

The surge in heart disease, asthma and arthritis is partly due to the unbalanced mix of fats in the modern diet

Trans-fats in processed foods may cause more heart disease than saturated fats

Natural polyunsaturates in fish, nuts and grains are essential to health – too few increases the risk of heart disease, arthritis, sterility and senility

High-dose PUFAs (in refined oils) are not recommended. Unless accompanied by anti-oxidants, they form toxic breakdown products in the body

Until Westernisation, Eskimos were practically immune to heart disease – thanks to the fish they ate

Oily fish like salmon, herring, mackerel and tuna contain valuable Omega 3 oils, which keep arteries healthy, lower damaging cholesterol and reduce the risk of clots

Large doses of Omega 3 can cut the risk of a heart attack by 30 per cent

Chapter 8

Essential Fatty Acids – the facts about fat

For years we have been tyrannised by food fads dressed up as science. The idea that fat is dangerous, for example, has created an entire low-fat industry, a generation of low-fat gurus, and a rash of low-fat, low-brow books.

We were told that saturated fats cause heart disease – and many of us changed our diets in a way that we thought would protect our hearts. But now it seems as if much of this was a waste of time.




The early idea that saturated fat intake was the most important cause of coronary artery disease is no longer popular. The so-called Seven Countries Trial, which started the low-fat ball rolling, has been effectively discredited. Death from coronary artery disease has been falling since around 1968-1970, which was well before saturated fat intakes began to decline. In Japan, the rate of coronary artery disease is

falling even though people are eating more saturated fat⁽¹⁰⁶⁾.

Too much saturated fat is still not a good thing, but the latest thinking is rather more complex than the early 'fat = bad' equation. It involves LOPs, COPs, anti-oxidants and more. But don't despair – it's not as complicated as that, and once you've grasped the essentials, avoiding heart attacks is relatively plain sailing.

THE DEFENCE BOOSTERS : Essential fatty acids

Subtle differences in the molecular structures of fatty acids determine their melting point and their effect on our health.

Saturated Fats SAFAs	Mono- Unsaturated Fats MUFAs	Poly- Unsaturated Fats PUFAs
		
<p>Saturated Fatty Acids are solid at room temperature, eg: butter and lard. These are typical fats.</p>	<p>Mono-Unsaturated Fatty Acids are liquid at room temperature, eg: olive, peanut and rapeseed oils.</p>	<p>Poly-Unsaturated Fatty Acids are also liquid at room temperature, eg: soy, corn, flaxseed and sunflower oils.</p>

The edible fats and oils, known collectively as fatty acids, are basically similar compounds. Oils, however, melt at lower temperatures than fats, and at room temperature oils are liquid and fats are solid.

Fatty acids (fats and oils) are a rich source of calories, which can either be 'burned' to produce energy, or stored as fat for lean times ahead. They are also incorporated into cell membranes and other tissues, where they have an important structural role.

Finally, fatty acids are metabolised into compounds called eicosanoids. Fats and oils produce quite different eicosanoids: broadly speaking, **fats** form eicosanoids which **increase inflammation**, and **oils** produce eicosanoids which **reduce inflammation**.

This difference is important to know, because many chronic diseases are basically inflammatory conditions. These include arthritis (inflammation of the joints), eczema (inflammation of the skin), asthma (inflammation of the lungs) and coronary artery disease (inflammation of the arteries).

Your risk of these conditions is affected by your genetic make-up, tobacco consumption and aspects of your diet; but the fats and oils we consume are also important.

The Fat Facts

The shorthand for the different types of fats is:

Saturated fats – SAFAs (**SA**turated **FAT**ty Acids)

Poly-unsaturates = PUFAs (**P**oly-**U**nsaturated **FAT**ty Acids)

Mono-unsaturates = MUFAs (**M**ono-**U**nsaturated **FAT**ty Acids)

SAFAs tend to be solid at room temperature and are termed 'fats'.

MUFAs and PUFAs are liquid and are called 'oils'.

Watch out for 'hidden' fats

All fats found in food contain a mixture of SAFAs, MUFAs and PUFAs, ie Saturated, Mono-unsaturated and Poly-unsaturated.

But the proportions in different foods vary considerably.

SAFAs are primarily animal fats, and are found in meat and dairy produce – coconut and palm oils are the only vegetable oils which contain large amounts of SAFAs.

Three good sources of MUFAs are olive oil, rapeseed oil and peanut oil.

The essential PUFAs are Omega-3, found in oily fish, and Omega-6 found in plant oils such as evening primrose oil and walnut oil.

Eggs are the odd ones out. They contain SAFAs, but in the form of phospholipids. These increase HDL, the 'good' cholesterol.

Calories per gram

Fat	9 cal
Protein	4 cal
Carbohydrate	4 cal
Alcohol	7 cal

Watch out for 'hidden' fats. It's easy to monitor how much butter, oil, or bacon fat you're eating, but less easy to check the fat content of foods like eggs and cheese which are naturally rich in fat.

Most deceptive are foods which have fat added during processing. Manufacturers don't like to throw away the fat they remove from reduced-fat products, so in many cases they simply conceal it in biscuits, cakes, quiches and a wide range of other standard processed foods.

Below is a checklist of foods showing the percentage of calories from fat.

To check the fat content of foods not listed, read the label and use the calories/gram formula below. If the calories from fat are less than 30% of the total calories, this is a reasonable balance.

Less than 10%	Most fruits, vegetables, fat-free milk
Over 10%	Bread
Over 20%	Crackers, crab meat, lean fish
Over 30%	Chicken, cottage cheese, tuna fish, low fat milk
Over 40%	Whole milk, cake, chips
Over 50%	Ice cream, steak
Over 60%	Crisps, ham, eggs
Over 70%	Cheddar cheese, bacon, most nuts inc. peanuts
Over 80%	Cream cheese, salad dressing, chocolate
Over 90%	Butter, margarine, cooking oils, cream

The fats in fatty foods

	Total fat per 100g	Saturated Fat	Mono-unsaturated	Poly-unsaturated
OLIVE OIL	100g	14g	70g	11g
BUTTER	82g	54g	21g	3g
MARGARINE	82g	16g	21g	(Inc. trans) 41g
CHEDDAR	34g	22g	10g	1g
AVOCADO	20g	4g	12g	2g
EGGS	11g	3g	5g	1g
WHOLE MILK	3g	2g	1g	0g

McCance and Widdowson. *The Composition of Food*, Fifth Edition, Royal Society of Chemistry and Ministry of Agriculture Fisheries and Food

Stone Age body, 20th-century fats

During the hundreds of thousands of years it took us to make the long evolutionary trek from ape to man, our ancestors ate a predominantly vegetarian diet based on shellfish, fruits, vegetables, grains and nuts, with occasional fish and game.

This Stone Age diet contained high levels of mono- and poly-unsaturated oils, with relatively little saturated fat. (Wild game is lean compared with farmed meat, and contains more PUFAs.) Our bodies were designed to run on this sort of fatty acid mix, which produces a healthy balance of eicosanoids.

The fatty acid composition of our diets today is very different. In the developed nations, most fatty acids in the diet are saturated fats contained in meat, dairy products and processed foods. Most of us are eating too few vegetables and fish and not enough oils and anti-oxidants.

As a result of this disproportionate intake of saturated fats, the balance has been upset. Anti-inflammatory eicosanoids have been reduced, leaving the inflammatory compounds unchecked – contributing to an epidemic of chronic inflammatory diseases like heart disease, arthritis and asthma.

