Fishing for facts

Why public health strategy should promote plant foods and oils rather than fish and their oils

Fish is not a health food by any means. Widespread pollution makes fish and shellfish so dangerous to eat that the Government recommends limiting their consumption. Fish oil is not the miracle cure-all it was promised to be either – it doesn't prevent heart disease and may be contaminated too. Going fish-free can protect your health and contribute to a more sustainable future.

Toxins in fish

Oceans and rivers are contaminated with chemicals and heavy metals, such as mercury. These toxins build up in the fat in fish, particularly in oily fish.

Chemical cocktail

The most common toxins in fish include polychlorinated biphenyls (PCBs), dioxins (toxic products of burning and industrial operations), many pesticides, polycyclic aromatic hydrocarbons (PAHs, resulting from cooking meat and fish at high temperatures) and drug residues. Many of these chemicals may interfere with your hormones and have adverse effects on your reproductive and nervous system, immunity, may increase your risk of cancer and may affect development in children.

When scientists tested 10 commercial fish oils – sold as supplements – they found they contained some of the most dangerous pesticides in the world (DDT, DDE, PCBs) and had oestrogen-like (female hormone) and anti-androgen (blocking male hormones) effects (Roszko *et al*., 2018). The amounts found in fish oil were small but still of concern, particularly to vulnerable people such as children, pregnant women or people with serious health issues.

A 2014 scientific review reported that fish, meat and dairy were the main sources of PCBs and dioxins in the human diet with "meat from eels" and "fish liver and derived products" (all from European countries) containing the highest amounts (Malisch and Kotz, 2014).

Cooking creates even more toxins

Cooking fish at high temperatures creates new compounds, such as PAHs mentioned above. They are known carcinogens. One study found that the level of PAHs in grilled fish was even higher than in meat (Sahin *et al*., 2020). Fatty fish such as salmon, hake and fresh tuna have a higher fat content and so produce more PAHs than other types of fish when cooked (Sampaio *et al*., 2021).

Government warnings

The Government has issued warnings to children, pregnant and breastfeeding women, and those who may become pregnant one day, to never eat shark, swordfish or marlin and to limit oily fish (salmon, sardines, trout, mackerel) to two portions a week because of the pollutants they contain (NHS, 2018). Premenopausal women are also advised not to eat more than two servings of oily fish a week and pregnant and breastfeeding women are urged to not eat fish liver oil. The latter is not just because of the pollutants but also because it contains high levels of vitamin A that may be toxic to an unborn baby.

The NHS then warn that adults should limit their consumption of shark, swordfish or marlin to one portion a week and to not eat sea bream, sea bass, turbot, halibut, rock salmon and brown meat from crabs too often.

Farmed fish are not the answer. Because of the way they are farmed, they contain even more toxins than wild-caught fish (Rodríguez-Hernández *et al*., 2017). Freshwater fish caught in the UK also carry a number of health risks, as a recent study showed – a number of tested samples showed levels of dioxins and PCBs above the acceptable limits (Rose *et al*., 2015). There is no 'safe' fish and with many pollutants remaining in the environment for decades if not longer, the situation isn't going to get better anytime soon.

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Fats in fish

The recommendations to eat fish are centred around the omega-3 fats fish contain – and so-called oily fish are a particularly rich source. Oily fish include herring, pilchards, salmon, sardines, sprats, trout and mackerel.

Omega-3 fats are essential for us – we cannot make them so we have to have them in our diet. There are three types of omega-3 fats. The one called ALA (alpha-linolenic acid) is found in seeds, such as flaxseed, chia seeds, hemp seeds, rapeseed and their oils, and walnuts. Your body converts ALA into EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) which are then used for various purposes. Fish oils contain ready-made EPA and DHA which is why some people think they are better sources of omega-3s but due to widespread pollutants and overfishing, this is simply not true.

What's more, fish only contain these omega-3s (EPA and DHA) because they eat tiny algae – called microalgae – that produce them. There is a wide range of algal omega-3 supplements available and they are much healthier and more sustainable than fish and their oils.

