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fish-free for life

Why Plant Omega-3s
are Better for You and
the Environment

by Dr Justine Butler and Jane Easton
Vegetarian & Vegan Foundation



The Vegetarian & Vegan Foundation

The Vegetarian & Vegan Foundation (VVF) is a science-based health and nutrition charity which monitors research on diet and health. We help the public, health professionals and the food industry make informed choices about diet by providing accurate information and advice on healthy eating. The VVF also runs health and education campaigns, gives talks and cookery demonstrations, publishes *Veggiehealth* magazine, the *Vegetarian Recipe Club*, *Vegetarian Shop* and other materials, and answers nutritional queries from the public, media and health bodies.



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Introduction

How many people do you know who call themselves vegetarian and then order fish from the menu? It doesn't seem to matter why they decided to become veggie – ethics, health or environmental –

fish simply don't seem to merit the same consideration as chickens, cows, pigs and sheep when it comes to diet.

Could it be that we've all had it drummed into us that fish are essential for good health (in the same way that we're constantly told that cow's milk is essential for calcium and healthy bones)? With fish, it's those elusive substances called 'essential fatty acids' (EFAs). They're the best source of the magical omega-3s which keep our heart healthy and are vital for our kids' brains to develop – or so we're told.

There is another view – that this is some of the most manipulative and deceptive marketing the UK has ever seen! Everywhere you look, oily fish is promoted – scientists recommend fish oils for children, food programmes on the television cook with them, health food magazines carry fish recipes, even some nutritionists who recommend a plant-based diet (and should know better) say there's no harm in taking a fish oil supplement! Health food shops have on occasion had to display 'SOLD OUT' signs following fish oil frenzies as a result of misleading marketing.

Even whilst promoting fish oils, the government has issued warnings to young people, pregnant and breastfeeding women and those who eventually intend to become pregnant to limit how much oily fish they eat because of the toxic pollutants it contains – pollutants that can harm them as well as unborn babies and infants. Fish now carries a government health warning!

The public has been left confused by these mixed messages.

This guide looks at the science behind health claims for fish and unearths the research that the fish industry would rather ignore – research which clearly shows that plant-based oils are much safer and healthier. It explains what omega-3 fats are, why they're important and recommends sources other than fish. It reveals precisely what toxins are present in fish and how harmful they can be. It explains why public health policies promoting oily fish are misplaced and how they effectively undermine health promotion. This guide will leave you in no doubt – fish is not a health food.

An introduction to fat

Why do we need fat?

Most people automatically think of fat as ‘bad’ but our bodies can’t function properly without some fats – or fatty acids, to be more accurate. They are an energy source and play a crucial role in all cell membranes – the coat that surrounds every cell in our bodies.

Fatty acids help carry cholesterol and when levels are high, a small amount of good (polyunsaturated) fat can help to carry it off for disposal, rather like bin men! When the bin men go on strike, rubbish accumulates in the streets and it’s much the same inside the body – too much bad (saturated) fat causes rubbish (cholesterol) to be deposited in your arteries and raises the risk of heart disease and stroke.

Fatty acids are needed for healthy hair and skin, they protect our organs, keep our bodies insulated and our brains are largely made up of them. We need fatty acids to carry certain vitamins from food into our bodies and without some fats in our diet, we couldn’t function!

The different types of fat

Here’s the technical bit! Fatty acids come in three categories – saturated,

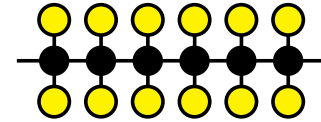
monounsaturated and polyunsaturated, depending upon their structure (a combination of carbon atoms with hydrogen atoms attached – see the illustration right).

Each of these fats behaves differently in the body. **Saturated** fat is so called because it is saturated with hydrogen atoms. The more saturated it is, the harder it is and usually solid at room temperature, such as lard and butter. **Unsaturated** fats such as olive and sunflower oil tend to be liquid at room temperature and elastic, vital for membranes, eyes and the brain, for example.

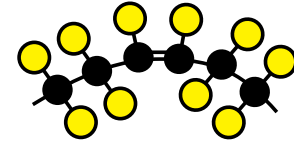
Trans fats

Another type of unsaturated fatty acid, called trans fat, is largely industry-made through a process called hydrogenation – adding hydrogen to low-quality vegetable oils to turn them into butter-like substitutes with a longer shelf-life. These hydrogenated fats behave more like saturated fats and have no health benefits – in fact, they’re extremely unhealthy. They raise ‘bad’ cholesterol levels in the same way as saturated fats but more so. Health authorities worldwide recommend that you avoid trans fats entirely.

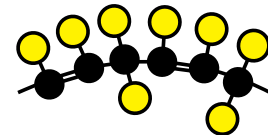
Fatty acids can be saturated, monounsaturated or polyunsaturated depending on how many double bonds there are



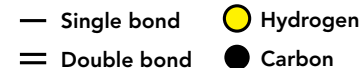
Saturated fatty acid molecule



Monounsaturated fatty acid molecule



Polyunsaturated fatty acid molecule



Good fat, bad fat

The brain is 60 per cent fat and to work properly must contain enough 'bendy' polyunsaturated fatty acids to stay supple and elastic. If fats in the brain are rigid, its function is affected. Fish require large amounts of flexible, unsaturated fat to enable them to see and swim around in cold, dim, watery environments.

They obtain them from plankton, algae and other fish. Polyunsaturated fats are also found in eggs, dairy foods and are plentiful in plant foods – nuts and seeds and their oils, avocados, olives and soya foods, for example. Green leafy vegetables don't contain a great deal as they are low in all fat.

Olive oil is a monounsaturated fatty acid and a good substitute (in moderation) for butter and lard in cooking.

We don't need saturated fat – at all! Found widely in processed foods, meat, dairy, eggs and poultry, it is unhealthy and increases the risk of heart disease and stroke by raising 'bad' cholesterol levels. Despite its promotion as a good source of unsaturated, 'healthy' fats, much of the fat found in some oily fish is saturated (see table, right). For example,

Nutritional content of selected oily fish and vegetarian alternatives

100 grams of:	Protein (grams)	Fat (grams)	Saturated fat (grams)	Cholesterol (milligrams)	Fibre (grams)	Energy (kcal)
Grilled salmon	24.2	13.1	2.5	60	0	215
Smoked mackerel	18.9	30.9	6.3	105	0	354
Tinned sardines	23.3	14.1	2.9	65	0	220
Smoked tofu	10.9	7.1	1.5	0	0.5	112
Red lentils, boiled	7.6	0.4	Trace amounts	0	1.9	100
Kidney beans, boiled	8.4	0.5	0.1	0	6.7	103
Tinned chick peas	10.3	2.5	0.2	0	4.3	119
Vegetarian style fish fingers (Redwoods)	13.3	15.2	1.9	0	1.0	279

Sources: Food Standards Agency, Sainsbury's, Redwoods and Cauldron Foods

grilled salmon contains the same amount of saturated fat as a roast chicken drumstick.

Contrary to popular belief, all fish and shellfish also contain cholesterol. Prawns, for instance, contain four times as much cholesterol as rump steak. Plant foods, like fruits, vegetables, wholegrains, nuts and seeds, contain no cholesterol.

Even fish that are lower in fat than red meat and chicken are not as low in fat as most vegetarian foods such as fruit, vegetables, pulses and wholegrains.

However it's dressed up, fish is not a low-fat food and the high levels of cholesterol and saturated fat in some make them a poor choice for fat-reducers.

Getting to know your essential fats

The idea that some fats are essential for growth came from scientists George and Mildred Burr in the late 1920s. Since then, two polyunsaturated fats have been classified as 'essential fatty acids' – 'EFAs'. They can't be made in the body and therefore have to be eaten. Their names don't trip off the tongue – linoleic acid (LA) and alpha linolenic acid (ALA).

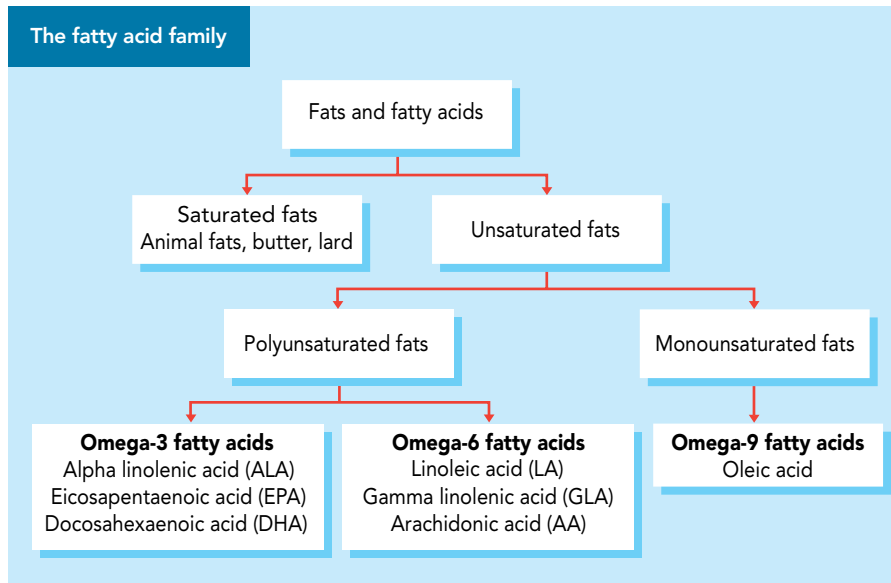
Meet the parents

ALA is a 'parent' omega-3 EFA as it can be converted by the body to form EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) – both omega-3s.

With omega-6 fats, LA is another parent, converting into GLA (gamma linolenic acid) and AA (arachidonic acid). Although EPA, DHA, GLA and AA are all important fatty acids, they are not essential fatty acids (EFAs) as they can be produced in the body from the parent fats ALA and LA.

What's so essential about EFAs?

EFAs help to make the cell membranes that coat every single cell in our bodies. They are crucial for the brain and nervous system, as well as our eyes and play a part in controlling



blood pressure, blood clotting, the immune system and inflammatory responses.

How much fat?

In 2003, the World Health Organisation (WHO) and the United Nations Food and Agriculture Organisation (UN FAO) issued a joint recommendation setting out how much of each fat we need – monounsaturated, saturated and polyunsaturated. They measured it in calories (see table, right).

Many people eat too much fat and to hit these targets, would have to cut down on the total amount they eat but particularly their saturated fat. Consumption of omega-6 fats has shot up with the popularity of oils such as sunflower and corn oil (and the processed foods that contain them) and these, too, may need to be reduced. On the other hand, most people need to increase their omega-3 intake.

How much oily fish?

In 2004, the UK Food Standards Agency issued guidelines on oily fish intake (see table, right).

The lower limit for breastfeeding mothers and pregnant women (two portions rather

WHO recommendations for daily fat intake

Type of fat	Percentage of total energy	Grams required for women (19-50) consuming 1,940 calories/day (kcal)	Grams required for men (19-50) consuming 2,550 calories/day (kcal)
Total fat	15-30	32.3-64.7	42.5-85.0
Saturated fat	Less than 10	Less than 21.6	Less than 28.3
Polyunsaturated fats	6-10	13.0-21.6	13.3-28.3
Omega-6	5-8	10.8-17.2	14.2-22.7
Omega-3	1-2	2.2-4.3	2.8-5.7

Food Standards Agency recommendations for the maximum number of portions of oily fish we should be eating each week (a portion is about 140g)

Two portions of oily fish	Four portions of oily fish
Girls and women who might have a baby one day	Other women
Women who are pregnant or breastfeeding	Men and boys

Where to get your daily omega-3s

Omega-3 fatty acids 1 daily portion is:

Flaxseed (linseed) oil 1-2 tsp

Ground flaxseed (linseed) 2 tbsp

Rapeseed oil 2 tbsp

Hempseed oil 1 tbsp

Hempseed 3-5 tbsp

Walnuts 8 halves (28 grams)

People with diarrhoea, irritable bowel syndrome, diverticulitis or inflammatory bowel disease (Crohn's disease or ulcerative colitis) should use caution if taking flaxseed (but not flaxseed oil) due to its possible laxative effects. If you have a medical condition, or are taking other drugs or supplements you should consult a doctor or nutritional therapist before changing your diet.

than four) is because most oily fish contain low levels of pollutants that can build up in the body. Curiously, the FSA doesn't seem to think that young boys need protection from toxic pollutants! The health benefits, they say, are greater than the risks so long as you don't eat more than the maximum. Hardly reassuring!

Most people can obtain all the essential omega-3 fatty acids they need by including good plant-based sources of omega-3s in their diet, such as flaxseed (linseed), rapeseed and their oils. Flaxseed oil is a particularly rich source containing around two-and-a-half grams of ALA per teaspoonful.

The table (left) shows how much you should aim to include in the diet each day. These fats are easily damaged by light or heat so keep these foods refrigerated. The oils should not be used in cooking; use them on salads in dressing and dips.