The obvious remedy is to redress the balance. To do this we can either change our diet, and/or supplement it. If we were to reduce our intake of saturated animal fats and increase our intake of MUFAs and PUFAs by eating more fish and vegetable foods, we would all be a lot healthier. (The environment would benefit too.)

Eating more PUFAs means more anti-inflammatory eicosanoids are produced, and less pro-inflammatory compounds. This is why fish oil, for example, is used to treat arthritis and to protect against coronary artery disease; and why evening primrose oil (taken orally) can reduce the severity of eczema and other inflammatory skin disorders^(113, 115).

To achieve these gains you need quite large doses of PUFAs – typically 6-10g a day or more.

Cholesterol problem

Saturated fats occur in animal and dairy goods, which also contain cholesterol. Cholesterol stops the gut from absorbing sterols and sterolins, which are powerful anti-inflammatory agents (see Chapter 19, Asthma). This contributes to the pro-inflammatory effect of a saturated-fat-rich diet.

Beware the label

The solution to not eating enough poly-unsaturated oils does not lie in consuming more processed poly-unsaturated spreads and oils.

These can cause problems because the anti-oxidants which occur naturally alongside poly-unsaturates in unprocessed foods like nuts and grains have all been removed.

Instead, eat more grains, seeds and sea-foods – which contain MUFAs, PUFAs, anti-oxidants **and** anti-inflammatory agents such as sterols and sterolins.

THE DEFENCE BOOSTERS : **Essential fatty acids**

Saturated Fats ...

decrease the number of LDL receptors in the liver. This reduces the liver's ability to remove LDL from the blood and leads to raised LDL levels^(37, 38), and an increased risk of coronary artery disease^(33, 34).

Fish oil reduces LDL (and triglycerides)^(5, 35, 36), reducing the risk of heart attacks.

More PUFAs

A lack of the essential PUFAs in the diet leads to deficiency symptoms such as dry skin, and an increased risk of heart disease, sterility and arthritis.

More fatty benefits

Fats and oils have other important effects. Saturated fats raise the levels of 'bad', ie LDL, cholesterol in the blood^(37, 38). Fish oil, on the other hand, slows the formation of LDL cholesterol, and lowers the risk of fatal heart attacks.

The medical profession initially found it hard to believe that a simple switch from fats to oils could have significant health benefits, but the sheer weight of all the clinical trials which have shown positive health benefits has changed their opinion. The evidence is particularly good in the area of coronary artery disease; and PUFAs are rapidly gaining a role in even conventional circles.

The essential oils

Not all PUFAs (poly-unsaturated fatty acids) are the same. Some of them are more important than others, and a few are so important they are termed, collectively, the Essential PUFAs.

There are two families of essential poly-unsaturated fatty acids, Omega 6 and Omega 3, both of which are oils. These oils are vital for the functioning of every cell in our bodies, and yet our bodies cannot make them. We have to obtain them from our diet, and in that sense they are similar to vitamins⁽²⁶⁾.

Once the oils have been absorbed from our food, our enzymes make all the other Omega 3 and 6 PUFAs our cells and systems need⁽²⁴⁾.

HEART DISEASE RISK CAN BE CUT BY 33% WITH PUFAS

PUFAs encourage the formation of compounds which lower blood pressure, reduce blood platelet stickiness, improve capillary function and reduce inflammation⁽¹²⁾. In addition, the Omega 3s reduce the levels of 'bad' plasma cholesterol⁽¹⁰⁾, and inhibit the formation of plaque in artery walls⁽⁹⁾.

Fish are no better than we are at making Omega 3 oils; fish in the wild get their Omega 3s from marine algae, which live in the cold Arctic waters.

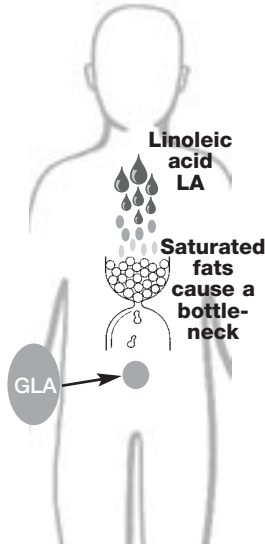
Farmed fish only contain EPA and DHA if they have been fed on fish scraps which themselves contained Omega 3.

An algae-based Omega 3 oil may enter the market once safety tests^(17, 18) are completed, if it can be produced at a competitive price.

How your body uses Omega 6 and Omega 3

OMEGA 6

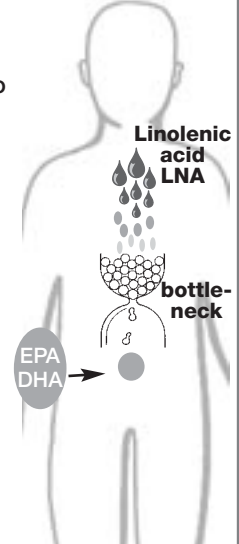
- The process begins when you eat foods containing linoleic acid (LA) found in flax, hemp, walnut, linseed, safflower, sunflower, soy oils.
- Our enzymes slowly turn the linoleic acid into gamma linoleic acid (GLA).
- The problem is that saturated fats in our diet slow down the process, causing a bottleneck so that insufficient GLA is available.
- The solution is to **by-pass** the process and take GLA directly as a supplement.



It's found in oils such as evening primrose oil, borage (starflower) and blackcurrant seed oil.

OMEGA 3

- The process begins when you eat food containing linolenic acid (LNA) found in oily fish, flax, hemp, pumpkin seeds, soya beans and walnuts
- Our enzymes slowly turn the linolenic acid into eicosapentanoic acid (EPA) and docosahexaenoic acid (DHA)
- Once again the problem is that bottlenecks can result in insufficient EPA and DHA being available.
- The **short-cut** is to take EPA and DHA directly from oily fish like salmon, trout, herring and mackerel or from Omega 3 supplements.



Note: Hempseed oil, flaxseed oil or soy oil can be the start point for **both** processes. These plant oils contain Omega 3 but usually at a lower level than fish oils⁽¹¹⁾. A recommended dose for a general supplement would be at 2-3g a day, rising to 10-15g a day to treat an existing case of heart disease or arthritis⁽⁶⁾.

Check labels carefully. A 1000mg capsule of fish oil does **not** contain 1000mg of Omega 3. The Omega 3 content may be 300mg or less. The level of Omega 3 from fish oil as a general supplement should start at 400-500mg a day.

Omega 3

In small doses, Omega 3 makes the heart less vulnerable to dangerous arrhythmias after a heart attack. At higher doses, the other cardiac benefits emerge and heart attacks themselves becomes less frequent.

Reminder!

Omega 3 = PUFAs (poly-unsaturated oils) usually from fish sources.

Omega 6 = PUFAs from vegetable sources.

Think of "Omega 3 – from the sea".

Capsules are better

If you take a fish oil supplement, avoid bottled oils; fish oils in capsules are safer. Do not use either after 'Use by' date.

For enhanced cardio-protection, combine with flavonoids and other anti-oxidants, such as Vitamins C and E, and take with food for better absorption.

PUFAs cut risks of heart disease

The best documented clinical use of PUFAs is in the prevention and treatment of heart disease. It is well-known that a high intake of animal fats increases the risk of heart attacks, while vegetarian or fish-based diets, which contain Omega 6 or 3 respectively, reduce the risk.

