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Should we eat more fish – or less?

PERSPECTIVES

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All food contains environmental toxins. The EU has set a new threshold for the level of environmental toxins that can be considered safe in the body. In Norway, the average intake exceeds this threshold, and fatty fish is the main source. Nevertheless, the Norwegian authorities recommend that all age groups eat more fish.

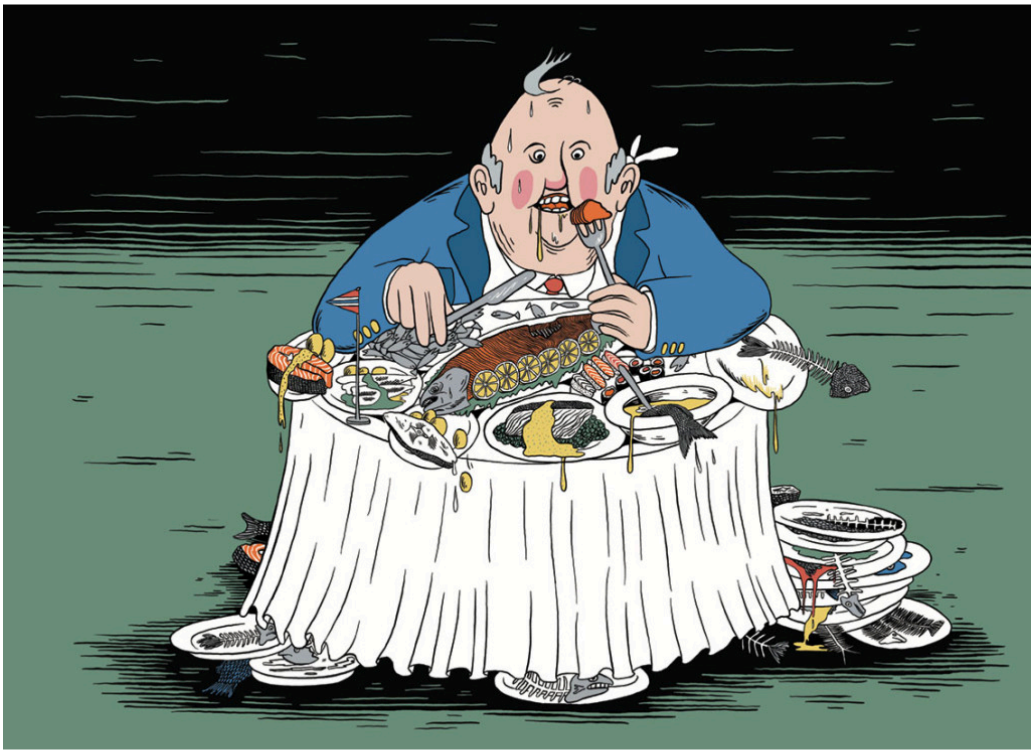
Illustration: Anders Kvammen

In 1976, a chemical factory explosion in Seveso, Italy, released large amounts of tetrachlorodibenzo-p-dioxin (TCDD) into the atmosphere (1, 2). Many animals died, and the flora withered. There were no fatalities, but many people suffered serious injuries that resembled burns (chloracne). The entire area had to be evacuated and decontaminated. The chemicals were highly toxic, and later studies showed that many in the Seveso area also experienced long-term effects such as endocrine and fertility disorders, as well as an increased incidence of cancer (2). Men who had been exposed to TCDD in early childhood had a reduced sperm count (3).

TCDD is one of several chemicals collectively known as dioxins and dioxin-like polychlorinated biphenyls (DL-PCBs). The chemicals are not easily degradable and therefore circulate in the environment and accumulate in the food chain. Most of them are fat-soluble, so the highest concentrations are found in fatty foods – especially fatty fish (4).

Environmental toxins and reduced fertility

International studies have also demonstrated an association between serum TCDD concentration in young boys and reduced sperm concentrations in adulthood (5). These effects have been replicated in experimental animal studies. Both epidemiological and experimental studies have shown that dioxins and DL-PCBs are associated with decreased sperm concentrations, altered sex ratio, impaired thyroid function and tooth enamel defects in offspring (6). In 2018, the European Food Safety Authority (EFSA) therefore reduced the tolerable weekly intake threshold for dioxins and DL-PCBs from 14 picograms per kilogram of body weight to 2 picograms per kilogram of body weight (6).

The decrease in sperm quality is a serious problem throughout the Western world. A systematic review has shown a 50–60 % reduction in sperm count among men from Europe, North America, Australia and New Zealand between 1973 and 2011 (7). New data suggest that this decline is accelerating. Since 2000, the percentage reduction in sperm count per year has doubled compared to the period 1972–2000 (increase from 1.16 % to 2.64 %) (7).

> ***«The declining sperm count has resulted in reproduction rates in Norway and many other countries that are too low to maintain population levels»***

A study published in 2002 found a lower percentage of men with a normal sperm count in Norway and Denmark than in Finland and Estonia (8). Danish men have also been shown to have the lowest sperm concentrations in Europe (9). The declining sperm count, combined with other factors that are reducing the fertility rate, has resulted in reproduction rates in Norway and many other countries that are too low to maintain population levels (10). This development is an existential threat to humanity.