EFA deficiency

For adults, EFA deficiency occurs when intakes are less than 1-2 per cent of total energy intake. Fortunately, damage is rare as even tiny amounts of EFAs can prevent it. According to the Department of Health,

most Western diets provide 8-15 grams of EFAs a day and healthy people carry a body reserve of 500-1,000 grams.

Where low levels of EFA do occur, it's mostly in infants fed very poor diets. Typical symptoms include excessive thirst, frequent urination, dry or rough skin, dry hair, dandruff, brittle nails, headaches, stomach ache, diarrhoea and constipation.



Low levels of omega-3 fats in particular are also associated with behavioural problems such as hyperactivity-impulsivity, anxiety, temper tantrums,

sleep problems and learning difficulties in some children. More specifically, low levels of DHA omega-3 have been linked with depression, schizophrenia, Alzheimer's disease and attention deficit hyperactivity disorder (ADHD).

It follows that omega-3 fatty acids are important for the brain and low levels may affect behaviour, learning and mood. It

is important to ensure omega-3 intake by consuming sufficient 'parent' EFAs for conversion. Adding them to the diet will reverse any deficiency (see page 12 for good sources).



Balancing the fat

The ratio of omega-6 to omega-3 fats may be more important than the actual amounts of each fat eaten because omega-6 competes with omega-3, essentially cancelling it out. It follows that cutting down on omega-6 may be just as important as increasing omega-3 to get the balance right.

Over the last few decades, consumption of sunflower, corn oil and vegetable fats in processed and baked foods has increased. As a consequence, omega-6 intake has gone up, as has the ratio of omega-6 to omega-3 fats.

Typical diets can produce whopping ratios of 30:1 (omega-6 to omega-3) in contrast to the WHO's recommendation of between 10:1 and 5:1. Other sources recommend ratios as low as between 4:1 and 2:1 but it's not

an exact science. Be aware of which foods contain which fats and choose accordingly. For omega-3, a good rule of thumb is little and often.

Reduce the use of sunflower, safflower and corn oils, replacing them with olive oil, flaxseed, rapeseed and soya bean oils.

Optimising conversion

The body converts the plant omega-3 ALA into the longer chain omega-3s (EPA and DHA), otherwise found in fish. However, we are repeatedly told – particularly by fish oil supplement companies – that conversion rates are low and inefficient. The claim that we cannot convert enough ALA to EPA and DHA is simply not true, but does serve to protect the fish oil market. The better health statistics for vegetarians and vegans – who don't eat fish – provides proof that they don't go short.

Several studies have measured the rate at which we convert ALA to EPA and DHA. A conservative

estimate is that about 5-10 per cent of ALA is converted to EPA and 2-5 per cent to DHA. Some studies show much higher levels of conversion (22 and 9 per cent respectively). Furthermore, a recent study revealed that vegetarians convert more than fish-eaters. It seems that we can convert as much or as little as we need, providing we have enough starting material (ALA).

As the body's fat deposits usually contain ALA, even a very low conversion rate of just 2.7 per cent would allow an average person to make the same amount of EPA as would be found in 18 large (1,000mg) capsules of the omega-3 richest fish oil. Even a person with no omega-3 fats in their body (perhaps after a long-term shortfall in the diet) who takes two tablespoons of flaxseed oil a day can make more EPA than contained in two large fish oil capsules.

In addition to this, we are capable of 'retroconversion' –





this means we can make EPA from DHA. So if you take an algal supplement that only contains DHA you can boost both DHA and EPA levels without exposing yourself to toxic pollutants found in fish oils. Furthermore, the EPA we make in our bodies has the advantage of being fresher and more stable than that found in fish oils.

If more people knew that they were perfectly capable of producing sufficient amounts of EPA and DHA from ALA they might avoid using rancid, contaminated fish oils and switch to plant-based omega-3s.

The good stuff

Poor diets can also reduce the rate of conversion, whilst a wide range of nutrients in a good diet (biotin,

calcium, magnesium, vitamin B3, vitamin B6, vitamin C and zinc) can improve it. A well-balanced diet rich in fruit, vegetables, pulses, wholegrains, nuts and seeds will provide all these nutrients and more.

The bad stuff

Hydrogenated fat (trans fats) found in some margarines, biscuits and pastries as well as meat, dairy products and alcohol can inhibit conversion.

Too much omega-6 can reduce omega-3 conversion by as much as 40 per cent. Wholefoods such as sunflower seeds, pumpkin seeds, sesame seeds, wheatgerm and soya foods do contain omega-6 but not enough to worry about and they do contain plenty of other healthy nutrients such as fibre, vitamins and minerals.

Using monounsaturated (olive oil) oil instead of polyunsaturated oil ensures that saturated

A range of nutrients help convert plant omega-3 ALA to the longer chain omega-3s EPA and DHA

Nutrients

Good sources

Biotin	Yeast extract, pulses (peas, beans and lentils), nuts and most vegetables
Calcium	Nuts, seeds (especially sesame seeds), tahini (sesame seed paste), pulses, calcium-set tofu, calcium-fortified soya milk and green leafy vegetables (not spinach)
Magnesium	Green leafy vegetables, pulses, wholegrains, nuts, seeds and avocados
Vitamin B3 (niacin)	Yeast extract, peanuts, wholemeal bread, mushrooms, sesame seeds, pulses, green leafy vegetables, asparagus, sweet potatoes and carrots
Vitamin B6 (pyridoxine)	Bran, wholemeal flour, yeast extract, hazelnuts, bananas, peanuts, currants, garlic and most vegetables
Vitamin C	Widely available in fruit and vegetables especially oranges, grapefruits, strawberries, blueberries, broccoli, green peppers, spinach and cabbage
Zinc	Sesame and pumpkin seeds, green vegetables, lentils and wholegrain foods

fats, trans fats and omega-6 fats are kept in check. Monounsaturated fats are also found in nuts, peanuts, olives and olive oil, avocados and rapeseed oil.

It doesn't matter how efficiently you convert ALA if you don't eat enough of it! Working on the WHO's recommendation of 1-2 per cent in the diet, a woman consuming an average of 1,940 calories per day needs between 2.2 to 4.3 grams of omega-3 fats per day and for men with a 2,550 calorie intake, it is 2.8 to 5.7 grams per day (see table, page 8).

Good sources include ground flaxseeds, hempseeds, rapeseeds and their oils, walnuts, soya beans and products made from them (such as tofu), green leafy vegetables and some species of algae, which may also contain EPA and DHA. You can also buy blended plant oils in health stores that supply omega-3, -6 and -9 fatty acids in the ideal balance (eg Udo's Choice Ultimate Oil Blend, or Well-Oiled – available from the VWF shop). The table on page 9 should meet most people's ALA needs.

Omega-3s from algae

Fish obtain their omega-3s from

Plant sources of EFAs

100 grams of:	Omega-3 ALA (grams)	Omega-6 grams LA (grams)
Oils		
Flaxseed (linseed) oil	53.30	12.70
Hempseed oil*	20.00	60.00
Walnut oil	10.40	52.90
Rapeseed (canola) oil	9.13	18.64
Wheatgerm oil	6.90	54.80
Soya oil	6.79	50.42
Corn oil	1.16	53.23
Sunflower oil	0.00	65.70
Nuts and seeds		
Flaxseeds (linseeds) ground, 2 tbsp	22.81	5.90
Walnuts	9.08	38.09
Hempseeds*	7.50	22.50
Vegetables, Fruits and Pulses		
Soya beans, cooked	0.60	4.47
Tofu, firm	0.58	4.34
Broccoli (cooked)	0.11	0.05
Soya milk	0.08	0.59
Strawberries	0.07	0.09
Peas (frozen and cooked)	0.02	0.08

Source: USDA National Nutrient Database for Standard Reference, 2008. * Adapted from Leizer et al., 2000, Journal of Nutraceuticals, Functional and Medical Foods. 2 (4) 35-53.

eating plankton, algae and other fish that have eaten plankton and algae; wild foods naturally rich in omega-3s. While some algae produce only DHA, recently discovered species contain both EPA and DHA. So, if you're concerned about conversion, fear not, you can obtain both of these omega-3 fatty acids from algae! Brands are available online.

Algae for omega-3 supplements is usually grown in controlled conditions away from the sea so it doesn't impact on marine ecosystems or deprive fish of their natural food. When fish stocks are declining so rapidly it is highly irresponsible to continue pushing them as the best source of omega-3s. Alternatives must be found and algae and other plant sources are the obvious choice. The bonus is that toxin levels are virtually non-existent.

Oily fish, omega-3s and health

The heart of the matter

One of the main reasons oily fish is promoted is because EFAs can lower the risk of heart disease. They got the nutritional thumbs up when it was seen

that Japanese and Inuit (Eskimo) people who eat lots of fish had much lower rates of heart disease. Research showed that EPA and DHA from fish helped reduce blood-clotting and lowered blood pressure, cholesterol and fat levels – all factors in reducing heart disease. What the research ignored was that EPA and DHA can be formed from plant omega-3 (ALA).

Since then, numerous studies have looked at the role of ALA, EPA and DHA in reducing heart disease with three studies in particular most usually being quoted – DART, GISSI and LYON.

The DART and GISSI trials showed how fish oils could reduce death rates in people who already have heart disease. Plenty of other studies showed that plant-based oils did the same thing – but without harmful toxins – particularly the LYON study.

DART – fish to fight heart disease

The DART trial set out to find if oily fish or fish oil supplements could help prevent a second heart attack in people who had already had one attack. It showed that those on fish oils were a third less likely to die from heart failure in the two years

after their first heart attack compared to those not taking fish oils. The improvement was thought to come from a normalising of heartbeat rhythms where heartbeats were irregular (arrhythmia).

While the DART trial showed a reduced number of deaths it didn't show a reduction in heart attacks – fewer deaths but the same number of painful attacks. A large body of evidence shows that plant-based diets can be used to both prevent and even reverse heart disease (see the VVF guide *Have a Heart* for further information).

Those taking blood-thinning medication such as daily aspirin or warfarin should speak to their GP before eating lots of food with added omega-3 or fish oil supplements, as these can also reduce blood-clotting.



GISSI – fish oil and heart disease

The GISSI trial also looked at the effect of EPA and DHA omega-3s on people who had recently survived a heart attack. Some were given a daily supplement of fish oil capsules while others weren't.

After three-and-a-half years, it showed a 20 per cent reduction in death rates for those on fish oil but, like the DART trial, the number of non-fatal heart attacks was unchanged. The daily one gram of fish oil taken was the equivalent to eating 100 grams of oily fish a day – exceeding the Food Standards Agency's 'safe' levels (see page 8).

No benefit

These two studies showed that fish oils may reduce the risk of death in people who have already had a heart attack but a review of many more studies showed that fish and fish oils do not reduce the risk for people with no history of heart problems. So, those with healthy lifestyles don't protect their heart by eating fish. There is now even doubt that fish oils offer protection to people with existing heart disease.

No long-term protection

Over a decade after the DART trial started, researchers went back to the fish and non-fish groups and found, to their surprise, that the death rate was almost identical in both groups. So, there was no evidence of long-term protection even for those with a heart condition.

Another study looked at whether advising men with angina to eat oily fish or fish oil supplements would help their condition. It found an *increased* death rate of 20 per cent and 45 per cent respectively! Health organisations and the government should perhaps rethink their promotion of fish and fish oils.

The *British Medical Journal* drew all the evidence together in a major review which looked at 89 studies on omega-3 fats and found no clear evidence that people's health benefited from them. Surprising, considering the benefits previously shown for omega-3s. What could it be about fish omega-3s that was negating these positive effects?

A possible explanation was provided by one large study in their review that showed

a significant increase in deaths from heart attack in men taking fish oil capsules. This trial had the longest follow-up period of all the studies. It was thought that the mercury in fish oil could build up over time and that early protective effects might later become harmful. In other words, pollutants cancel out the beneficial effects of fish omega-3s in the long term!

LYON – plants on trial

The LYON study investigated whether a healthier, Mediterranean-type diet could reduce the risk of a second heart attack.

Patients were given either a Mediterranean diet or a low-fat 'prudent' Western diet. The Mediterranean diet was largely plant-based with butter and cream being replaced with olive oil and rapeseed oil margarine. The diet did contain some fish but less red meat and was lower in animal fat. It had much less cholesterol but was higher in the plant omega-3 ALA.

This diet increased levels of ALA in the blood by 70 per cent and EPA by 40 per cent. Their fish intake was only seven grams a day more than the group on the 'prudent' Western diet so the higher

EPA levels were due to plant ALA rather than fish.

After almost four years, patients following the Mediterranean-style diet had a 50-70 per cent lower risk of recurrent heart disease compared to those on the 'prudent' Western diet.