This explains why fish-eating folk like the Eskimos don't have heart attacks. Fish oil doesn't make us quite as immune to heart attacks as the Eskimos are (or used to be before the introduction of processed foods), because the effects of the PUFAs in fish oil are reduced by the large amounts of saturated fats we eat, but nonetheless the benefits are significant.

In the American MRFIT trial, the risk of heart disease was cut by around a third in men who consumed more oily fish; and similar results have been obtained in at least four other large European studies^(43-46, 98) – see also pages 131-137.

Quite apart from its cardio-protective properties, fish oil is also able to damp down an over-active immune system⁽⁶³⁻⁶⁷⁾. This would explain why Eskimos are not only singularly free from heart disease, but eczema and arthritis as well; findings which have recently been duplicated in clinical studies^(104, 105). The immunoregulatory effects of fish oil are currently being used in treating allergies and improving the success rate of organ grafts.

Research into Omega 6 PUFAs in nuts and grains has been overshadowed by the Omega 3 work. There are a few studies, however, which indicate that Omega 6s may also be cardio-protective.

In a trial reported in the British Medical Journal, 400 heart attack patients were put on either a Western diet (which contained meat, eggs and butter), or a vegetarian diet, which contained nut and vegetable oils. The veggies did considerably better, with significantly fewer cardiac problems and fewer fatal heart attacks than their meat-eating colleagues^(1, 8).

In the same year the New England Journal of Medicine reported that snacking on walnuts, a rich source of Omega 3 and 6 PUFAs and MUFAs, reduced total cholesterol levels, and improved the HDL/LDL cholesterol ratio in normal men⁽¹¹⁶⁾.

Further work has shown that almonds are just as good at lowering LDL cholesterol as walnuts⁽¹⁰⁷⁾, and should be just as cardio-protective⁽¹¹⁷⁾. The best bet may still be fish, however, as fish eaters appear to have lower blood pressure, and lower cholesterol levels than vegetarians^(6, 11)

The overall health benefits of a dietary shift may include not only healthier hearts, but better-balanced immune systems as well.

PUFAs FOR PEPTIC ULCERS?

There are additional, unexpected benefits linked to going back to our nutritional roots, and eating a high PUFA diet. There is some evidence, for example, that this could protect against peptic ulcers. Peptic ulcers are caused by a bacterium called *Helicobacter pylori*. When there are plenty of PUFAs around, *H pylori* absorbs them into its cell membranes. This makes the membranes more permeable, and the bacterium becomes more vulnerable to attack by the gastric juices⁽⁹⁹⁾.

This strongly implies that a diet rich in nuts, cereals and fish, and low in animal fats, could reduce the risk of infection with *H pylori* – and might even be able to eradicate it, if used together with other nutritional components (see Chapter 7, Pre-biotic fibre). In Central Europe, flaxseed soup was traditionally used to treat stomach ulcers.

The right mix

PUFAs are a powerful force for good health but, as with other powerful agents, they should not be taken indiscriminately. The ratio of the various PUFAs in the diet is important^(17, 27, 30), and the fact that in most mammals' cells the level of Omega 6 (from vegetable sources) is three to four times higher than the Omega 3 content (from fish sources), gives us a pointer as to what we should aim for.

The Japanese diet was traditionally the other way round – three times higher in Omega 3 than Omega 6. The fact that Japanese mortality rates have fallen since the '50s, when the diet first began to shift towards a more Western style and incorporate more vegetable oils, is thought by some to be linked to their increased intake of Omega 6 PUFAs.

Balance

The first step to a better balance of fats in the diet is cutting down on butter, lard, milk, cheese and poly-unsaturated vegetable oils.

Although some vegetable oils contain linolenic acid, which is slowly converted in the body to Omega 3s, the overall effect of most vegetable oils is to reduce the synthesis of Omega 3s.


Saturated animal fats are not entirely unhealthy. There are essential saturated fatty acids too, such as myristic acid⁽²³⁾, and perhaps 20 others.

All of these are found in the tissues and many of them have essential and specific roles in metabolism, cell-to-cell interactions, and in modulating immune responses⁽²²⁾.

THE DEFENCE BOOSTERS : Essential fatty acids

The Western diet, however, is skewed in the opposite direction. The ratio of Omega 6 (vegetable oil derived) to Omega 3 (fish oils) in our diet is about 6 to 1⁽¹⁶⁾ – and that's almost certainly too high^(11, 14, 17).

As a final piece of evidence of the importance of the PUFA ratio, consider the composition of human milk. The proportion of Omega 6 and Omega 3 in the diet of vegetarian and fish-eating communities is wildly different but the PUFA content of breast milk is identical – between 2:1 and 3:1⁽²¹⁾. It's a reflection of the most basic nutritional needs of the growing child^(26, 28, 29).



LOOK FOR
...
a fish oil supplement containing 500mg of Omega 3 a day.
This will provide about 300mg of EPA and

LOW FAT FOODS? MAYBE!

Low or reduced fat claims on food labels are almost meaningless, and have never been legally defined. In many cases it appears to be little more than a marketing exercise. Check the contents list on the label, remembering that fat has more than twice as many calories per gram as protein or carbohydrate.

Beef and dairy products, such as cheese and butter, contain more saturated fats than pork and poultry, which contain slightly more PUFAs.

This is why nutritionists recommend switching from red meat to white meat. However, game meats are healthier than farmed meat because they contain far less fat and the fat they do contain has a higher percentage of PUFAs⁽⁶⁾.

Fish oil and aggression

Fish oils can help reduce aggressive behaviour in adolescents and young adults. One recent study showed this effect on rebellious young Californians, whose base-line diet was typical American junk food⁽²¹⁾.

What next?

How much should we modify our intake of fats and oils to achieve optimum health?

The current recommendations from the health experts suggest we eat less saturated fats and more mono-unsaturated oils and Omega 3, while maintaining our consumption of Omega 6 vegetable oils^(69, 85). There are several very simple steps we can all take to achieve this nutritional balance, and better health.

- 1 Cut down on meat and dairy produce, and/or change where possible to genuinely low-fat products.
- 2 Eat more oily fish.
- 3 Eat more olives and olive oil products
- 4 Switch from sunflower oil to flaxseed oil, which contains Omega 3 and 6 fats in a 3:1 ratio, or to hempseed, where the ratio is 1:3⁽⁷²⁾.

Virgin hemp oil has a green colour due to its chlorophyll content, tastes like sunflower oil, and is good for all uses except frying. To extend its shelf life, squeeze a Vitamin E capsule into the bottle.

The dangers of processed PUFAs

To get the maximum benefit from the new diet, and to avoid the possible dangers, we have to look very seriously at anti-oxidants.

The problem with poly-unsaturated fatty acids (PUFAs) is that they are very prone to going rancid, or oxidising. It's fine to eat a high PUFA diet if the PUFAs are in unprocessed foods such as nuts and grains, because these foods contain their own anti-oxidants, such as Vitamin E, carotenoids and flavonoids. Without these they would go rancid, and the seeds, grains and nuts would not survive long enough to propagate the species. But if your intake of PUFAs is in the form of refined poly-unsaturated oils and spreads, you could be in trouble.

These processed foods have had the naturally occurring anti-oxidants stripped away, and are therefore highly prone to being oxidised. This has two potentially very serious effects.

