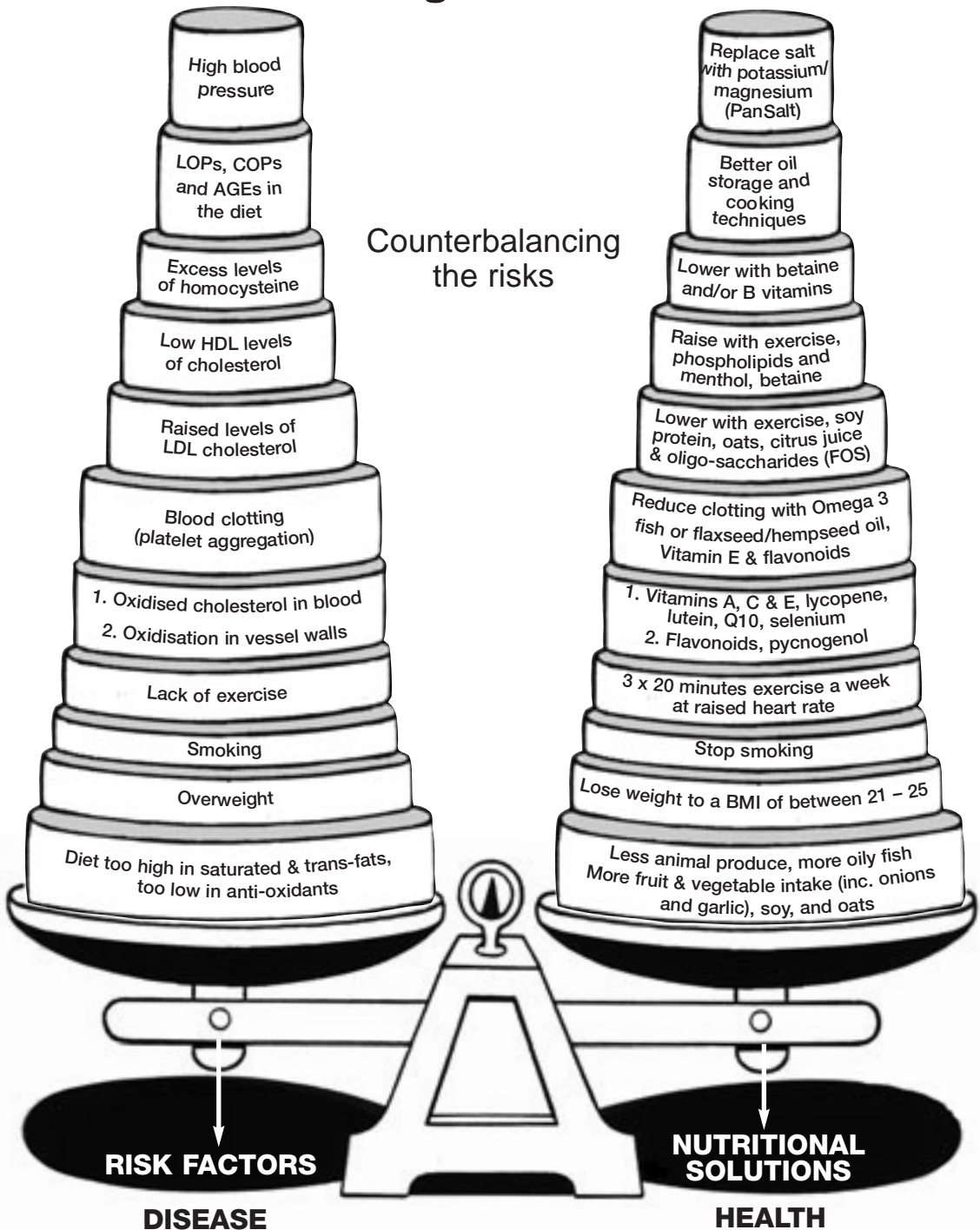
A COMPREHENSIVE CARDIO-PROTECTIVE ACTION PLAN

This should include Vitamin C, Vitamin E, Q10, B vitamins and betaine (to reduce homocysteine formation), calcium, potassium and magnesium (to relax the muscle walls of the arteries), Omega 3 and Omega 6 (in flaxseed oil), and plenty of fruit and vegetables to increase your intake of potassium, flavonoids and carotenoids.

Cut down on fried foods and salt, exercise regularly and don't smoke.

Result: your risk of heart disease should be near zero.

Preventing heart disease



SUMMARY

The healthy heart guide

- Stop smoking.
- Exercise three times a week.
- Gradually lose weight to fit your ideal body mass index. Don't crash diet – rapid weight loss is usually soon regained, and yo-yo dieting may be associated with an increased risk of CAD⁽³⁰⁾.
- Have regular blood pressure and cholesterol checks.
- Eat oily fish twice a week.
- Incorporate plenty of ripe fruit and vegetables into your diet, including the flavonoid-rich plants (see Chapter 6, Flavonoids & isoflavones).
- Drink a third of a litre of citrus juice (orange, grapefruit, etc) a day.
- Cut back on saturated fats and avoid trans-fats in margarines and processed foods. They are usually identified on the label as vegetable fats, and hydrogenated or partly hydrogenated vegetable oils.
- Poly-unsaturated oils are fine for salad dressings, but not for frying.
- Keep margarines and oils in the fridge.
- Use mono-unsaturated oils such as olive or rapeseed oils for cooking.
- Substitute soy products for meat, and red wine for beer.
- Oat-based foods, and most types of bean, can help to reduce blood cholesterol levels; especially when combined with nicotinic acid (Vitamin B3), a supplement available in health food shops.
- Take Vitamins C and E, Q10, lutein, lycopene, B vitamins or betaine. Take Vitamin K in spinach, kale or broccoli.
- Top up with magnesium, calcium, copper and selenium.
- If you have hypertension, switch from table salt to a magnesium/potassium salt mix, such as PanSalt. It tastes identical, but gradually lowers your blood pressure.
- For additional benefits, take high dose flavonoids such as green tea or berry flavonoids. These reduce inflammation in artery walls, and help them to relax.
- Cut back on sweet and starchy foods: potatoes, white bread, cake and biscuits.