An important difference between this and previous studies with fish oils was that the number of non-fatal heart attacks was reduced. Secondly, the diet's protective effect was associated with the parent omega-3 ALA rather than the converted EPA as in previous studies. In fact there was no link between the converted EPA and DHA omega-3s and a reduction in heart attacks.

The LYON study showed that plant ALA is extremely effective in reducing the risks of secondary heart disease, that it was superior to fish-derived EPA and DHA in reducing the risk of a second heart attack and that it protects the heart in the long-term.

The bonus is that the Mediterranean diet is rich in disease-busting antioxidants that can help reduce the build up of fatty deposits in the arteries that lead to heart

disease and reduce the risk of cholesterol becoming 'oxidised' – the body's equivalent of rust. When oxidised, 'bad' cholesterol can harm the walls of arteries, increasing the risk of heart disease.

The problem is – this research does not appear to have reached health professionals! Around 300,000 people in Britain have a heart attack every year and many of those who survive receive little or no dietary advice. Many scientists agree that survivors should be advised to follow a diet similar to that used in the LYON study.

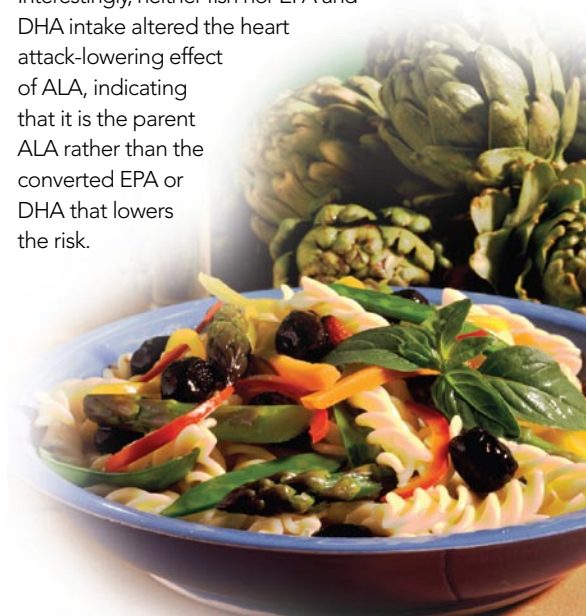
Plant omega-3s and heart disease

There is a wealth of science showing that plant-based omega-3s protect against heart disease. The Health Professionals' Study found that a one per cent increase in ALA intake lowered the risk of heart attack by 59 per cent. The Nurses' Health Study found that those who ate the most ALA had a 45 per cent lower risk of fatal heart disease.

In 2003, a WHO/UN FAO report supported the fact that ALA protected against heart disease and listed flaxseed, rapeseed and soya bean oils as being beneficial.

In 2008, a study in the journal *Circulation* (the journal of the American Heart Association) reported that when ALA intake was just 0.65 per cent of daily energy intake (compared to 0.24 per cent), non-fatal heart attacks reduced by a staggering 57 per cent. In weight, this amounts to just 1.79 grams per day – two teaspoons of soya bean or rapeseed oil, 1-2ml (1tsp = 5ml) of flaxseed oil, or 6-10 walnuts a day would do the trick.

Interestingly, neither fish nor EPA and DHA intake altered the heart attack-lowering effect of ALA, indicating that it is the parent ALA rather than the converted EPA or DHA that lowers the risk.



veggie diets...

THE RIGHT PRESCRIPTION

Changing your diet can change – and save – your life! Meat, poultry, fish, eggs and dairy products all contain cholesterol while a plant-based diet contains little or no cholesterol so, not surprisingly, vegans have lower cholesterol levels than vegetarians – fish and meat-eaters tend to have the highest. As a result, vegetarians and vegans have a much lower risk of heart disease than meat-eaters – and a 25 per cent lower risk of dying from heart disease! If people throughout Britain went vegetarian, there would be some 40,000 fewer deaths from heart disease every year.

And it's never too late to change. Plant-based diets can not only prevent heart disease, they can reverse the damage. Dr Dean Ornish, Clinical Professor of Medicine at the University of California in San Francisco, is known for his Lifestyle

Heart Trial in which he treated severe heart disease patients by changing their lifestyle and nothing else. They ate a low-fat, wholegrain, plant-based diet containing lots of fruit, vegetables and pulses, took exercise and managed their stress. A 'control' group of similar patients received conventional treatment.

After one year, the control group experienced a 165 per cent increase in the frequency of chest pain, cholesterol was higher and artery blockages had worsened. Conversely, 82 per cent of the patients following Ornish's lifestyle changes had improved with a 91 per cent reduction in chest pain and reduced cholesterol levels.

For more information on heart disease see the VVF fact sheet *Plant-based Diets and Cardiovascular Disease*.

The conclusion of the study was that vegetable oils rich in ALA could provide important protection against heart disease. The National Heart, Lung and Blood Institute Family Heart Study showed that men eating the most ALA had a 40 per cent lower risk and women, a whopping 50-70 per cent reduction.

Inflammatory diseases

It's been known for years that omega-3 fats can help fight coronary heart disease, asthma, type 1 diabetes and multiple sclerosis. The beneficial effects have also been seen in some cancers, inflammatory bowel disease, arthritis, osteoporosis, mental health, dry eye disease, age-related macular degeneration and psoriasis. Many of these conditions involve inflammation.

Our bodies use inflammation to protect tissues from infection, injury or disease. It usually promotes healing but, if uncontrolled, can harm. We now know that the balance of omega-6s to omega-3s is important for regulating inflammation. As a general rule, omega-6 fats are considered pro-inflammatory, whereas omega-3 fats are considered anti-inflammatory (GLA is the exception as it is an omega-6 fat with anti-inflammatory properties).

There is evidence that changing the diet can help some people with inflammatory conditions; some of these are discussed below.

Arthritis

Arthritis is a painful condition of the joints and bones. There are many different forms of arthritis; the two main types are osteoarthritis and rheumatoid arthritis. Other forms include ankylosing spondylitis, cervical spondylitis, fibromyalgia, lupus, gout, psoriatic arthritis and Reiter's syndrome.

Osteoarthritis

Osteoarthritis is the most common type of arthritis in the UK, affecting 8.5 million people. Sometimes called 'wear and tear' arthritis, it occurs when cartilage (the strong, smooth lining covering our bones) breaks down faster than it can be repaired. Eventually the surface of the bones rub together, causing damage. This can lead to bony growths developing around the edge of the joints and inflammation of the tissues. Osteoarthritis mostly occurs in the knees, hips and hands but can affect any joint.

It generally occurs in the over 50s, and is more common in women than men. However, it is

not an inevitable part of aging. It can develop after an injury to a joint; this can happen months or even years after the injury.

There is much less research on omega-3s and osteoarthritis compared to rheumatoid arthritis (see below). However, some work indicates that omega-3s are involved. One study found that cartilage from osteoarthritis patients had higher levels of omega-6s and lower levels of omega-3s than muscle tissue from the same people. Another study showed that long chain omega-3s can reduce the level of cartilage-degrading enzymes. This raises the possibility that omega-3s can help prevent the loss of cartilage and ultimately prevent osteoarthritis.

More research on omega-3 fats and osteoarthritis is needed. Eating a healthy plant-based diet, containing a good supply of omega-3 fats (including an algal supplement if necessary), would however be a good insurance policy, rather than just waiting for the research.

Rheumatoid arthritis

Rheumatoid (inflammatory) arthritis is a more aggressive, but less common condition than osteoarthritis. It is known as

an 'autoimmune' disease, whereby the body's own immune system attacks the joints, causing pain and swelling and the destruction of cartilage and bone.

Rheumatoid arthritis affects around 350,000 people in the UK and like osteoarthritis, is also more common in women than men. It is most common after the age of 40, but can affect people of any age.

It is characterised by hot painful swelling in the joints. It usually starts in the wrists, hands and feet but can spread to other joints. In many diseases inflammation can help healing, but in rheumatoid arthritis, it damages. For some people the discomfort, pain and loss of mobility can have a serious impact on their lives.

Diet and arthritis

In the past, people with arthritis were told that changing their diet would not help them. Despite this, over the years, many arthritis patients have found that certain foods can help, while others can harm.

Arthritis Care, the UK's largest voluntary organisation working with and for

people with arthritis, suggest a diet high in fruit, vegetables, pasta, fish and white meat and low in fatty foods such as red meat, cream and cheese can help. Most people would benefit from eating less saturated fat and sugar and eating more complex carbohydrates, fibre, vitamins and minerals. It is clear that for many people with arthritis, a healthier diet can help considerably.

The research shows that people who eat the most red meat, white meat and meat products have the highest risk for inflammatory arthritis, while vegetarian and vegan diets can prevent and treat this and many other diseases.

Studies show that low-fat, gluten-free, vegan diets can help reduce symptoms of arthritis. Other work, looking at an uncooked vegan diet, rich in antioxidants and fibre, reduced joint stiffness and pain. Further studies show that fasting, followed by a vegetarian or vegan diet can help people with arthritis. These studies provide strong evidence that dietary modification can benefit arthritis patients and that some foods do help while others harm.

Weight control

It is very important for people with arthritis to maintain a healthy weight. The extra burden on the joints, in overweight or obese arthritis patients, can make symptoms much worse. Losing weight can have a dramatic effect in improving the condition.

Vegetarian and vegan diets can help people lose weight and maintain a healthy body weight. Many studies show that vegetarians and vegans weigh less than meat-eaters; on average between six pounds and two stones less.

When losing weight, it is important to ensure a good intake of nutrients. A healthy balanced diet containing plenty of fruit and vegetables, pulses and wholegrain foods (wholemeal bread, brown rice and wholemeal pasta) provides a good supply of vitamins, minerals and fibre. A diet lacking in these foods and rich in meat, dairy and processed foods (such as white bread, white rice and white pasta), does not provide a good source of nutrients. Find out how to achieve and maintain a healthy weight while protecting your health too in the VVF's *V-Plan Diet* guide.

Getting the fats right

While vegetarian and vegan diets have been shown to help some people with arthritis, people who eat large amounts of red meat, dairy and processed foods may suffer more. The key point here is that plant-based diets (rich in antioxidants and omega-3 fats) are helpful, whereas Western diets (rich in meat, dairy and processed foods) contain harmful saturated fat which can increase the pain and inflammation of arthritis. The fact that people also lose weight on a plant-based diet is an added bonus.

Omega-6 fats don't appear to help people with arthritis. In fact, they may increase inflammation by competing with omega-3 fats. Most people have diets which already contain more omega-6 than they need. If you have arthritis, it may be helpful to replace some of the omega-6 fats (found in sunflower oil, corn oil and products made from them such as margarine) with omega-3 fats from flaxseed, hempseed and rapeseed oils and walnuts. Omega-3s from these sources will ensure you get this healthy fat without exposing your body to the harmful toxins found in oily fish. For an extra boost, you can take omega-3 algal supplements.

Gout

People with gout are advised not to eat oily fish. Gout is a type of arthritis caused by a high level of uric acid in the body which can crystallise in the joints and cause severe pain and inflammation. Uric acid is produced from the breakdown of foods high in substances called purines. Such foods include certain meats (kidney, liver, veal, turkey and venison) and fish (anchovies, herring, mackerel, sardines, fish roes, mussels and scallops).

To avoid foods high in purines, replace animal-based foods with other sources of protein such as pulses, nuts and seeds. Other dietary measures for gout include losing weight (if you are overweight) and avoiding excessive alcohol consumption.

Calcium

A well-balanced healthy diet can help if you are taking strong drugs for arthritis. In fact, it could help protect against some of the side-effects. For example steroids (such as prednisolone), can cause osteoporosis, particularly if you stay on them for a long time. Plenty of calcium in your diet will help reduce the risk.

Arthritis Care warns that some people with arthritis have an increased risk of osteoporosis and say that ensuring a good calcium intake is very important. While cow's milk and dairy products are indeed a source of calcium, they are not the best. This is because they contain animal protein. Excessive amounts of animal protein can upset the acid balance within the body, which then takes calcium from the bones to neutralise the acid. Even the usually pro-dairy National Osteoporosis Society says that it is a good idea to avoid too much protein, particularly animal protein such as meat and cheese. It is also a good idea to avoid too much salt, fizzy drinks and caffeine for the same reason.

Healthy sources of calcium include green leafy vegetables (broccoli, kale, spring greens, cabbage, parsley and watercress – but not spinach), dried fruits (figs and dates), nuts (almonds and Brazil nuts), seeds (sesame seeds and tahini – sesame seed paste) and pulses (peas, beans, lentils and soya products such as calcium-set tofu and calcium-enriched soya milk). For more information on calcium see the VVF's fact sheet *Boning up on Calcium*.

Iron

Some people with arthritis may be concerned about their iron intake, particularly (they may be told) if they have decided not to eat red meat. This should not be a concern as the British Medical Association and the American Dietetic Association agree that vegetarians are no more likely to suffer from iron deficiency than meat-eaters. Indeed one of the largest studies of vegetarians and vegans in the world found that the vegans had the highest intake of iron, followed by the vegetarians and then the meat-eaters. Good sources of iron include pulses, dried fruits and green leafy vegetables.