Firstly, the PUFAs form lipid oxidation products⁽⁹¹⁾ (LOPs). LOPs are extremely toxic: they literally rip holes in the lining of the arteries⁽⁴⁸⁾ and are therefore a substantial risk factor for heart disease⁽¹⁶⁾. Secondly, as the PUFAs oxidise they soak up anti-oxidants in the body⁽⁹⁰⁾, leaving an excess of free radicals and causing accelerated ageing⁽²⁰⁹⁾.

The end result is an increase in the risk and severity of chronic degenerative diseases from heart disease to cancer to asthma.

At the Royal Prince Alfred Hospital in Sydney, Australia, epidemiologists have linked the huge increase in childhood asthma with a five-fold increase in margarine consumption since the War. Their theory is that the increased PUFA content in the diet has led to an increase in inflammatory and toxic LOPs, which leave the airways raw, and trigger the asthma^(31,32).

The Australian work, although provocative, cannot be the whole story. But we can be sure that the common combination of

Why are allergies on the increase?

Asthma and other allergic diseases have doubled every decade for last 30 years..

The increase in these disorders could be linked to the increase in processed PUFAs (eg from margarine) in the diet since World War 2^(31, 32) – and the related decline in flavonoids, sterols and sterolins (see pages 73-74 and Chapter 19, Asthma).

Overweight?

Anti-oxidants are particularly important if you are overweight.

The so-called Metabolic Syndrome is probably a form of pre-diabetes: symptoms include putting on weight, experiencing cravings for sweet foods, and getting spells of cold, tiredness and irritability.

The rate of PUFA oxidation is raised in this condition⁽⁹³⁾, so a good anti-oxidant combination is strongly recommended.

THE DEFENCE BOOSTERS : Essential fatty acids

Keep oil cool

PUFA oils stored where they are subjected to light and heat will form LOPs. Keep them in the fridge.

Bad COPs

When animal fats (including lard and butter) containing cholesterol are heated, this forms cholesterol oxidation products (COPs), which are as harmful as LOPs.

Don't overheat these fats, don't re-use, and don't cook in iron pans or woks, as this increases COP formation.

More bad news for smokers

Smokers produce significant amounts of COPs and LOPs in their bodies, and should definitely take anti-oxidant supplements which reduce COPs and LOPs formation⁽⁵⁵⁾.

eating too many poly-unsaturated spreads and oils and not enough anti-oxidants, leaves us with cholesterol which is very prone to being oxidised⁽¹¹²⁾, dangerously high levels of LOPs^(89, 91, 93) and dangerously low levels of anti-oxidants⁽⁹⁰⁾.

The only way to prevent this unhealthy scenario is to supplement with anti-oxidants^(88, 90, 94, 112). But which ones? Vitamin E on its own is relatively ineffective^(7, 19, 91, 113). The best approach seems to be to concentrate on anti-oxidant combinations. A combination of E, C, beta carotene and flavonoids is extremely effective at stopping the oxidation process, and has been patented by Nestlé⁽¹⁹⁾. Vitamin E combined with garlic and ginkgo, both of which contain complex mixtures of anti-oxidants, may be even more effective⁽⁹²⁾.

HEART DISEASE EPIDEMIC

Heat processed powdered egg, widely consumed in the '40s, was a rich source of COPs, and was probably an important factor in coronary artery disease deaths in the '50s and '60s. But we also have to consider the increase in the consumption of trans-fats which occurred rather earlier on, and which fits the beginning of the rise in heart disease in the West.

Nor should we forget the arrival of mass motor transport. Petrol and especially diesel exhausts produce enormous amounts of free radicals, which when inhaled lead to anti-oxidant depletion^(53, 54).

The increasing popularity of cigarette smoking after World War 1, and the reduced consumption of fresh fruit and vegetables also play a part.

The recent fall in coronary artery disease in the professional classes is almost certainly caused by decreased smoking, and increased fruit, vegetable and supplement intake.

Bad COPs, bad LOPs

Anti-oxidant supplements can prevent COPs (Cholesterol Oxidation Products formed when animal fats are heated) and LOPs from being formed in your body. They won't protect you, however, against LOPs or COPs in your food.

LOPs and COPs are created by bad cooking and storage techniques. Once ingested, they are quickly absorbed into the

THE DEFENCE BOOSTERS : Essential fatty acids

blood stream^(47, 49) and are among the most dangerous items on the menu, and certainly the worst for your heart.

COPs are produced in certain types of food processing. Particularly high levels of COPs are found in powdered egg. Few people eat powdered egg now, but it was a staple during World War 2, and was probably a major contributing factor to the epidemic of heart disease which peaked some 10-15 years later.

Major sources of LOPs are poly-unsaturated oils and margarines which are stored for too long, or under the wrong conditions, or over-heated during cooking.

Oils should be stored in dark glass containers, and preferably in the fridge. Margarines should also be kept in the fridge. Tubs of the stuff left lying around soon develop a translucent ring around the edge where the fat has melted and re-set, a sure sign that LOPs are being formed, ie the fat is being oxidised.

Some manufacturers add anti-oxidants such as Vitamin E to their products to prevent them from oxidising (going rancid). This helps to some extent, but has no protective effect whatsoever during cooking as Vitamin E breaks down when heated.

So what can we do to minimise our exposure to these highly cardiotoxic compounds? Tiny amounts of COPs and LOPs are formed in the body but the bulk are found in our food, and are already oxidised before we eat them, so anti-oxidant supplements offer no protection at all. The solution lies in modifying our food storage and cooking techniques (see the Cook Guide on the next page).

COPS AND LOPS AND CORONARY ARTERY DISEASE

There are three basic stages in the development of coronary artery disease: damage to the artery wall, the build-up of atheroma, and the formation of blood clots. COPs and LOPs help all three stages along the way^(47, 113-115):

- They are toxic to cells in general, and the cells lining the arteries in particular⁽⁴⁸⁾.
- They increase levels of LDL cholesterol.
- They increase platelet stickiness, which increases the tendency to form clots.

How to cook eggs



Fresh eggs contain cholesterol but no COPs and can be eaten with impunity.

Their phospholipid content boosts levels of HDL, the 'good' cholesterol.

Different cooking techniques produce different amounts of COPs, in ascending order:

- 1 Poaching or soft boiling -
- 2 Hard boiling +/-
- 3 Frying + limit
- 4 Heat processing to produce dried egg. ++++ avoid

N.B. Modern freeze-drying methods do not increase COPs levels and are inherently safer.

The Anti-COPs/LOPs Cook Guide

- Cooking with animal fats which contain cholesterol, such as lard or butter, produces COPs. Use as little as possible, and never re-use it.
- Don't fry with poly-unsaturates, these produce LOPs even at normal frying conditions⁽⁸⁷⁾, and should **never** be re-used.
- Deep-frying, where the oil not only forms dangerous amounts of oxidation products but is also generally re-used, especially in commercial establishments, should be off limits altogether.
- When cooking, do not overheat the oil: if it's smoking, it's too hot.
- Don't fry in iron cookware, as the traces of iron that leach into the oil increase the formation of LOPs and/or COPs many times over.
- Wherever possible, cook with mono-unsaturates such as olive, peanut or rapeseed oil. These form no COPs and relatively small amounts of LOPs⁽³⁴⁾, although re-use should still be avoided.