When you eat fish, you're not just eating omega-3 fats, you're also eating saturated fat and cholesterol. Just one serving of salmon can contain over 200 milligrams of cholesterol. Scientific studies found that each 300 milligrams of cholesterol a day may increase the risk of heart disease by 16-17 per cent (Zhong *et al.*, 2019; Zhuang *et al.*, 2021).

A comprehensive study compared the effects of different foods on the risk of heart disease (Guasch-Ferré *et al.*, 2019). The researchers found that replacing red meat with plant-based protein sources, such as pulses, reduced the risk but replacing red meat with fish did not. The authors suggested that it's probably because plant-based foods mean reduced intake of saturated fat and cholesterol and increased intake of fibre and antioxidants. Fish do not offer this advantage.

Fish oil and heart disease

Fish oil, with its omega-3 fats, is often recommended as a supplement meant to reduce your risk of heart disease. However, its supposed benefits are not supported by the science.

Cochrane reviews are considered to be the gold standard quality in science. The most comprehensive Cochrane review of evidence on the subject found that increasing EPA and DHA has little or no effect on cardiovascular events (eg heart attack) or death (Abdelhamid *et al.*, 2020). They also found that omega-3 supplements do not reduce heart disease, stroke or death and that there was little evidence of effects of eating fish. However, eating ALA (from walnuts, chia seeds or flaxseed oil) may help slightly reduce cardiovascular events, heart irregularities and death. They concluded that increasing plant-based ALA may be slightly protective for some heart and circulatory diseases.

Another set of studies found a concerning effect of fish oil supplements – they may actually increase the risk of atrial fibrillation (irregular heartbeat) by 25 per cent and if you take more than one gram daily, the risk may increase by up to 49 per cent (Gencer *et al.*, 2021). Interestingly, plant-based omega-3s (ALA from flaxseed or flaxseed oil, chia seeds, hemp seed, walnuts or rapeseed oil) lower the risk (Abdelhamid *et al.*, 2020).

Vegans and people whose diets are mainly plant based have lower blood pressure and cholesterol levels than all other diet groups and a much lower risk of heart disease – 25-57 per cent (Bradbury *et al.*, 2014; Le and Sabaté, 2014; Appleby and Key, 2016; Dinu *et al.*, 2017; Benatar and Stewart, 2018; Kahleova *et al.*, 2018; Korakas *et al.*, 2018; Matsumoto *et al.*, 2019).

Fish farming and antibiotic resistance

Fish farming means that huge numbers of fish – hundreds of thousands – are reared in overcrowded conditions that put the fish under chronic stress and make them more susceptible to disease. This environment provides the ideal breeding grounds for infectious bacteria and parasites. As a result, fish are fed antibiotics with their feed in an attempt to halt the spread of dangerous bacteria. However, these drugs are also eaten and absorbed by many other aquatic organisms and contribute to the evolution of antibiotic-resistant bacteria (Meek *et al.*, 2015; Rigos *et al.*, 2021). Once antibiotic-resistant bacteria spread, it poses a major threat to global human health.

Fish farming is still relatively new and every country has different regulations. Many different types of antibiotics may be used but the one that is most popular across the world is tetracycline (Done *et al.*, 2015). It is also the antibiotic that's commonly used to treat infections of the skin, digestive system, lungs, urinary tract, genitals and more, and it cures diseases such as cholera, plague, malaria and syphilis. If this antibiotic stops working because enough bacteria develop a resistance to it, the world will be a very different place.

However, it's not just antibiotics that are used on farmed fish and shellfish but a whole cocktail of veterinary drugs. Some are to keep them healthy, some rid them of parasites, others make them grow. A large survey carried out across Europe, USA, Canada and Japan found many violations in the use of the drugs and residue levels in fish (Love *et al.*, 2011).

Food poisoning

Fish can carry a wide variety of bacteria, viruses and parasites that can cause a host of nasty illnesses. For example, tilapia, one of the most commonly farmed fish, tends to carry the bacterium *Plesiomonas shigelloides* which causes diarrhoea, nausea, vomiting and fever (Cortés-Sánchez *et al.*, 2021). There are many other types of food poisoning that can be caused by eating fish and thorough cooking doesn't always prevent it as raw fish can contaminate kitchen surfaces.