Unlike iron from plant foods, the iron in meat is absorbed into the body whether it is needed or not. Thus meat can supply an overload of iron (but no vitamin C and very little vitamin E). Excessive iron in the diet can increase production of harmful molecules called free radicals (see *Antioxidant action*, page 20) linked to heart disease, cancer and other diseases. Conversely, vegetables and wholegrain foods can supply as much, or as little iron as is required, as well as an abundance of antioxidant vitamins and other nutrients.

For more information on iron see the VVF's fact sheet *Ironing out the Facts*.

Antioxidant action

The antioxidant vitamins A, C and E protect against disease (and aging) by 'mopping up' harmful free radicals, produced as your body breaks down food or when it is exposed to harmful chemicals (including cigarette smoke). Free radicals play a role in the development of many diseases. They do this by causing a sequence of events (rather like a line of dominos falling down) which can ultimately result in cancer, heart disease or arthritis.

Anti-rheumatic drugs may work by acting as antioxidants. For example, non-steroidal anti-inflammatory drugs act as free radical 'scavengers' mopping up free radicals. However, antioxidants may be more useful in preventing damage before it occurs, rather than treating an already inflamed joint. A plant-based diet, rich in a wide range of brightly coloured fruit and vegetables (such as sweet potato, red cabbage, carrots, blueberries and so on) will provide an abundance of disease-busting antioxidants that will fight off many diseases, not just arthritis.

Omega-3s

For some people with arthritis, omega-3 supplements may be helpful, for example a tablespoon of flaxseed oil twice a day (this exceeds the 1-2 teaspoon-a-day recommendation for normal consumption). If it is helpful, it is a good idea to try to reduce your intake to the lowest effective dose.

Additional treatments

Some arthritis patients have benefited from taking a herbal remedy isolated from rose-hips. In one study, the rose-hip remedy reduced pain so much after just three weeks that patients were able to reduce their intake of painkillers and non-steroidal anti-inflammatory drugs. This result compares favourably with glucosamine, currently the most popular supplement for joint health.

Summary

Losing weight and eating a healthy plant-based diet that includes a good supply of omega-3 fatty acids (either through foods or algal supplements) and antioxidants can help reduce the symptoms of arthritis and may help some people reduce the amount of medication they are taking.

Multiple sclerosis

Multiple sclerosis (MS) is a disease affecting the central nervous system (the brain and spinal cord). In MS, the protective sheath called myelin, that surrounds the nerve fibres of the central nervous system becomes damaged. This disrupts the messages that pass between the brain and other parts of the body. Symptoms include blurred vision, paralysis, slurred speech, lack of coordination and incontinence. The severity of symptoms depends on how much damage has occurred.

Around 85,000 people in the UK have MS and twice as many women as men are affected. It can occur at any age, but in most cases symptoms appear between the ages of 20 and 40. Most people with MS suffer attacks followed by periods of recovery. This is why MS is called a relapsing-remitting condition. It is a life-long condition, but it is not terminal and people with MS can expect to live as long as anyone else.

MS is an autoimmune disease whereby the body's immune system attacks its own tissues. As with other autoimmune diseases (like rheumatoid arthritis or

type 1 diabetes), it is thought that a combination of genetic factors and environmental triggers cause the disease. Although genes are involved, evidence suggests that MS is more strongly related to environmental factors which may include bacteria, viruses or components of the diet.

Geographical pattern

One of the most interesting features of MS is that it occurs mostly in countries far from the equator. It is relatively common in the UK, North America and Scandinavia, but rare in Malaysia and Ecuador. The reason for this is not really understood; it could be that MS is triggered by a bacteria or virus which thrives in cooler climates. Alternatively, it could be that certain foods eaten in these countries are responsible.

Populations that eat lots of animal-based foods are most affected by MS. In fact, many studies reveal a striking link between the geographical pattern of MS and that of meat and dairy food consumption. In general, the evidence shows that foods rich in saturated fats are associated with higher levels of MS, while foods rich in polyunsaturated fats are linked to lower levels.

Omega-6 fatty acids and MS

Omega-6 fats may be involved in both the development and treatment of MS. This may be because people with MS do not process them as well, leading to lower levels than in people without MS.

Studies show that taking borage oil (containing the omega-6 fatty acid GLA) can lower the number of relapses and slow the disease. Some experts argue that it would be good for people with MS to add more omega-6 fats to their diets. Others disagree saying that the evidence is not there and it should be avoided because of the potential negative health consequences.

An ideal way of getting enough (but not too much) omega-6 is through increasing flaxseed oil in the diet, as it contains both omega-6 and omega-3 fatty acids. Some experts recommend consuming four teaspoons of flaxseed oil daily (higher than the 1-2 teaspoons-a-day recommended normally). In general, a low saturated fat, plant-based diet, containing both omega-6 and omega-3 fats in a healthy balance may help control MS.

Autoimmune diseases

In general, diets low in saturated fat and high in omega-3 fats can reduce the severity of some autoimmune diseases such as rheumatoid arthritis, while diets high in omega-6 fats may increase the severity. The possible exception is MS; there is convincing evidence for a protective role of both omega-6 and omega-3 fats in MS.

The immune system works best when there is a good balance of omega-6 and omega-3 fats in the diet. The optimum ratio varies depending on age and the condition being treated. Some scientists recommend ratios between 5:1 and 10:1 omega-6 to omega-3. Others suggest a ratio of between 1:1 and 4:1 as being best. What are we getting? The current ratio in our diet is estimated to be higher than 15:1 and may be as much as 30:1 in some people. We clearly need to increase our intake of omega-3s.

You can improve your ratio by making a few simple changes: use olive oil in place of sunflower or safflower oil, and flaxseed oil in dressings and dips. If you want to improve the ratio further, take flaxseed oil or an algal supplement.

The overall message is clear: a plant-based diet low in saturated fat, salt and sugar (and processed foods) and high in fresh fruits, vegetables, wholegrain foods, pulses, nuts and seeds can provide all the nutrients required for good health while protecting against a wide range of diseases.

As the incidence of most autoimmune diseases is directly linked to the consumption of animal foods, this approach could help prevent many autoimmune conditions that occur increasingly in populations that eat large amounts of dairy and meat products.

Allergies

The steep rise in the amount of omega-6 fats in the diet and the huge drop in omega-3 fats is a major driver of the increase of inflammatory allergic reactions.

The omega-6 fat LA is made into arachidonic acid in the body, which gives rise to hormones that promote inflammation. So high levels of omega-6s can encourage allergic inflammation. On the other hand, omega-3s reduce inflammation as they compete for the enzymes that convert omega-6s into arachidonic acid, thus blocking production of inflammatory hormones.

Asthma

Asthma is a chronic, inflammatory lung disease characterised by recurrent breathing problems. The UK has one of the highest rates for asthma in the world, along with New Zealand, Australia and Ireland, with one in eight children and one in 20 adults affected.

During an asthma attack, the lining of the airways becomes inflamed and constricted, leading to coughing, wheezing, difficulty in breathing and tightness across the chest. The causes of asthma include a genetic susceptibility (asthma in the family) and environmental triggers such as cigarette smoke, chemicals, dust mites or diet. As food allergies are responsible for around five per cent of all asthma cases, and as cow's milk is a primary cause of food allergies, it may be useful to consider avoiding cow's milk and dairy products in the treatment of asthma.

Changing the diet in other ways has been shown to help, reducing the need for drugs. Supplementing the diet with plant-based fatty acids may relieve the symptoms of asthma in some people. In one study, borage oil (containing GLA) reduced the

symptoms. Lowering the ratio of omega-6 to omega-3 fats from 10:1 to 2:1 helped other people with asthma, while a ratio of 10:1 made symptoms worse.

Eczema

The increasing rates of eczema in the UK have also been linked to the rising levels of omega-6 fats and the falling levels of omega-3 fats in the typical Western diet.

Supplementing eczema patients with omega-3 fats has been shown to relieve symptoms. Again, the anti-inflammatory effect of these omega-3s is attributed to their role in stopping arachidonic acid being used to make inflammatory hormones.

Supplementing the diet with DHA and EPA from fish has been shown to increase blood levels of both long chain omega-3s. But the higher levels of EPA could result either directly from the EPA in the supplement, or from 'retroconversion' of DHA into EPA. This is very important as it shows that an algal supplement supplying DHA could increase both DHA and EPA levels in the body.

The study referred to above used preparations from tuna fish, however, in an

email to the VVF, the author said: “I personally think, and we also have already experimental data, that algal sources would work as well.” In short, there is no need to expose yourself to harmful toxins found in fish oils when you can obtain effective treatment from omega-3 fats from plant foods and algal supplements.

Summary

Because many people dislike the taste or smell of fish oils, even when provided in capsules, and because of dwindling fish stocks, interest in plant-based sources of omega-3 fatty acids has increased tremendously. A well-balanced plant-based diet, low in saturated fats but providing a good balance of omega-6s and omega-3s, and algal supplements when deemed necessary, can protect against a range of inflammatory (and other) diseases without exposure to the insidious toxic pollutants found in fish oils.

A large number of vegetarian and vegan studies convincingly show that plant-based diets have numerous health benefits, including the prevention and treatment of many common chronic

diseases. Furthermore, since vegetarian and vegan diets are more sustainable, environmentally and economically, they certainly deserve more consideration in the prevention and treatment of disease.

Brain food

The human brain develops rapidly during the first year of life, tripling in size by the age of one. Over 60 per cent composed of fat, the brain's early development requires a good supply of polyunsaturated EFAs, which is why there are high levels in human breast milk compared to cow's milk. Cow's milk tends to be low in these types of fat but high in saturated fats, needed for rapid body growth – essential for survival in the wild.

Nutrients in breast milk have a significant effect on brain development in infants. Long-term breastfeeding is linked with higher scores in verbal, performance and IQ tests. Omega-6 arachidonic acid and omega-3 DHA are both important fats.

Attempts to alter the fat composition of cow's milk to meet human requirements

involved feeding cows fish meal, soya beans and flaxseed. Flaxseed produced a lower omega-6 to omega-3 fatty acid ratio but you could, of course, eat the flaxseed yourself and get better results!

Smart enough to be veggie?

According to Benjamin Franklin, the 18th century statesman and scientist, a vegetarian diet results in: “greater clearness of head and quicker comprehension.”

Consider this – if fish oils really were the best source of EFAs then vegetarians would come bottom of the intelligence stakes. In fact the opposite seems to be true. In 2006, a team of veggies won the BBC's *Test the Nation* IQ battle. The butchers came joint fourth – there was not a team of fishmongers!

The *British Medical Journal* provided more weighty evidence showing that intelligent children are more likely to become vegetarians. People who were vegetarians



by the age of 30 had an IQ five points higher than average when they were 10. Perhaps not surprisingly, people with a higher IQ tend to be healthier – and vegetarians generally suffer less heart disease, hypertension, obesity, diabetes, various cancers, diverticular disease, bowel disorders, gallstones, kidney stones and osteoporosis.

If not eating fish was a serious threat to brain development, vegetarians would generally fail at school, university and work. They don't!

Fish oils for brainy kids?

The evidence that fish oil can improve brain power comes mainly from trials on children with behavioural problems and is largely anecdotal, not scientific.

The Durham-Oxford Study is the work usually quoted. Over 100

children with developmental coordination disorders (DCDs) such as attention deficit/hyperactivity disorder (ADHD), dyslexia and dyspraxia, were given a daily supplement of fish oils while others were given olive oil as a control.

After three months, there were significant improvements in reading, spelling and behaviour in those taking fish oil supplements. Perhaps not surprisingly, the conclusion was that EFA supplements are an effective way of improving the performance of children with these problems. At this time, the VVF asked the researchers in Durham if they would consider using flaxseed oil in future trials to see if similar results could be achieved without exposing children to potential toxins but our suggestions were completely ignored.

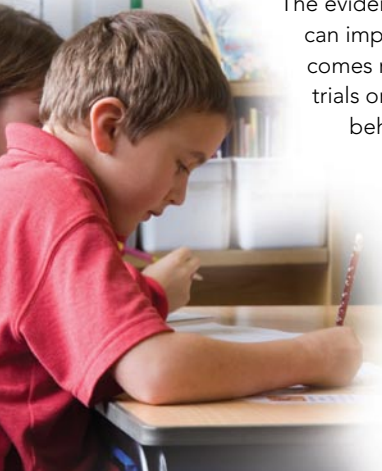
A follow-up trial in Durham was conducted more recently whereby three million fish oil capsules were given to 2,000 children over eight months to see if their GCSE results improved. Unfortunately the results were rather disappointing but this was not press-released by the County Council. In some very fast back-peddalling they said:

"...it was never intended, and the County Council never suggested, that it would use this initiative to draw conclusions about the effectiveness or otherwise of using fish oil to boost exam results." So it seems fish oil was not the magic bullet Durham Council was looking for.