To make your cooking oils safer:

- Store them in dark glass, in the fridge. Glass is better than cans, as there is some concern that iron in the walls of metal cans could leach into the oil and accelerate the oxidative process.
- Add grapeseed or green tea extract (available from some health food suppliers) to the oil before using.

Both extracts contain catechins and catechin gallates, powerful heat-stable anti-oxidants which inhibit COPs and LOPs formation during the cooking process.

- If you like herbs in your cooking, rosemary or rosemary extract has been shown to prevent the formation of COPs and LOPs in frying trials^(39, 109-111).

Grind the rosemary in olive oil, and then use the same oil for frying. If you don't like rosemary, then sage, thyme and oregano are almost as good⁽³⁹⁾.

Fried or grilled meats such as hamburgers are particularly bad, because the minced meat leaks iron (from blood) during the cooking. The iron is a powerful oxidant and increases the amount of COPs produced many times. Fast food companies would not accept that they are selling cardiotoxic food, but the evidence against them is strong.

You can make safer burgers by adding barley bran and wild rice to your hamburger mix. This adds fibre and improves the texture and the taste.

Furthermore, the wild rice contains powerful antioxidant compounds which reduce COPs and LOPs formation almost to zero, and the bran locks on to free iron, which also reduces oxidation.

It's a modification that the burger chains should look at. It could save many thousands of lives.

Anti-oxidants are anti-COPS

The COPs-LOPs story is yet another reason why a high intake of anti-oxidants correlates with higher levels of health.

Secret danger in 'healthy' spreads?

Most of us have heard a lot about vitamins and minerals, and yet our knowledge about fats and oils, for the most part, is pretty hazy. It's a nutritional scandal, as dietary fats are just as important to health as vitamins and minerals.

We know that too much saturated fat isn't a good thing, but did you know that ultra-low fat diets can lead to health problems by causing deficiencies of the fat-soluble vitamins and have been linked to serious birth defects?

THE DEFENCE BOOSTERS : Essential fatty acids

Or that trans-fatty acids in some poly-unsaturated margarines – sold as ‘healthier’ alternatives to butter – may actually increase the risk of heart disease, and probably certain cancers?

It’s true that poly-unsaturated fatty acids can be good for you, but what the food manufacturers don’t tell you is that PUFAs come in two forms: **cis**, which occur naturally and are essential to health, and **trans**, which are neither of those things. Unfortunately the body cannot discriminate between the two, so trans-fats in the diet are incorporated into cell membranes and tissues where cis-fats should be. Once there, they impair various aspects of cell function.

Trans-fats compete with normal fats in the body for enzymes. They replace normal fats and oils, with unknown consequences in eicosanoid formation, and cell membranes and functions^(75, 78).

Because of their ability to substitute for normal fats, trans-fats raise levels of ‘bad’ LDL cholesterol in the blood, lower levels of ‘good’ HDL cholesterol, increase levels of triglycerides (a particularly important risk factor in women), and increase levels of lipoprotein (a hereditary risk factor for coronary artery disease that is otherwise little affected by diet^(79, 80, 108)).

The resulting health problems are thought to include a loss of skin pliability, impaired brain and nervous function, an increased tendency to asthma and rheumatoid arthritis, and an elevated risk of coronary artery disease.

It is amazing that in most countries, with the exception of Scandinavia, little has been done to remove these pernicious fats from the food chain.

The links between trans-fat consumption and heart disease are particularly strong^(73, 74, 118).

In one early study, people dying of CAD (Coronary Artery Disease) were found to have higher levels of trans-fats in their bodies than in people who had died from other causes⁽⁸¹⁾. This was not conclusive evidence, but it was highly suggestive; and then other trials began to show similar findings.

In one recent clinical trial, 748 men between the ages of 43 and 85 were studied to assess the effects of trans-fats on blood lipids. The doctors discovered that trans-fats not only had an

Impaired cell membranes

Fatty acids, built into phospholipids, form the bulk of cell membranes (see Chapter 17, A healthy brain). The altered structure of trans-fats disrupts normal cell membrane structure (causing irregularities known as ‘packing defects’): and leaving fat deposits that are hard for the body to break down.

The best vegetable oils

Go for cold-pressed vegetable oils with the highest Vitamin E/PUFA ratio.

Safflower, olive and flaxseed oils are best.

Corn and peanut oils are intermediate.

Soy oil and rapeseed oils are worst in this respect. Soy oil contains a version of Vitamin E called gamma tocopherol which our bodies are unable to utilise. So, if you use a lot of soy oil, consider an additional Vitamin E supplement.

For cooking, keep to mono-unsaturates such as olive oil.

THE DEFENCE BOOSTERS : **Essential fatty acids**

adverse effect on blood lipid (ie fat) levels and ratios, but also increased the risk of a heart attack⁽¹⁴⁾.

The following year, in a separate and very major study, a team of researchers at Harvard who had been studying 85,000 nurses for eight years, published results which confirmed the earlier findings. The data showed unequivocally that the nurses who ate margarine with high levels of trans-fats were at a higher risk of developing heart disease than those who ate butter⁽¹⁵⁾.

The best evidence we have shows that an above average consumption of trans-fats nearly doubles the risk of a heart attack in men, and increases it by 60 per cent in women^(82, 83) – causing more than 30,000 deaths per year in the USA alone⁽⁸⁴⁾.

Trans-fats may harm the unborn as well. They cross the placenta and are incorporated into foetal tissue, concentrating in the developing central nervous system. Unsurprisingly, an increased consumption of trans-fats in pregnant women has been linked to premature births, and low-birth-weight infants with a high risk of brain damage⁽⁸⁶⁾.

Too many processed foods are made with trans-fats. To avoid them, check on the label for 'vegetable fat', or 'partially hydrogenated vegetable oil'. Anyone who eats a lot of processed foods is at risk: vegetarians who eat basic foods do well, but vegetarians who eat a lot of convenience foods and hence a lot of trans vegetable fats, are especially vulnerable.

Why on earth should the manufacturers spend so much time and money changing perfectly healthy cis-PUFAs into unhealthy trans-PUFAs? Simple – the trans-fat forms are more suited to margarines, keep for longer and have better 'spreadability'. But what a price to pay!

(Small amounts of some trans-fats occur naturally in animal fats – but these are not the same as the trans-fats produced by industry, and don't appear to be as cardio-toxic.)

Health Warning

Avoid foods labelled as containing 'vegetable fats', 'hydrogenated vegetable oil' or 'partially hydrogenated vegetable oil' – these all mean trans-fats.

They could also mean a potential increased risk of arthritis, asthma and heart disease.

Trans-fats raise heart disease risk

An above-average consumption of trans-fats increases heart attacks by 100% in men and 60% in women^(82, 83).

ULTRA-LOW-FAT DIETS

An ultra-low-fat diet not only leads to skin lesions and other problems but, if the dieter becomes pregnant, also increases the risk of foetal and paediatric complications including cerebral palsy. This is because, as the foetus grows, the developing brain and nervous system requires large amounts of PUFAs. A deficiency in the maternal diet can interfere with the normal growth of the baby's brain.

In addition, a very low-fat diet will reduce the amount of fat-soluble micro-nutrients (Vitamins A, D, E and K, and the carotenoids) absorbed from the diet. All these nutrients have essential roles in maintaining health in tissues as diverse as the eye, brain and prostate.