The NHS warn that pregnant women, babies and children should avoid eating raw shellfish (such as mussels, clams and oysters) because of the high risk of food poisoning (NHS, 2018). They may carry norovirus – the vomiting bug that can cause severe sickness and fever. Both raw and cooked shellfish can also contain toxins that may cause nausea, vomiting, diarrhoea, headaches, numbness, breathing difficulties, memory loss, disorientation and abdominal pain.

Gout

Gout develops when uric acid crystals accumulate in the joints, causing chronic inflammation and irritation. During gout attacks, people experience intense joint pain, often accompanied by swelling and redness of the affected joints. High levels of uric acid in the body have also been linked to kidney and heart disease – particularly sudden events, such as heart attack or stroke, heart failure and atrial fibrillation (irregular heartbeat) (Maloberti *et al.*, 2021).

Your body produces uric acid when it breaks down purines — compounds found naturally in your body but also in many foods. The richest sources of purines by far are red and organ meats, such as liver or kidneys, and also anchovies, sardines, trout, tuna, mussels and scallops.

As one review neatly summarised; seafood, red meat, alcohol and fructose increase the risk of gout, while soya and other pulses (peas, beans, lentils) and coffee lower the risk (Li *et al*., 2018). This highlighths that there's no need to avoid pulses as was once recommended because of their purine content – they contain much less than meat, fish or shellfish and also offer a wide range of healthful nutrients.

According to a study on plant-based diets, uric acid and the risk of gout, plant-based diets do not increase your risk even if you consume purine-containing pulses, vegetables and mock-meat products (Jakše *et al*., 2019). They simply aren't as high in purines as meat and fish. In fact, the study authors concluded that plant-based diets help to prevent gout and maintain healthy uric acid levels.

Fishing and fish-farming and the environment

It may seem like there's plenty of fish in the sea but the opposite is true. About a third of commercial fish stocks are caught at unsustainable levels – they cannot reproduce quickly enough to keep the populations up – and 90 per cent of fisheries are exploited to their maximum capacity (Landos *et al*., 2021). A fishery is an area where fish and shellfish are caught for commercial purposes. This puts an incredibly high pressure on the oceans and coastal waters and it's also the reason why fish farms are cropping up at an unprecedented rate. Almost half of all fish consumed now come from fish farms (Landos *et al*., 2021).

Commercial fishing

Discarded fishing gear is the biggest plastic pollutant in the oceans – it is estimated that about 30 million pounds of plastic fishing gear are dumped into the oceans each year (Du *et al*., 2021). Floating plastic can be broken into small pieces and consumed by marine animals, accumulating in their bodies and preventing them from functioning normally, which affects all life, including humans who eat fish and shellfish – microplastics are found in virtually all sea life.

Larger pieces of discarded fishing gear, such as nets, are extremely damaging because many animals get entangled in them and die a slow death. These ghost nets kill hundreds of thousands of dolphins, turtles, whales, seals, birds and fish every year. And because it takes hundreds of years for this kind of plastic to break down, they can keep killing animals for centuries to come.

There are also many other commercial fishing practices that have a devastating environmental impact, such as bottom trawling which destroys the ocean floor, or longline fishing which catches anything in the way. Both of these lead to large amounts of 'bycatch' – animals caught by accident and discarded or ground into fishmeal that can be fed to farmed animals and fish. This is also the fate of many endangered species such as sea turtles.

Fish farming

Fish farms cause serious environmental, welfare and public health issues. They can be both inland and in coastal areas but regardless of where they are, the huge numbers of fish kept there require massive amounts of feed, antibiotics and other veterinary drugs and produce large amounts of waste that throws the surrounding ecosystems off balance. Many of the farmed fish are predators so they need to eat smaller fish and it leads to more fishing to keep supplying fish farms with enough feed – an utterly unsustainable practice.

We don't need fish or their oils to be healthy – on the contrary, they can harm our health. Commercial fishing and fish farming are such damaging practices that we need to stop supporting them. Going fish-free is one of the best things you can do for yourself and for the environment.

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