Most children in the UK eat such appalling diets that nutritional deficiencies are inevitable. Correcting the deficiencies will, in many cases, improve performance of those kids. This is not the same as saying that fish oil will turn kids into geniuses, which is how the media interpreted the findings.

Publicity from this kind of research has encouraged companies to produce so-called functional foods, such as the St Ivel Advance Omega-3 milk. Advertises for this 'clever milk' implied that because of its fish omega-3 content, it may make children more intelligent. The Foods Standards Agency issued a short briefing which was



prepared specifically in response to the St Ivel 'clever milk' campaign stating that: "the evidence on the cognitive benefits of the omega-3 fatty acids, EPA and DHA, which are found in fish oils, is currently uncertain." Quite rightly, the Advertising Standards Authority (ASA) ruled that the adverts were misleading and the claims unproven, not least because results from trials involving children with learning difficulties could not be applied to all children. The adverts were withdrawn.

The Joint Health Claims Initiative operated between 2000 and 2007, checking the science behind health claims. During this period it approved claims for soya protein, oats and reduced saturated fat for their cholesterol-lowering effects and wholegrain foods for their benefits to heart health. It also approved health claims for omega-3 fats for healthy hearts. It did not approve any claims linking omega-3 fats to improved brain function.

In fact, fish oils may have no effect on cognitive ability at all and encouraging children to take them in the pursuit of cleverness may lead to far more serious health problems from toxic chemicals.

Fish – a danger to health

Almost all of the world's oceans and rivers are polluted with toxic chemicals, mainly from decades of industrial activity. The health risks from fish and fish oil supplements result directly from this. Oily fish such as salmon, trout, herring, sardines and mackerel are invariably contaminated whilst shark, marlin and swordfish can also contain high levels of mercury. Long-term exposure to these damaging substances is a threat to health.

POP goes the seawall

Persistent organic pollutants (POPs) are particularly nasty and are found in oily fish. POPs come from plastics, paints and pesticides and don't break down easily in the environment, building up in the food chain. A small fish eats some larvae, then a bigger fish eats the small fish, then an even bigger fish eats that fish, and so on. Fish at the top of the food chain – such as tuna, shark, swordfish, tilefish and king mackerel – have the highest concentrations of POPs. Farmed salmon – which is most of the salmon eaten – are of particular concern because of the concentration of POPs in the feed they eat, mostly wild-caught fish and fish oils.

Although some POPs are now banned, it will be years before they disappear from the environment. Other POPs are still being released. The World Wildlife Fund have expressed concerns that global warming could increase levels of POPs as higher temperatures release chemicals frozen in glaciers.

High levels of POPs in human blood have been linked to insulin resistance and diabetes. Some scientists say resignedly that it is hard to avoid POPs while others believe that they need to be seriously considered when planning treatment. Avoiding fish is one easy way to cut exposure.

PCBs and dioxins

POPs known as polychlorinated biphenyls (PCBs) and dioxins are the main toxins in oily



fish. PCBs are widespread, very persistent chemicals and are generally present at low concentrations in fat-containing foods such as milk, meat and fish. Fat-loving, PCBs accumulate in fatty tissue and are particularly likely to be present in oily fish. Recent surveys have shown that some other fish and crab may also have similar levels of PCBs and dioxins as oily fish. These include: sea bream, turbot, halibut, dogfish or huss and sea bass.

Implicated in heart disease, cancer and infertility, PCBs and dioxins can also harm developing foetuses by disrupting the growth of male babies' reproductive organs.

Dioxins were the primary ingredient in Agent Orange, the defoliant sprayed over Vietnam and which has produced an appalling legacy of cancers and other diseases, miscarriages and birth defects.

Mercury rising

Mercury is everywhere in the world's seas and accumulates in the food chain in the same way as POPs. It can affect the kidneys, heart and central nervous system. Exposure for unborn children, where the

main organs and nervous system are still developing, is particularly hazardous.

In those studies that have shown fish or fish oils can increase the risk of heart disease, mercury is usually seen as the guilty party as it can accelerate atherosclerosis – the build up of fatty deposits in the arteries.

Men in Eastern Finland eat a lot of fish yet have an exceptionally high death rate from heart disease. In one study, just 30 grams of fish a day was linked to a two-fold increase in heart attacks. Each additional 10 grams a day increased the risk by five per cent. High levels of mercury in their hair indicated that mercury-tainted fish was to blame. Levels of mercury in Finnish lakes are known to be relatively high and it was thought eating non-oily freshwater fish was the cause. It is thought that the mercury simply cancels out any benefit from the omega-3s in fish.

Studies in eight European countries and Israel confirmed that DHA lowers the risk of a heart attack but where high levels of mercury are present, the risk increases. Mercury is already a concern for high-risk groups such as pregnant and breastfeeding women but researchers say

that the caution to limit the intake of some fish should be extended to everyone.

The American Heart Association acknowledges the contradictions in research on fish oils and heart health and also points the finger at mercury. It still supports the idea of two weekly servings of fish but says this should be balanced against concerns over pollutants – whatever that might mean! It does support the inclusion of vegetable oils high in ALA as part of a healthy diet. A small move in the right direction.

Food poisoning

The Food Standards Agency estimates that over five million people get food poisoning in the UK every year. It is impossible to know exactly how many people are affected as so many cases go unreported.

Most food poisoning is caused by meat, poultry, eggs, dairy, fish and shellfish contaminated with bacteria. Plant foods are much safer as they rarely harbour the types of bacteria that cause food poisoning. When plant foods are responsible, it is usually because they are contaminated with animal excreta, human sewage or prepared with dirty hands.

The role of fish and shellfish in food poisoning is often underestimated. Raw and undercooked fish and shellfish can contain harmful viruses and bacteria.

The Food Standards Agency recommends that elderly people and people who are unwell avoid eating raw shellfish. It also provides an 18-point list of precautionary measures people can take when buying, storing and preparing fish. Of course just avoiding fish and shellfish altogether would be much easier. Indeed excluding all animal foods from the diet will dramatically decrease your risk of food poisoning.

Fish and PhIPs

Some people regularly overcook meat and fish to avoid food poisoning. However, this could lead to even more serious problems.

Grilling, frying or barbecuing meat and fish can produce cancer-causing compounds called heterocyclic amines (HCAs). These dangerous compounds are made when creatine (a chemical found in muscle) reacts with amino acids (the building blocks of protein) and sugar at high temperatures. Meat and fish both contain creatine, vegetables contain none.

The most abundant HCA in food is called PhIP and is linked to cancers of the colon, breast and prostate. Some research suggests that PhIP encourages breaks in our DNA that then lead to cancer. Other work shows that PhIP acts in the same way as the female hormone oestrogen, high levels of which are linked to breast cancer. This could explain the link between red meat and breast cancer.

The amount of PhIP in fish varies widely according to the type of fish and method of cooking; one study reported high levels in grilled salmon. In fact, a recent report from the Physicians Committee for Responsible Medicine showed that the five foods containing the highest levels included: chicken breasts, steak, pork, salmon and hamburgers.

The damaging effect of HCAs can be reduced by foods containing antioxidants, such as vegetables and soya foods. However, the safest option is to avoid meat and fish altogether. Healthier options for grilling and frying include soya burgers, veggie sausages and Portabella mushrooms.

Farmed and dangerous

Unless you specifically buy wild fish, the chances are the fish you eat are raised

on a fish farm and there are important nutritional differences between farmed and wild fish.

Farmed fish are likely to contain more fat than their wild cousins, but less omega-3s. Wild salmon can eat 10 times their body weight of smaller fish. To feed that amount of fish to farmed salmon is uneconomical, so much cheaper, manufactured pellets of soya, rapeseed or corn are used, combined with animal by-products, vitamins and minerals as well as wild-caught fish. Commercial fish feed may consist of just 35 per cent fish or less.

Organic fish feeds are made from the discarded filleting waste (blood, guts, tails and heads) of fish and shellfish caught for human consumption. As fish stocks are so low, the Soil Association are considering permitting up to 25 per cent oil seed in fish meal.

The outcome of using plant foods in fish meal is that the level of omega-6 fats in farmed fish has increased. Tilapia, the fish most in demand worldwide, has some of the highest levels of omega-6 in our food supply. This is not healthy!

Farmed fish can also contain pesticide residues and dangerous levels of POPs such as PCBs. A study of toxins in salmon feed, farmed salmon and wild salmon found that farmed salmon had consistently higher levels of contaminants, including PCBs. Other studies have confirmed this, meaning considerable health risks for those who regularly eat farmed salmon.

This is a crazy situation and there is no longer any convincing argument in favour of eating fish.

Fish oil supplements

Some people choose fish oil supplements in preference to eating oily fish. The news here is not good either – particularly worrying as intense marketing by producers boasts of meticulous manufacturing techniques and reassurances that all toxins have been removed.

In March 2006, the Food Standards Agency announced that supplement manufacturer Seven Seas Limited was withdrawing some batches of fish oil supplements because of high levels of pollutants. Less than a month later, Boots also withdrew fish oil capsules for the same reason. In both cases they claimed

there were no health risks yet the levels of dioxins exceeded statutory limits. A bizarre statement which seems to say that a little bit of poison is okay!

The official position – not budging

The risk of toxins in fish prompted the government to commission a report on the benefits and risks of fish consumption. The report from the Scientific Advisory Committee on Nutrition and the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment was published in 2004.

It led to the advice that pregnant and breastfeeding women should limit their consumption of oily fish to one or two 140 gram portions a week. They, along with children under 16, should also avoid shark, marlin and swordfish entirely and limit the amount of tuna they eat. Men, boys and women past childbearing age or

who are not intending to have children, can eat up to four portions of oily fish a week before possible risks outweigh the benefits, they claimed.

The report highlighted dioxins in herring, salmon, mackerel and, to a lesser degree, trout and voiced concerns about other pollutants such as brominated flame retardants. The Food Standards Agency insists that occasionally eating more oily fish than they recommend will not be harmful.

The risks from chemicals such as dioxins are not immediate but develop over time as they accumulate in the body and no-one knows what the long-term effects will be. Surely it must be better to avoid these hazardous chemicals entirely? This guide's recipe section will enable you to do just that!

Confused? You will be!

Official advice to eat oily fish to help the development of unborn and breastfeeding infants is contradicted by advice to limit fish eating for fear of damaging both these vulnerable groups. So just when your intake of omega-3 really matters –



during pregnancy and breastfeeding – the government warns you to limit your intake! No wonder people are confused!

In 2002, *Which?* magazine reported on a Consumers' Association survey which found that only a sixth of fish eaters knew that the official advice is to eat oily fish once a week; over half thought the advice was to eat two or more portions but a staggering 61 per cent had no idea that oily fish is likely to contain toxins. One per cent knew that pregnant women should avoid certain fish but nobody could name them.

Most people were even confused by what was meant by oily fish – 14 per cent thought that cod was an oily fish – it isn't.

It's no clearer in the US. In 2002, the American Heart Association recommended at least two servings of fish, particularly oily fish, per week. It also warned that this needed to be balanced with concerns over mercury and PCBs. How on earth are people supposed to do that? It is either safe or it isn't, and such cautions seriously challenge the idea that fish is 'healthy'. Who should the public listen to?

Fish failing

Despite the constant promotion of fish, the British public just doesn't buy it! On average, people eat only a third of a portion of oily fish a week and seven out of ten people eat none at all. Clearly, oily fish is not a significant contributor of omega-3 fatty acids in the diets of most people.

Encouraging people to eat oily fish is not working as a public health measure and if it did work it would be an environmental disaster as the oceans simply cannot cope with the current, let alone increased, demand. And farmed fish are not the solution.

The upshot of all this is that many people fail to understand the importance of omega-3s and don't realise how easy it is to obtain them from everyday plant foods. The government is doing us a great disservice by not promoting alternative, plant-based sources. We can only guess that they see the protection of the fishing industry as more important than public health.

Promoting oily fish as the only route to heart health could actively deter people from making the fundamental dietary changes necessary to improve their health.

A better and simpler solution would be to recommend a plant-based diet containing EFA-rich seeds, nuts and oils. Plants, not fish, are the way forward for good health.

The way to good health

The good news is you don't have to eat neurotoxins and carcinogens (cancer causing agents) to get your omega-3 fatty acids – there are perfectly safe plant sources (see page 9). But there's much more to plant foods than that.

Free radicals are unstable molecules generated by normal bodily functions and such things as cigarette smoke, pollution, ultraviolet light and stress. They are linked to cancer and other diseases as well as the aging process.

Antioxidants such as vitamins A, C and E are the body's main defence against free radicals and are found in abundance in plant foods such as fresh fruits, vegetables, nuts and seeds. Antioxidants in plants also protect EFAs against deterioration, which is another reason why plant sources are superior to fish EFAs.