I do not recommend ultra low-fat diets, even for coronary artery disease patients; there are more elegant alternatives (see Chapters 5, Anti-oxidants, and 6, Flavonoids & isoflavones).

No 1 for heart attacks

British men and women are at the top of the international heart attack league tables, although Eastern Europe is currently catching up.

The harsh reality behind these statistics is that one in every three British men, and one in every four women, die of coronary artery disease (CAD). And the tragedy is that it's largely preventable.

Trans Spotting

The trans-fat story starts just before World War 1. There was a glut of cheap vegetable and fish oils, difficult to sell and to store because they quickly went rancid.

Scientists and industrialists looked for ways to improve the keeping qualities of the oils, and in 1912 the process of hydrogenation was launched on an unsuspecting world.

By boiling the oils at high temperatures for hours on end, under hydrogen gas and in the presence of a nickel catalyst, the oils turned to fats. They solidified, becoming easier to store and less prone to turning rancid, and they took the market by storm.

In Europe it was predominantly fish oils that were boiled down into margarine, and in the USA they mostly used vegetable oils, but the end product was

pretty similar. The public lapped it up. And a mere eight years later, in 1920, coronary artery disease really started to take off.

The consumption of trans-fats increased during the first half of the century, and then stabilised⁽¹⁰⁷⁾, a pattern which runs very much in parallel with the Coronary Artery Disease epidemic.

Today, trans-fats constitute about five per cent of dietary fat in the USA⁽⁷⁵⁾. In processed foods such as cookies, pastries and french fries, trans-fats are generally over 10 per cent of the total fat content.

In margarines, the trans-fat content is often over 10 per cent, and in some brands may be as high as 60 per cent^(76, 77). Manufacturers are beginning to catch on and newer brands are better in this respect.

Fats and ageing

As we get older, our tissues deteriorate as they steadily lose PUFAs from their cell membranes^(56, 57). Most PUFA loss is due to oxidation⁽⁵⁸⁾, and anti-oxidants exert many of their health benefits by slowing down this degenerative process⁽⁵⁹⁾.

The central nervous system (including the brain) contains particularly high levels of PUFAs, in the membranes of nerve cells or neurones. As we get older PUFA oxidation in the brain and damage to nerve cell membranes contributes to brain cell death, memory loss, and eventually senile dementia (See Chapter 17, A healthy brain).

The products of PUFA oxidation include LOPs, which as we saw earlier are highly toxic, and lipofucsin, the so-called brown age pigment. The rate at which lipofucsin builds up increases if the diet is deficient in anti-oxidants⁽⁹⁷⁾. Lipofucsin in the skin forms 'age spots', which are unsightly but harmless. When it accumulates inside nerve cells, however, it slows them down and eventually kills them.

Anti-oxidants which enter the brain and concentrate in the nerve cell membranes and prevent PUFA oxidation should protect against premature brain cell death. The latest data strongly suggests that they do.

Age spots

Centrophoxine, a powerful anti-oxidant drug which concentrates in lipids, removes lipofucsin deposits^(100, 101). It erases age spots and is reported to improve mental function in elderly rats – and humans too^(102, 103).

A question of thyme

Some fascinating work has been done on the oil found in the herb thyme at the Scottish Agricultural College in Auchincruive, Ayr. Thyme oil contains thymol, a powerful anti-oxidant, which has the useful property of concentrating in the membranes of the nerve cells in the brain.

Thyme oil has another complementary effect; it boosts levels in the body of glutathione peroxidase, an anti-oxidant enzyme involved in preventing PUFA oxidation.

The Scottish group fed thyme oil to mice and found that its dual effect led to a significant reduction in oxidative damage. The bodies and brains of the mice retained the PUFA composition of young animals, even into old age⁽⁶⁰⁾.

INCLUDE

Thyme, clove, nutmeg and pepper oils in your cooking.

Research shows they protect poly-unsaturated fats in the body and the brain.



The brains of the thyme-travelled mice showed significantly fewer signs of ageing, and had retained a higher number of viable nerve cells than the brains of untreated mice. This suggests that the inexorable loss of brain cells which accompanies human ageing could also be stopped, or at least slowed, by thyme oil.

If you don't like the taste or scent of thyme, there's a reasonably wide choice of alternative herbs and spices. The Scottish team showed that PUFA levels in aged mice can be almost equally well preserved with clove, nutmeg and pepper oils⁽⁶²⁾.

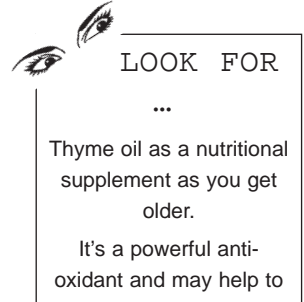
The Eskimo diet

In some countries, heart disease is uncommon, even rare. The Eskimos, for example, don't have a word in their language for a heart attack. In one study a Danish doctor examined 2,400 Eskimos and found, remarkably, only three of them with any signs of heart disease⁽¹⁵⁰⁾.

So what is the Eskimo secret? It's simple. Like us, the Eskimos are what they eat. After extensive research, cardiologists concluded that it is the Eskimos' eating pattern which makes them so immune to coronary artery disease. Many nutritionists recommend a so-called Eskimo diet to reduce our appalling incidence of heart attacks. But does anybody know what the Eskimos really eat? And if they did, would the Western palate be able to cope with it?

Before the arrival of modern processed foods, the Eskimo diet consisted largely of fish, shellfish and sea mammals such as seals, whales and walrus. And although they inhabited terrain known as 'the largest deepfreeze in the world', their diet was strictly seasonal.

Throughout the long winter the average Eskimo would chew his or her way through a couple of pounds of seal meat and blubber every day. Come the spring, and the salmon run would provide a welcome change of diet, together with varied shellfish – two to three pounds of salmon a day, even more during periods of heavy activity, was not unusual. Later in the year mackerel, herring and cod would appear on the menu and, here again, a



Toxic fish

Dangerous organic pollutants including pesticides and coolants are dumped at sea, and permeate the food chain from algae to fish to seals – where they are implicated in causing recent mass kills.

Choose, if you can, fish oils certified free from these toxins.

THE DEFENCE BOOSTERS : **Essential fatty acids**

Extended bleeding time

The ability of fish oil to prolong bleeding time – which is what happens when you reduce platelet stickiness and clotting – is well known to Finnish dentists. They dread pulling Eskimo teeth because their patients bleed copiously, and need to be given clotting agents.

consumption of two or three pounds of fish per day was by no means untypical.

In the summer there might be assorted berries and roots, but the bulk of the Eskimo's food came from the sea. And because the marine food chain starts with plankton, which is a rich source of Omega 3 fatty acids, the Eskimo ate a large amount of these oils.

This is in complete contrast to the Western diet, which contains a great deal of saturated fat and only tiny amounts of Omega 3. But following an authentic Eskimo diet would be extremely difficult. Even if you could persuade your local supermarket to stock it, you might not be so keen on chewing under-cooked seal fat every day of the week.

Fortunately, there's an alternative. The seal gets its Omega 3 oils from the fish it eats, such as salmon, herring, anchovies, mackerel and tuna – and so can you.

Fish oil reduces:

At low doses

- **Electrical instability of the heart muscle**

At higher doses

- **Inflammation of the artery walls**
- **The risk of blood clots**
- **LDL (the bad) cholesterol**
- **Blood triglyceride levels**

This combination reduces your risk of a fatal heart attack.

A real chance of avoiding heart disease?

Does it work? In a word, yes. This particular nutritional topic has been intensively studied, yielding enough scientific evidence to convince even the most hardened sceptic.

Numerous studies have revealed that large doses of fish oil block many of the steps in the pathological sequence of events that culminates in a heart attack.

To begin with, the PUFAs (poly-unsaturated fatty acids) in fish oil reduce inflammation in the body^(161, 162, 203). Inflammation in the artery walls is one of the earliest steps in the formation of atheroma. Fish oil calms the arteries down, and reduces any inflammatory changes there. This is probably one way fish oil reduces the amount of LDL cholesterol (the 'bad cholesterol') entering the artery wall⁽¹⁶²⁾ – an integral and early step in the formation of atheroma.

Fish oil also reduces platelet stickiness, which inhibits clotting^(163-165, 183, 201, 208), rather like aspirin does. This reduces the risk of thrombosis, which is generally the last link in the chain that leads to the heart attack.

Fish oil's ability to inhibit both the beginning and the end of the

process that culminates in the heart attack begins to explain the Eskimo's good health, but there is more.

Fish oil reduces the level of LDL, the 'bad' cholesterol in the blood^(174, 175), which is desirable in men. It also lowers triglycerides^(166, 167), which is important particularly for women, for whom high triglyceride levels increase the risk of heart disease as much as five times⁽¹⁵⁸⁾. At the same time, fish oil increases levels of HDL, the 'good' cholesterol which lowers the risk of a heart attack⁽¹⁸⁴⁾.

In addition, fish oils tend to prevent the constriction of small arteries, which again reduces the risk of blood clots forming^(168, 197, 198). This opening up of the small arteries, together with the cholesterol-lowering effect, probably explains why fish oil can lower the blood pressure by a small but significant amount, particularly in patients with hypertension and/or coronary artery disease^(169, 190-195). It also explains why so many patients say that fish oil alleviates their angina.

Finally, and at even quite small doses, fish oil reduces the tendency of the heart to develop an arrhythmia (irregular heartbeat)⁽¹⁷⁰⁾, a common cause of death after heart attacks.

Fish on trial

There are at least six ways in which fish oils theoretically protect the heart; but do they work in practice? The answer is yes.

There has been one major trial in the UK, the so-called DART study. DART stands for Diet and Reinfarction Trial and, as the name suggests, the subjects were at above average risk because they had already had at least one heart attack.

This trial showed that oily fish, or fish oil capsules, reduced the risk of a second fatal heart attack by 29 per cent⁽¹⁵²⁾. This is a very significant reduction, all the more so because the subjects all had damaged hearts and arteries.

Which raises the question, how effective could fish oil be in healthy subjects, whose cardiovascular systems are in relatively good shape?

30% Reduction in Heart Disease with Omega 3

A major British study found fish oil reduced the risk of a second attack in heart patients by nearly 30 per cent⁽¹⁵²⁾.

In an American trial of high risk men, large doses of Omega 3 cut the risk of heart attack by over 30 per cent⁽¹⁵³⁾.

... even in low doses

The protective effects of small doses of fish oil (ie in capsules) are due to its ability to prevent heart arrhythmias.

Ginkgo too?

Anyone prone to clotting disorders, and most Europeans⁽²⁰⁴⁾, should consider combining fish oil with ginkgo and Vitamin E.

Ginkgo or Vitamin E also prevent unwanted clot formation in a way which augments the effects of fish oil.

THE DEFENCE BOOSTERS : **Essential fatty acids**

The Eskimo data suggests that if you take enough fish oil, you probably won't get heart disease at all. But what happens if you eat a Western diet, with added fish?

In 1973 some 13,000 American men at risk of developing coronary artery disease were recruited into the Multiple Risk Factor Intervention Trial (MRFIT). (They were thought to have an elevated risk of CAD because they either smoked, had a high cholesterol or blood pressure, or all three.)

The trial ran until 1982, and the results make interesting reading. The more Omega 3 oils in the diet, the lower the risk of coronary artery disease, cerebrovascular disease and total mortality. The benefits were clearest in the highest dose group, who were consuming an average of 664mg Omega 3 a day. In this group, the risk of death from coronary artery disease was reduced by a little over a third⁽¹⁵³⁾.

A large Dutch study also concluded that eating more fish reduced the risk of heart attacks⁽¹⁵⁴⁾ and strokes⁽¹⁹⁹⁾. Other studies have produced more or less identical findings^(2, 3, 155, 156, 205-208).

Giving women priority

One of the problems with studies of coronary artery disease is that they concentrate almost exclusively on men. Women are conspicuous by their absence – which is a scandal, because this act of omission has led to lower standards of care for women.

It is only very recently, for example, that it has been shown that raised blood cholesterol (a risk factor in men) is not necessarily very important in women at all⁽¹⁵⁷⁾.

In women, raised triglycerides (another component of the blood lipid profile) are now considered to be much more important⁽¹⁵⁸⁾. Fish oil, as we have seen, is particularly good at reducing blood triglycerides^(166, 167).

This is a good reason for women to take fish oil or Omega 3 supplements, but there is more. Even

though women are nearly as much at risk of CAD as men, the myth that women don't get CAD has prejudiced the medical profession to the extent that they do not give women such good care as men.

A woman with a cardiac problem is less likely to be diagnosed, less likely to be sent to a consultant, less likely to be given intensive care, and more likely, as a result, to do badly^(159, 160). That's another reason for women to pay special attention to preventative health care, and good cardio-protective nutrition.

Finally, for younger women, there is evidence that a fish oil supplement reduces the risk of developing the potentially dangerous increase in blood pressure that occurs in some pregnancies⁽¹⁸¹⁾ and the risk of premature births⁽¹⁸²⁾.

Fish or supplements?

Governments and doctors alike have agreed that everyone should eat more oily fish^(177, 178).

Nobody's going to eat an authentic Inuit (Eskimo) diet, but eating a good portion of oily fish three times a week will reduce the risk of coronary artery disease; not to the vanishingly low levels of the Inuit, but it will at least cut the Western risk of CAD by up to a third.

A simple change in eating habits should do the trick. Unfortunately, people don't work like that. Even people who have had a heart attack, and have been told to eat oily fish, don't generally do it for long. They won't modify their eating habits. They don't like the taste, they don't like the bones or they don't know how to cook it. They're worried about putting on weight, because the kilo of oily fish a week needed to get the recommended dose of 1- 2 grams a day of the vital Omega 3 oils knocks up over 4,000 calories.

A tiny minority of people – mostly in coastal communities – are genuinely allergic to fish.

There is also concern about levels of heavy metals and other contaminants such as PCBs and organo-phosphates in fish. Our unappealing habit of dumping industrial waste at sea has polluted many fishing sites to the point where measurable amounts of heavy metals and organic contaminants are commonly found in the catch.

Some governmental advisers have suggested, off the record, that fish should not be eaten more than twice a week.

This means that for many people, fish oil capsules are a preferred alternative. Whole fish contains certain nutrients that fish oil capsules miss out, such as iodine and selenium, but a good fish oil (or flax or hemp oil) supplement ensures that you get enough of the Omega 3 oils to reduce your risk of CAD.



LOOK FOR

...

an Omega 3 capsule in the form of free fatty acids or triglycerides,

Oily fish

Oily fish are better than fish oil, because they contain other good things – such as iodine, selenium and astaxanthin. This little-known carotenoid is a powerful anti-oxidant and anti-cancer agent. Derived from red algae, it is the red in red salmon, crayfish and flamingo legs.