Most people know that certain fats are more likely to 'go off' when exposed to air and fish oils are one of these, giving off a



characteristic 'fishy' smell as they oxidise. Antioxidants help slow this decaying process by acting as a fall guy, taking the damaging oxygen hit rather than the fat. Plant sources of EFAs such as nuts and seeds possess their own antioxidants (in particular vitamin E) which give this protection. Yet another reason in favour of plant oils.

The three amigos of the antioxidant world are beta-carotene (vitamin A), vitamin C and vitamin E – plus the mineral selenium. Neither meat nor fish are good sources, the best being plant foods – fruit, vegetables, nuts and seeds.

In the largest and most comprehensive analysis to date on the antioxidant content of foods, cranberries, blueberries and blackberries ranked highest amongst fruits. Beans, artichokes and russet potatoes topped the list of vegetables. Pecans, walnuts and hazelnuts were the top nuts and ground cloves, cinnamon and oregano ranked highest among the herbs and spices. As a general rule, brightly-coloured vegetables such as sweet potatoes, red cabbage and tomatoes are high in antioxidants.

Feeling better – naturally



By Juliet Gellatley,
nutritional therapist,
founder and director of
VVF and Viva!

Over the years I have supported many clients with many conditions

and the power of a healthy diet never ceases to amaze me! Here are just three examples of many success stories where people have been helped without fish oils for conditions where they are traditionally used.

Sean. Age: 5. Condition: eczema

Sean's condition had suddenly worsened, with the whole of his side covered in sore, red skin. Topical steroids are popular in cases such as this but I advised natural products and a change in diet. The first thing to go was dairy, which is a well-known eczema trigger. I then helped his mum to improve his diet by introducing rich sources of omega-3s – flaxseed and hempseed oil – by mixing them into his main meal after cooking and from ground flaxseeds sprinkled onto breakfast cereal. This was also changed, from high-

sugar to wholegrain varieties and porridge made with soya milk, to which were added mixed fresh or frozen berries every day.

To boost his antioxidant intake, I persuaded his mum to buy a juicer so he could have a mix of fresh fruits every morning, something which became part of his (and her!) routine. Foods rich in nutrients to help the skin heal and ensure bowel health were given.

The eczema dampened down quickly but returned if the changes were not stuck to. It took about four months but Sean's skin has now returned to being normal and healthy.

John. Age: 62. Condition: osteoarthritis

Inflammation is central to this condition and so I advised John to remove the inflammatory foods from his diet – particularly sugar (including alcohol!) and dairy. I advised an anti-inflammatory vegan diet rich in the antioxidants vitamins C and E (which protect and enhance cartilage formation), complex carbohydrates, fibre, vegetable proteins and omega-3 oils.

A helping hand came from a plant supplement which specifically helps

reduce inflammation in joints and promotes healing. Levels of omega-3 DHA and EPA were topped up with an algal supplement.

In John's words the results were 'amazing'. His long-established and worsening condition improved 100 per cent in his knees and elbows and by about 60 per cent in his shoulders. No fish oils or shark cartilage were used!

Andrew. Age: 66. Condition: coronary heart disease

Andrew had a heart attack a year before seeing me. Despite wanting to help himself become healthy rather than rely solely on drugs, he had received little information on diet. Blood pressure and cholesterol levels were high and so I advised an anti-inflammatory diet as inflammation plays a big role in clogging arteries.

Diet can reduce inflammation, which is why people are advised, wrongly in my opinion, to opt for fish oils. I advised Andrew to cut his saturated fat intake and he immediately stopped eating meat and

then gradually removed all dairy from his diet. He boosted omega-3s by taking flaxseed oil and ground seeds daily, as well as green leafy veg, and ate walnuts regularly. All these foods help reduce inflammation and clogging of arteries as well as helping to 'thin' the blood.

To help lower his blood pressure, Andrew included much more fibre from brown rice, wholemeal bread and wholemeal pasta in his diet, and by sprinkling rice bran on soups and sauces he also helped to lower his cholesterol. His fresh fruit and veg intake increased to about eight portions a day and again I advised him to invest in a juicer.

Together, we devised an exercise programme that suited him and during the course of a year, his cholesterol came down by a third and his blood pressure returned to a normal 120/80.

With nutritional therapy, long interviews are conducted with patients and treatment plans are tailored specifically for them. In these brief reports, only some major elements of the treatment are included.

Sustainability

The promotion of the supposed health benefits of fish, combined with dwindling wild supplies, have spawned a dramatic expansion in aquaculture (farmed fish), increasing at an annual rate of 9.2 per cent.

Nearly half the fish consumed worldwide as food (43 per cent) are now raised on fish farms. In 1980 it was just nine per cent. Wild-caught fish have reached a peak at around 90-93 million tonnes annually, despite increasing demand due to a growing world population and there are no prospects of an increase in catches, according to the UN FAO. In fact, it's all downhill from here on!

If people maintain their eating habits, an additional 40 million tonnes of food from the sea would be required by 2030 just to support current levels of consumption. This is clearly unsustainable and we have to look for alternatives – but fish farming is not the answer. Its demands on wild-caught fish as food and the spread of disease, sea lice and pollution are unacceptable and environmentally irresponsible.

Just as in other forms of factory farming, chemicals and antibiotics are widely used in

fish farming and are just as harmful to human health. A chemical used to kill sea lice has been linked to testicular cancer, for example, and antibiotic resistant superbugs owe their appearance largely to factory farming.

In the wild, fish have become infected with deadly sea lice and other diseases caught from fish that have escaped from fish farms. There is even evidence of genetic pollution in wild salmon – factory-farmed fish breeding with wild fish and reducing their ability to survive. Couple this to the terrifying, automated scoop-it-all-up nets that catch everything in their path – and then throw back up to a quarter of the catch dead – and the pressure on the oceans is extreme and is unsustainable. The better and more sensible – in fact the only answer – is to obtain our omega-3 fats from sustainable plant sources.

(For more information on the environmental impact of fishing see Viva!'s guide *End of the Line*).

Recommendations

A well-balanced, plant-based diet containing green leafy vegetables, wholegrain foods, pulses, nuts and seeds will provide all the plant omega-3 ALA you need. One of the

best sources is flaxseed oil, containing 57 per cent ALA and 16 per cent LA, with an omega-6 to omega-3 ratio of 0.28:1. A 14 gram tablespoonful of flaxseed oil provides eight grams of ALA.

Flaxseed oil must be kept in the fridge and can be added to dressings, sauces, dips or cooked food but cooking with it will destroy its properties. It's always best to buy and store nuts, seeds and their oils in small quantities to ensure that they're as fresh as possible and have little time to degrade.

It is difficult to say exactly how much of a certain food should be eaten to obtain your EFAs but a sensible approach is to limit how much omega-6 rich vegetable oil you use, switch to olive oil for cooking and increase your omega-3 intake from the sources we've listed. Spurn saturated and trans fats as much as possible, which means cutting down



on animal and processed foods, because you are much better off without them.

To improve the conversion of ALA to EPA and DHA follow these simple guidelines:

- Eat a range of wholefoods everyday – variety is the spice of life!
- Obtain most fat from wholefoods - nuts, seeds, wholegrains, olives, avocados and soya
- Choose olive oil for cooking
- Use sunflower, corn and safflower oil sparingly
- Use flaxseed oil for salad dressings and dips, keep it in the fridge and don't cook with it
- Cut down on cholesterol by avoiding eggs, meat, fish and dairy products
- Avoid processed foods, trans fats from margarines and hydrogenated vegetable oils
- Avoid or reduce fried foods, alcohol, caffeine, sugar, smoking and stress

Conclusion

No shortcuts, no magic bullet...

Fish is not a health food. It's not a magical wonder food that can guarantee good heart health and turn all kids into geniuses. The real problem is a lack of good fats because of the appalling state of most people's diets. Fish is not a popular food and most people never eat it. We have to stop looking for a 'quick fix' miracle and focus on the bigger picture... improving our diets by cutting out the foods laden with animal fats, sugar, salt and cholesterol and eating more fruit, vegetables, pulses, wholegrains, nuts and seeds. It really is that simple.

Fish are a source of protective EFAs but they are not the only one nor are they the healthiest. They contain saturated fat, are loaded with toxic pollutants known to damage health and no-one knows what the long-term result will be of constant exposure to low levels of these highly-toxic chemicals. It could well be described as a game of Russian roulette. When you take a mouthful of fish you are also eating neurotoxins and

carcinogens, including mercury, PCBs and dioxins and contributing to the destruction of the world's oceans.

There is an alternative. ALA from plants protects your heart and doesn't come laced with poison. If you want belt and braces, take an algal supplement.

Well-balanced vegetarian and vegan diets, containing EFA-rich foods, not only help combat heart disease but also protect against many other degenerative diseases. The big question is – why have the tremendous advantages of a plant-based diet in providing ALA and reducing the risk from almost all degenerative diseases been virtually ignored by health professionals?

Our hearts don't need fish, our brains don't need fish and our health is far better served by plant EFAs. In short – fish is not a health food.

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If you're not already a VVF supporter, don't miss out – join today! It costs just £15 for a full year (£12 unwaged) and entitles you to **Veggiehealth** magazine, five fact sheets in a special folder, free diet and nutrition advice and online access to the **Vegetarian Recipe Club**.

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Fish-free recipes

Introduction

So what do you eat instead for a bit of ocean-style nutrition and flavour? Well, the VVF has created some fish-friendly alternatives to favourites old and new. While nothing tastes identical to fish, sea vegetables have a definite sea-tang and are very tasty! Such foods may be unfamiliar to you but were eaten regularly by UK coastal-dwellers until quite recently and are still consumed in huge quantities throughout the rest of the world – Japan and China in particular.

Sea vegetables are the true ‘fruits de mer’ or fruits of the sea, not shellfish. Not only do they add flavour to food, each variety is a nutritional powerhouse, crammed with vitamins and minerals in an easily digestible format. Indeed, they are one of the main components of the Okinawan diet, responsible for more healthy nonagenarians and centenarians than anywhere else in the world. Go sea veggies!

For those of you who want a quick and convenient alternative to fish there are products on the market that are similar but vegan – they contain no fish or any other animal product (eg Redwoods Vegetarian Fish Style Fingers and Fillets). You can keep these in the fridge for those evenings when you’re late home and just want a really quick supper. For the more adventurous, try these fabulous easy-to-follow recipes.

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Tofu Chowder

Serves 6-8

Prep time: 30 minutes

Chowder is a traditional recipe from New England, USA and is a delicious dish somewhere between a soup and stew – very filling! Often made with clams (seafood), this fish-friendly variation is a great alternative. Kombu and nori, two varieties of sea vegetable, add a gentle taste of the ocean as well as providing important nutrients (see nutritional content of selected sea vegetables on page 49).



© Chava Eichner

- 1 tbsp oil
- 1 medium onion, chopped
- 2 carrots, chopped small
- 3 celery stalks, diced
- 500ml/18fl oz vegan stock (eg Marigold Swiss Vegetable Bouillon in red or purple tub, available from good supermarkets or health stores – or use equivalent Oxo Vegetable)
- 450ml/16fl oz soya milk
- 225/8oz tofu, crumbled
- Salt to taste (remember stock will be salty)
- ½ tsp black pepper
- ½ tsp celery seed (use celery salt if not available)
- 2 large potatoes, peeled and cubed
- 1 strip kombu (sea vegetable, available from health and Oriental stores)
- 2-3 tbsp nori flakes, according to taste. Plus more for serving (available from health stores OR make equivalent from a sheet of whole nori (also available from health and Oriental stores and some larger supermarkets). Just toast the sheet over a cooker ring or gas ring for a few seconds until it turns crispy, then crumble with your fingers)
- Small pinch allspice powder

- 1 Heat the oil in a large cooking pot.
- 2 Add the onion, carrots and celery and sauté for 15 minutes.
- 3 Add the stock, kombu, soya milk and stir.
- 4 Add the tofu, salt, pepper, nori flakes, celery seed and allspice and bring to a boil.
- 5 Add the potatoes, reduce the heat and simmer until the potatoes are soft.

6 If desired, blend 2-3 ladles of the soup along with the kombu then return the mixture to pan and stir into rest of soup. Otherwise, discard kombu and don't blend.

7 Serve with a sprinkling of nori flakes in each bowl.

Veggie Sushi

Makes 6-8 pieces

Prep time: 30 minutes

This is a fun recipe to make – don't be put off by the instructions as you prepare everything while the rice is cooking so it's pretty quick to do! It's also just as easy to make a larger batch (for a party, for example) as the rolling up process doesn't take very long.



Wasabi is a very hot green powder that is made to a paste by adding a little water. Known as 'Japanese horseradish', it has an extremely potent kick rather like very strong mustard. You only need a minute amount – about the head of a match! – but it does give a very special taste to the sushi, along with a dash of good quality soya sauce, such as Essential, Suma, Kikkoman or Clearspring brands. These products are available from large supermarkets and good health stores.

- 115g/5oz short grain brown rice
- 230-300ml/8-10fl oz cold water
- 1 tsp vegan low-salt bouillon powder
- 1 sheet nori (check packet to see if it's ready-toasted or not)
- 1½ tsp tahini
- 1 tbsp shoyu soya sauce
- 1 medium carrot, grated
- 1 tsp fresh ginger, grated
- A small handful dried arame, soaked in water for 10 minutes then rinsed and drained

Plus any one of these options:

- Thinly sliced cucumber
- Thin strips of avocado
- Sauerkraut (pickled cabbage in a jar)
- Toasted sesame seeds
- Spring onion greens, chopped

To serve:

Wasabi to taste (see above)
2 tbsp soya sauce and 2 tbsp cold water, mixed together (preferably shoyu or tamari type)

Salad:

- Select from these: 2 handfuls of Pak Choi, Cos, Lollo Rosso, Lamb's lettuce plus 1 handful of watercress and/or rocket
 - Beansprouts
- 1 Cook the rice in the water and bouillon powder until it is well-cooked and slightly sticky – about 25-30 minutes. (Add a little more water if necessary but don't drown it. You want all the liquid to be absorbed by the end of the cooking process.)
 - 2 Meanwhile, grate the carrot and ginger and soak the arame. Prepare one ingredient from the list of options and make the salad now if you have time.
 - 3 If you don't have a sushi mat, wet a clean teatowel and wring it out well so that it's just a little damp.



- 4 Let the rice cool. It should be fairly sticky and just slightly warm – this makes it easier to roll. Mix in the shoyu soya sauce and the grated ginger and stir thoroughly.
- 5 If the nori isn't ready-toasted, do this now – simply toast it carefully by holding it by a corner over a gas flame or hot electric ring until it turns green.
- 6 Place the nori sheet carefully on sushi mat/damp teatowel.
- 7 Spread the rice thinly on the nori sheet, leaving a 1cm/½ inch gap at the top and bottom.
- 8 With a chopstick or handle of a wooden spoon, make a horizontal indentation in the middle of the rice.
- 9 Spread the tahini in the gap and then add the grated carrot and arame.
- 10 Add your chosen option from the list.
- 11 Using the mat/teatowel, roll the nori up into a mini Swiss roll, making sure you keep pulling the leading edge of the mat/teatowel back so it doesn't get rolled into the sushi.
- 13 Continue rolling tightly until the uncovered top edge of the nori is reached.
- 14 Wet this edge with a little cold water and complete rolling – this will seal the sushi.
- 15 Slice the roll in half with a sharp knife, making sure you cut through all the nori.
- 16 Then slice each half into 3 or 4 pieces.
- 17 Serve on the nicest plate you have, preferably plain white, with the soya sauce dip, a dab of wasabi and the green salad.

Rice, Carrot and Arame Salad

Serves 4

Prep time: 30 minutes (less if you have pre-cooked rice)

This isn't a fish replacement as such but has a lovely simple, fresh taste with a hint of the sea! Arame is a fantastic source of protein, calcium, iodine and potassium.

- 170g/6oz brown rice
- 1 tsp vegan bouillon powder or ½ a stock cube (eg Marigold, Kallo or Oxo Vegetable)
- 600ml/21fl oz water



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- 1 large carrot, grated finely
- 1 handful arame, soaked in water for 10 minutes, then drained (the liquid can be put aside for soup stock)

Dressing:

- 4 tbsp sesame oil (use cold-pressed sunflower if you can't get sesame)
- 2 tbsp cider vinegar
- 2 tbsp fresh orange juice
- 2 tsp soya sauce

- 1 Put the brown rice, bouillon powder and water on to heat.
- 2 Bring to boil then reduce heat and simmer for 20-25 minutes, adding a little more water if rice starts to stick.
- 3 Meanwhile, soak the arame.
- 4 Grate the carrot and put aside.
- 5 Make the dressing by mixing all ingredients together in a jar.
- 6 When the rice is cooked, leave it to cool.
- 7 Add arame and carrot and mix in well with rice.
- 8 Add some of the dressing, coating ingredients well.
- 9 Serve with a wholemeal roll or with other salads as part of a buffet.

Options:

Add ½ cup of cooked wild rice, unsalted peanuts or cooked pulses, such as whole lentils or adzuki beans.

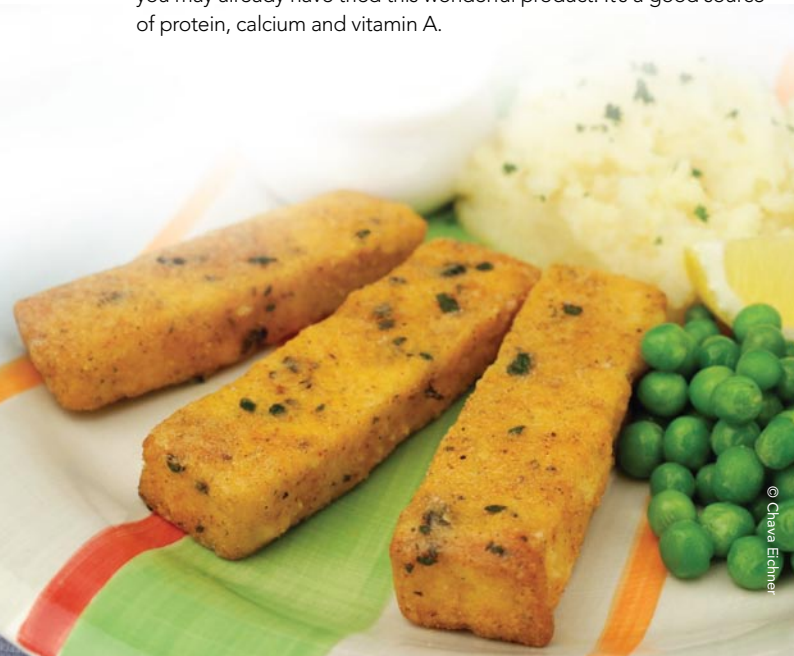
Tofu 'Fish' Fingers

Makes 8-12 sticks (about 4 servings)

Prep time: 45 minutes: 15 minutes preparation, 30 minutes cooking

This recipe is adapted from the Vegan Lunch Box www.veganlunchbox.com.

Nori is a sea vegetable more commonly used to wrap round sushi, so you may already have tried this wonderful product. It's a good source of protein, calcium and vitamin A.



© Chava Eichner

- 450g/1 lb firm tofu, drained
- 120g/4oz fine cornmeal (polenta) OR 75g/2½ oz white flour
- 60g/2oz flaked almonds
- 2 tsp paprika
- 2 tsp nori flakes
- 1 tsp salt
- ½ tsp onion powder
- ½ tsp garlic powder
- ¼ tsp dried dill
- Freshly ground black pepper, to taste
- 80ml/3fl oz unsweetened soya milk
- Juice of 1 lemon
- Olive oil or olive oil spray

- 1 Preheat the oven to 200°C/100°F/Gas Mark 6.
- 2 Line a baking sheet with greaseproof paper and lightly coat with olive oil. Set aside.
- 3 Make the coating mixture by blending the cornmeal or flour, almonds, paprika, nori, salt, onion and garlic powder, dill, and black pepper until most of the almonds have been turned into a coarse meal, with a few larger pieces of almond remaining.
- 4 Pour the mixture into a wide baking dish or similar.
- 5 Place the soya milk in a bowl next to the coating mixture.
- 6 Cut the tofu into fish finger-shaped slices – they should be about 1cm/just under ½ inch deep.
- 7 Working with one piece at a time, dip the tofu into the soya milk, then toss gently in the coating mixture until evenly covered.
- 8 Place tofu fingers on the prepared baking sheet. When they are all done, sprinkle them lightly with olive oil or oil spray.

- 9 Bake for 15 minutes, then turn and bake for an additional 15 minutes, or until crispy.
- 10 Transfer to a plate, and squeeze some fresh lemon juice evenly over the tofu fingers.
- 11 Serve with mashed potatoes, peas and/or salad. Try them with our Tasty Tartar Sauce (see page 43).

Faux Fish Fillets

Serves 4-6

Prep time: 30 minutes

This makes a great fish-free supper.



- 450g/1 lb plain, firm tofu
- 1 tsp egg replacer made as directed on packet (eg 1tsp Organ brand, available from large supermarkets and health stores, mixed with 2 tsp water)
- 2 tsp nori flakes
- 2 tbsp soya sauce
- 30g/1oz wheatgerm OR fine breadcrumbs
- 30g/1oz white flour
- ¼ tsp paprika
- ¼ tsp dried basil
- Pinch of dried thyme
- Oil for frying (use oil spray if you are watching your fat intake)

- 1 Cut the tofu into ¾ cm/¼ inch thick slices so you have several thin 'steaks' or fillets.
- 2 Wrap the slices in a clean tea towel or thick paper towels and pat to remove excess moisture.
- 3 Beat the egg replacer, soya sauce and nori flakes together in a small bowl and set aside.
- 4 Combine the wheatgerm or breadcrumbs, white flour, paprika, basil and thyme on a plate.
- 5 Heat the oil or oil spray in a large non-stick or heavy frying pan.
- 6 Dip each slice of tofu into the egg replacer mixture, and then coat both sides in the wheatgerm mixture.
- 7 Fry the slices until golden brown on both sides.
- 8 Serve with new potatoes and salad or green vegetables and Tasty Tartar Sauce (see page 43).

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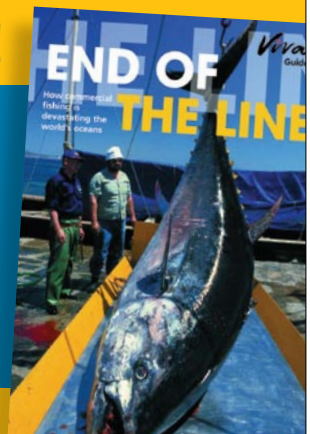
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Tasty Tartar Sauce

Makes 1 jar – halve or quarter the quantities if you just want enough for one meal.

Prep time: 5 minutes

This tangy sauce enhances any faux fish dish.

- 225g/8oz soft or medium-firm tofu
- 4 tbsp sunflower oil
- ½ tsp salt
- 2 tsp prepared English mustard
- 2 tbsp sweet pickle (if large lumps, chop fine)
- 2 tsp capers, drained and rinsed
- 1 tsp fresh chives, chopped (optional)

- 1 Blend together the tofu, oil, salt, and mustard in a food processor until smooth.
- 2 Stir in the pickle and capers top with chives (optional) and serve.

For a quick and simple alternative version, combine 1 tbsp vegan mayonnaise (eg Plamil or Granovita brands) with 2 tsp good quality capers, chopped. Serves two.



Veggie Fish Sauce

Serves 2-4

Prep time: 5 minutes

Veggie versions of fish sauce are available in some health stores, but this version is fast and cheap to make! The recipe makes a very small jar's worth (it will keep for a couple of

weeks in the fridge) and is suitable for use in veggie Thai/Vietnamese dishes instead of standard fish sauce. Alternatively, use it as a sauce with tofu – just fry the tofu pieces in the usual way until golden brown, then add a little of the sauce at the end so it sizzles into the tofu, making it a deeper colour.

- 1 tbsp brown sugar
- 2 tbsp good quality soya sauce (eg Kikkoman, Essential or Suma brands)
- 2 tbsp water
- 1 tbsp roasted peanuts
- 2 tsp nori flakes
- Pinch of chilli powder or more to taste

- 1 Blend all the ingredients together until smooth.
- 2 Thin with a little more water to soya sauce consistency.
- 3 Store in the fridge in a bottle or screw top jar.

Kedgerree

Serves 4-6

Prep time: 40 minutes – put the rice on first and prepare and cook everything else meanwhile.

Kedgerree comes from ‘Kitcheree’, a traditional Indian dish of rice and lentils which the British Raj somehow converted into a posh breakfast dish containing smoked fish and hard-boiled egg! Our delicious veggie version contains no fish or eggs, of course, but does include nutty brown rice, smoked tofu and a few other magical ingredients. It’s good for brunch, lunch or dinner and nice served with a large green salad – or steamed greens in the winter.



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- 400g/14oz long grain brown rice, rinsed well (use brown basmati if you can afford it!)
- 600ml/21fl oz cold water
- 1 heaped tsp vegan bouillon or ½ stock cube (eg Marigold or Kallo brands, otherwise use Oxo Vegetable)
- Large handful of arame
- 1 tbsp vegetable oil
- 1 large onion, peeled and chopped quite small
- 3 large cloves garlic, peeled and crushed
- 1 red or orange pepper – de-seeded and chopped quite small
- 2 tsp paprika
- ¼ tsp chilli powder
- 1-2 tsp mild curry powder, according to taste
- 1 packet smoked tofu (eg Taifun or Cauldron brands), chopped into bite-sized pieces
- 1 tsp fresh ground black pepper
- Half a tin of low-fat coconut milk
- 2 tbsp nori flakes
- 2 tsp vegan bouillon or 1 stock cube (see above for brands)
- 110g/4oz cooked whole green or brown lentils (about ½ a tin, drained and well rinsed)
- Large handful fresh parsley, finely chopped
- Lemon wedges
- Optional: hot pepper sauce on the side for those who like their food spicy!