THE DEFENCE BOOSTERS : Essential fatty acids



Cod liver oil

Cod liver oil is the top selling supplement. But its benefits are not as clear as fish oil capsules.

First, fish oil capsules deliver far more Omega 3 by weight.

Secondly, a reputable brand of Omega 3 is less likely to be contaminated by heavy metal and other pollutants from ocean dumping.

And thirdly, cod liver oil contains Vitamins A and D – which can cause problems in overdose.

Sun factor

High doses of fish oil protect against sunburn⁽²⁰³⁾, and should be combined with Vitamins C and E and mixed carotenoids.

Asthma

Some asthmatics respond positively to fish oil⁽⁴¹⁾.

FISH OIL MUST BE COMBINED WITH ANTI-OXIDANTS

Because poly-unsaturated oils are so prone to oxidation, it is very important to combine them with an anti-oxidant preparation, especially if you smoke.

Otherwise, you are likely to increase the load of PUFA radicals and oxidation products in your body, which are actually harmful to the arteries⁽¹⁷¹⁻¹⁷³⁾. This may explain the disappointing results of a recent trial which found that fish oil supplements on their own have little effect on preventing atheroma formation⁽²⁰⁰⁾.

The ideal daily anti-oxidant combination should contain

- Mixed carotenoids (10-20mg)
- Vitamin C (500-1000mg)
- Mixed flavonoids (100-500mg)
- Vitamin E as mixed tocopherols (100mg)
- Co-enzyme Q10 (30-120 mg)
- Flavonoids (250mg)

Co-enzyme Q10 is particularly recommended. Apart from its other benefits (see Chapter 9, Q10 and L-carnitine), it is very good at preventing the increase in free radicals otherwise caused by fish oil supplements⁽¹⁹⁶⁾.

Helps osteoporosis, arthritis and smokers too!

Taken in large amounts (8-10g a day) fish oil can be also used as part of a nutritional programme to prevent osteoporosis. It has various effects on the body's ability to handle calcium. It has been shown to enhance new bone growth⁽¹⁷⁹⁾, and reduce the loss of calcium after the menopause⁽¹⁸⁰⁾ (see Chapter 15, Bones). **Lower doses of fish oil are ineffective.**

In addition, the anti-inflammatory properties of fish oil can play a very useful role in the treatment of arthritis. Increasing the amount of oily fish in the diet, or taking fish oil supplements, has been shown to reduce pain and stiffness in inflamed joints^(40, 188, 189, 202, 206).

Other diseases where an anti-inflammatory effect is very helpful include the tobacco-related lung diseases, which are caused by the flood of inflammatory free radicals in cigarette smoke.

Eating more oily fish improves lung function, even in smokers^(185, 186). Another study found that smokers who ate a lot of oily fish cut their risk of developing chronic bronchitis and emphysema by two thirds and one third respectively⁽¹⁸⁷⁾.

Fish oil facts

What makes a good fish oil? The type of fish is irrelevant. All that matters is the content of the two key Omega 3 oils: eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).

Not all brands of fish oil are equal in this respect: some have little medicinal value, with very low levels of EPA and DHA, and are the same grade of fish oil used in some parts of Scandinavia to run central heating plants!

- Check the small print and the EPA and DHA content. You need at least 500mg of Omega 3 a day.
- Check the form of the Omega 3s: free fatty acids and triglycerides are the best absorbed, while the cheaper esters are not good in this respect.
- Check that the preparation is certified free from heavy metal contamination, and from Vitamins A and D. These two vitamins are fine in moderation, but overdose can cause serious health problems.
- Avoid bottled fish oil such as cod liver oils. Many cod liver oils are low grade and do not contain sufficient anti-oxidants.

If it smells fishy, it's gone off, and the oil has begun to oxidise. Oxidised or rancid oils don't do you any good at all, and have been linked to the type of damage to the arteries that leads to coronary artery disease⁽¹⁷¹⁻¹⁷³⁾.
- Go for fish oil in capsules, and make sure the manufacturer has included an anti-oxidant such as Vitamin E.
- Always take them with meals to minimise 'repeating'.

OTHER SOURCES OF EPA AND DHA

If a fish-based diet is too expensive or you are vegetarian, there are alternatives.

- Eat plenty of linseed, hempseed or their oils, and walnuts and pecans. These foods don't contain EPA and DHA, but they do contain linolenic acid (LNA), which the body uses to make EPA and DHA.

It's a slow process, and can be blocked by high levels of the Omega 6 PUFAs – found in most poly-unsaturated oils and spreads. So keep these to a minimum and cut down on meat and dairy produce for the same reason.
- EPA/DHA supplements derived from commercially grown marine algae (see below) are now available.
- In years to come crops will be bred to yield corn oil, for instance, containing EPA, DHA, more GLA and even more exotic oils designed for specific health benefits^(171, 176). Not all GM crops are bad!
- Another alternative is stearadonic acid, an Omega 3 oil derived from the purple viper bugloss. This will be commercially available in the next few years, if the regulatory agencies behave reasonably.

Go wild!

Wild salmon feed on marine algae which contain Omega 3.

Farmed salmon frequently have a lower Omega 3 content as they are usually fed on food pellets that have a lower Omega 3 content.

SUMMARY

The Good Fat Guide

- Follow a Mediterranean-style diet – olive oil, vegetables, fish, herbs like thyme and rosemary – and less meat.
- Cut down on saturated fats (dairy products and red meat) which block the production of EPA and DHA.
- Eat more mono-unsaturated oils like olive oil, and more Omega 3 oils – fish oil, and walnut, sunflower and soya bean oils.
- Switch to wild game or free-range meat which has less saturated fat than farmed meat.
- Increase your Omega 3 PUFAs with herring, wild salmon and trout, mackerel and tuna two or three times a week.
- Take a daily Omega 3 supplement with 400IU natural **or** 145IU Vitamin E as mixed tocopherols and 500mg Vitamin C, mixed carotenoids and flavonoids. Look for fish oil in capsules rather than bottled.
- The Omega 3 supplement should :
 - have high levels of EPA and DHA (500mg a day total)
 - provide Omega 3 in the form of free fatty acids or triglycerides
 - not contain Vitamins A or D
 - be certified free of heavy metal and organic contaminants
 - have a clear 'sell by' date.
- A good Omega 3 supplement reduces your risk of a heart attack.
- Keep oils, especially polyunsaturates, in dark glass, in the fridge.
- When cooking, don't overheat the oil. If it's smoking it's too hot. Don't use iron cookware with oils or fats. Don't re-use cooking oil.
- Add ginkgo if you're prone to clotting disorders. Add garlic, rosemary or thyme when cooking for additional benefits.
- Add grapeseed or green tea extract (available from health food suppliers) to oil before using for cooking – it stops COPs and LOPs forming.
- Grind rosemary, sage, thyme or oregano in olive oil, and use it for flavour and better keeping.
- Use one of the more 'peppery' olive oils. These contain powerful flavonoid anti-oxidants⁽⁴²⁾.
- Cut down on or avoid:
 - poly-unsaturated vegetable oils and spreads.
 - foods which contain hydrogenated vegetable oils or fats.
 - animal fats like butter and lard for frying.
 - deep-fried food from commercial establishments.