- 1 Cook the rice in a heavy, covered pan with the water and bouillon/stock cube.
- 2 Bring the rice to the boil then reduce heat and simmer with lid on for 40 minutes. Check 10 minutes before the end of cooking that all the water has been absorbed – add a little more hot water if the rice is still very chewy. By the end of cooking you want the rice tender and dry.
- 3 Soak the arame in cold water and set aside.
- 4 Chop the vegetables then fry the onions and crushed garlic in the oil for about 5 minutes.
- 5 Add the peppers, chilli, curry powder and paprika and cook for a further 5 minutes or so, stirring continuously.
- 6 Rinse and drain the arame.
- 7 Add the smoked tofu and black pepper to the onion mixture, then the coconut milk, nori, arame and 2 tsp bouillon/1 stock cube.
- 8 Stir until all is heated through and then add the hot cooked rice, lentils and parsley, gently stirring everything well to distribute all ingredients evenly.
- 9 Serve with more parsley on top of each plate and a wedge of lemon per person to squeeze on the kedgeree.

Sweet & Sour Veggie King Prawns with Steamed Oriental Vegetables and Brown Rice

Serves 4

Prep time: 35-40 minutes: 10 minutes preparation, 25 minutes cooking

This is both delicious and quick, as the vegetable and sauce preparation can be done while the rice is cooking. Check your local Oriental supermarket as they may sell veggie prawns in the freezer cabinet (we found them at Wai Hee Yong in Bristol). Otherwise, you can buy the tasty king 'prawns' by mail order from www.veggie-world.com (item no. KC29). This company sells an amazing range of vegan and vegetarian faux fish and meat products and also has a restaurant near Milton Keynes!



- 225g/8oz short grain brown rice
- 1 tsp reduced salt vegan bouillon powder or ½ a reduced salt vegan stock cube (eg Marigold or Kallo brands)

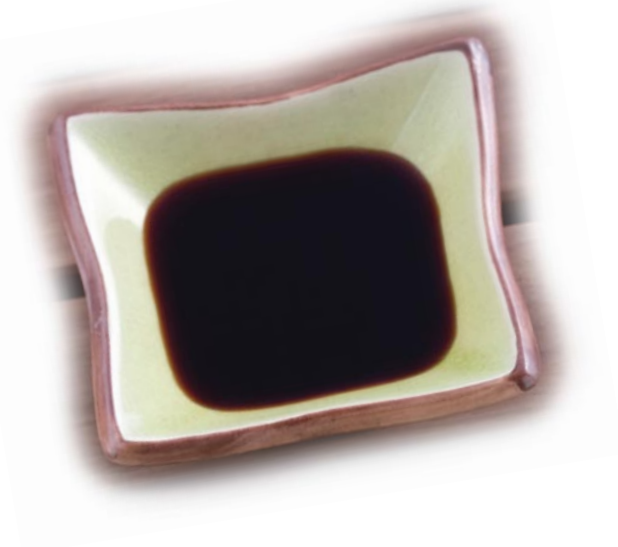
Vegetables:

- 2 carrots, cut into thin strips
- 2 courgettes, cut into thin strips
- 1 small head broccoli, cut into thin pieces (peel the stalk, discard the peelings and use the rest of stalk cut into sticks)
- 225g/8oz mange tout, halved
- Large bunch spring onions, sliced
- 1 pack of veggie prawns, defrosted, plus a little oil to fry (about 1 tbsp)

Sauce:

- 3 tomatoes, chopped fine
- Large carrot, grated
- ½ an onion, roughly chopped
- 2-3 tbsp date syrup or other natural sweetener, to taste
- 30g/1oz sun-dried tomatoes (not in oil), chopped
- 2 tbsp cider OR white wine vinegar
- 2 tbsp Aminos (eg Bragg's or Marigold brands available from health stores) OR 1 tbsp soya sauce
- 1 tsp plain or sunflower oil
- 1cm/½ inch piece fresh ginger, grated fine
- 1 clove garlic, crushed
- Quarter of a red chilli, de-seeded (unless you like very hot food) and finely chopped OR a pinch or two of chilli powder, to taste

- 1 Put brown rice on to cook first in a heavy-bottomed pan.
- 2 Cover rice with about 2 inches of water covering it and add bouillon/stock cube.
- 3 Bring to boil then reduce heat and simmer – top up with a little hot water if it gets too dry before being fully cooked.
- 4 Meanwhile, prepare the vegetables.
- 5 Steam all the vegetables until just cooked – 5-10 minutes.
- 6 Now fry the 'prawns' in a little hot oil for a couple of minutes – when cooked, set aside and keep warm
- 7 Heat the sauce ingredients (but don't boil), then blend.
- 8 Drain any surplus liquid from rice and serve, placing vegetables then 'prawns' on top.
- 9 Pour sauce in a serving bowl and serve separately, alongside the main dish.



Paella

Serves 6

Prep time: Allow 60 minutes for the first time you cook this; it will be quicker next time!

This is a wonderful alternative to traditional Paella, and great for dinner parties. Don't be put off by the length of the recipe – the Paella ingredients can be measured and prepared while the Pilaf rice (the basis) is cooking, or you can cook the Pilaf in advance. Leftover Pilaf freezes well, also.



© Chava Eichner

Saffron Basmati Pilaf:

- 1 medium onion, finely chopped
- 2 cloves garlic, finely chopped
- 1 tsp olive oil
- 1½ tsp ground cumin
- 1 tsp fennel seed
- ¼ tsp ground pepper
- ½ tsp salt
- 450g/1lb brown basmati rice
- ½ tsp saffron, steeped in 4 tbsp warm water
- 840ml/30fl oz vegetable stock

- 1 In a medium-sized heavy saucepan, sauté the onion and garlic in oil over a medium heat until just softened.
- 2 Add the cumin, fennel seed, pepper and salt.
- 3 Sauté for 1 minute.
- 4 Add the rice and stir constantly for about 2 minutes or until the rice smells fragrant.
- 5 Add the saffron and stock; bring to the boil and cover.
- 6 Reduce the heat and simmer for about 20-25 minutes, or until the liquid is absorbed.
- 7 Remove from heat and let sit for 10 minutes.

Paella:

- 2 medium onions, cut into 1cm/½ inch pieces
- 4 cloves garlic, crushed
- 2 red peppers, chopped
- 1 tbsp olive oil
- ½ tsp dried oregano
- ¾ tsp red chilli flakes
- ½ tsp grated orange zest (about half an orange's worth)
- ¾ tsp cumin seeds
- 25g/1oz dried arame (sea vegetable available from health stores), soaked in warm water for 10 minutes
- 1 tin chopped tomatoes
- 6oz smoked tofu, cut into 1cm/½ inch cubes (eg Cauldron brand available from large supermarkets, Taifun, Clearspot, Dragonfly etc from good health stores)
- 2 courgettes, halved lengthways and cut into 1cm/½ inch slices
- 2 tsp capers, drained
- ¼ cup pitted black olives, chopped
- Greens for 6: choose from curly kale, green cabbage or purple sprouting broccoli
- 225g/8oz mushrooms, sliced if big, halved if small
- 4 cups *Saffron Basmati Pilaf* (see recipe 47)
- 2 tbsp parsley, chopped



Aioli (Garlic Mayonnaise):

- 2 tbsp Plamil vegan mayonnaise thinned with 1 tbsp soya milk
- 1-2 cloves garlic, crushed

- 1 Lightly fry the onions, garlic and peppers in olive oil in a paella pan for about 5 minutes.
- 2 Add the oregano, chilli flakes, orange zest and cumin seeds and continue to sauté for 1 minute.
- 3 Drain and rinse the arame.
- 4 Add the tomatoes, smoked tofu, courgettes, arame, capers and black olives.
- 5 Steam the greens for 5 minutes in another pan.
- 6 Reduce the heat under the paella to medium-low and simmer for 5 minutes while the greens are cooking.
- 7 Add the mushrooms to the paella and sauté for another minute or two.
- 8 Stir in the Saffron Basmati Pilaf and parsley.
- 9 Heat through.
- 10 Adjust seasoning if necessary.
- 11 Drain the greens.
- 12 Mix the mayonnaise, soya milk and garlic together to make aioli.
- 13 Serve the paella in middle of large plate, arrange the greens around the edges and put a dab of the Aioli in the middle.

Top Tip:

If you don't have a paella pan you can use a large frying pan or wok.

Sea Vegetables

Sea vegetables have been used in the UK for thousands of years – we're island folk after all, and our ancestors valued them as a delicious and nutrient-rich part of their diet. Laver bread – made from dulse – is a well-known Welsh dish, but other types of sea vegetables, such as kelp, were also eaten throughout England, Scotland and Ireland. If you like to buy local food, choose Atlantic-farmed varieties. However, the Japanese types are well worth investigating – and overall have a very low carbon footprint compared to fish or other animal foods!

Sea vegetables vary in their nutrients, but their riches include generous quantities of iodine, calcium, vitamin A, vitamin K and some B vitamins. Indeed, nearly all of them are far higher in calcium than cow's milk – arame contains a staggering 1,120 milligrams per 100 grams, compared to 118 milligrams per 100 grams in cow's milk. In addition, sea vegetables contain good amounts of lignans, plant compounds reported to have cancer protective properties.

Regarding iodine, while many of us in the UK have iodine levels that are too low, as with all minerals and vitamins, it's also important not to have too much! Just check the packaging for recommended intake. The RDA for adults is 140 micrograms per day – children need much less.

And of course, not only are sea vegetables kinder to animals and the planet, but their nutrients are more easily absorbed by the body. Being lower down the food chain also makes them far less polluted than fish.

Sea vegetables are available from good health and Oriental stores and (mainly nori sheets) in some larger supermarkets. Most require soaking in water before cooking, except for nori. If using kombu or wakame as part of a soup, you do not need to soak it, just add it to the pan and let it cook in the soup. While

most people love nori, arame and hijiki, if you aren't keen on the texture of kombu and wakame, simply add during cooking and remove before serving, or blend with the food you've cooked them in.

Getting to know your sea vegetables

Arame (pronounced 'ahrahmay') thin black slivers that look a bit like dry tangled string until hydrated. It has a fairly mild, sweetish flavour and can be added to stews, soups, salads and is very good with rice. It is an excellent source of protein, calcium, iodine and potassium.

Hijiki looks very like arame, but with a milder taste.

Kombu (kelp) dried strips, often used to make stock for Japanese miso soup. Also excellent when cooked with pulses – a strip of kombu reduces the 'flatulent' qualities of beans and lentils! Remove from the pan before serving – or else blend with stock for future use. Kombu is very rich in iodine and calcium, so much so that people in Eastern countries who use a lot of kombu in cooking don't need to use iodised salt. Kelp powder is another good way of using this superfood (don't overdo it though as the iodine level is quite high).

Wakame looks rather like kombu until hydrated, when it fans into large leaves. Also used for soup stock, amongst other things. It's even richer in calcium than kombu, though much lower in iodine.

Nori paper-thin sheets of black-coloured compressed sea vegetable, used to make sushi wraps. Dulse is its wild relative found around the British Isles, whereas nori is farmed in Japan and has a milder taste. Nori is sold in thin, pre-toasted sheets, but also comes in flakes (eg Green Nori Sprinkle from Clearspring) as a condiment to sprinkle over soup, rice and salads.

Dulse very rich in iron and protein. (See **Nori**).

Agar-agar a vegan alternative to gelatine, can be used to set jellies and so forth.

Nutritional content of 100 grams of selected sea vegetables

	Energy (kcal)	Protein (g)	Carbohydrate (g)	Fat (g)	of which Saturates (g)	Fibre (g)	Sodium (g)	Calcium (mg)	Magnesium (mg)	Iron (mg)	Iodine (mg)
ARAME	74	9.7	7.2	0.7	0.4	61.3	1.3	1120	515	5	59
HIJIKI	106	9.5	15.3	0.7	0.4	45.0	1.5	1550	630	36	64
KOMBU	44	7.0	21.5	3.3	1.7	34.4	3.7	942	742	7	263
WAKAME	132	20.5	9.3	1.4	0.8	26.7	7.1	721	1070	4	12
NORI	180	41.1	3.2	0.3	0.1	41.6	0.2	330	360	20	2
GREEN NORI SPRINKLE	111	21.7	5.8	0.1	trace	41.0	0.9	720	1300	75	2
DULSE	142	16.9	18.1	0.2	trace	29.6	1.3	140	202	9	11

Source: Clearspring

Too much iodine can be harmful, see packaging for recommended weekly intake

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