Other environmental toxins have also been found to be more dangerous than previously thought. Per- and polyfluoroalkyl substances (PFAS), which are synthetic chemicals with various applications, such as packaging, cookware coatings, impregnation agents, paint and ski wax, find their way into the body through food and drinking water (11). Several large cohort studies have demonstrated a link between exposure to these chemicals and reduced fertility in both men and women (12–15). Epidemiological and experimental studies have shown that individual PFAS compounds are also associated with changes in cholesterol levels and have negative effects on the immune system. The EFSA has reduced the tolerance threshold to a fraction of the previous limit. The new tolerance threshold for the sum of four PFAS (perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), perfluorononanoic acid (PFNA) and perfluorohexane sulfonic acid (PFHxS)) is now 4.4 nanograms per kilogram of body weight per week (16–18).

The Norwegian diet exceeds the tolerance threshold

The Norwegian Scientific Committee for Food and Environment (NSCFE) has recently issued two reports (19, 20). According to these, a typical Norwegian diet exceeds the tolerance threshold of 2 picograms per kilogram of body weight per week for dioxins and DL-PCBs. The reports indicate that the proportion of people with average exposure above the tolerance threshold ranged from 96 % for 13-year-olds to 100 % for 2-, 4- and 9-year-olds. Fatty fish is a primary source of exposure, followed by dairy products (20).

> ***«PFAS intake exceeds the tolerance threshold in 44 % to 100 % of the population, and fish is the main contributor»***

The NSCFE also highlights that the adult population's average estimated PFAS exposure is 1.7 times higher than the tolerance threshold for current fish consumption. PFAS intake exceeds the tolerance threshold in 44 % to 100 % of the population (depending on the age group), and fish is the main contributor (20).

However, the NSCFE's 2022 report on the benefits and risks of fish in the Norwegian diet (20) recommends that all age groups increase their fish intake: adults should consume 300–450 grams of fish per week, including at least 200 grams of fatty fish. The report is more than 1000 pages long and emphasises the potentially positive effects of eating fish. This makes up more than two-thirds of the report's content, but there is little mention of the negative health effects of environmental toxins. One of the report's conclusions is that fish consumption protects against cardiovascular diseases, but it fails to mention that PFAS also contributes to increased levels of total and non-HDL cholesterol, which are known risk factors for cardiovascular and vascular diseases (21).

The Norwegian Human Milk Study (HUMIS) demonstrated that girls with high perinatal exposure to dioxins and DL-PCBs have a 50 % increased risk of being overweight at the age of seven (22). Overweight is also a known risk factor for later development of diabetes and cardiovascular diseases (23). The NSCFE concluded that there was no strong evidence to suggest that fish consumption affected children's health. In relation to adults, they only found evidence of positive health effects from increased fish consumption, no negative ones.

Industry-funded research

The NSCFE's report contains several references to studies that are funded by industry. One example is the Fish Intervention Studies (FINS), where the Norwegian Seafood Research Fund (FHF) provided NOK 45 million in funding and various other seafood industry stakeholders also gave several million in support (24).

> ***«Economic benefits for the food industry do not guarantee better health outcomes for the population, and the use of industry-funded studies as the basis for national nutrition recommendations is concerning»***

According to the project announcement, the aim of the project was 'to document positive effects and causal relationships between the consumption of seafood and human health' (25). In the project information, the expected contribution of the project was described as follows: '... promote a generally positive focus on seafood that will increase consumption and sales, and create further value in the industry' (26).

However, economic benefits for the food industry do not guarantee better health outcomes for the population, and the use of industry-funded studies as the basis for national nutrition recommendations is concerning (27).

Health effects from increased consumption of fish

The NSCFE's report states the following about environmental toxins: 'It is estimated that increasing fish intake to the highest recommended level will lead to an increase in the proportion exceeding the tolerance threshold for PFAS, resulting in all adults exceeding it. Children have a high estimated exposure, both in the current situation and in the projected scenarios, ranging from 1.5 times the tolerable threshold in the current situation for 9-year-olds, to 4.8 times the tolerable threshold for 2-year-olds in scenario 3.' Average exposure to dioxins and DL-PCBs also increases for all age groups (20).

The NSCFE acknowledges that exposure to dioxins, DL-PCBs and PFAS can lead to decreased sperm concentrations and reduced vaccine response. However, it recommends that the Norwegian authorities continue to disregard the tolerance thresholds set by the EFSA and recommends increasing the intake of both lean and fatty fish in all age groups. The NSCFE believes that such an increase could reduce the future occurrence of 'chronic public health diseases affecting older age groups', that 'male infertility constitutes a relatively small part of the disease burden' and that 'it is not known whether a lower vaccine response will lead to an increased risk of infections' (20). As such, they are weighing the risks of certain age-related diseases against the risks of other negative effects. Based on this, the NSCFE believes that 'the benefits of increasing fish intake (...) outweigh the risks'.

Increased intake = increased exposure to environmental toxins

The 'benefits' of increased fish intake do not, however, *negate* the risk. And a strong immune system is essential for good health in many ways. Following the recommendations, i.e. increasing the intake of fatty fish, will – as the NSCFE itself points out – increase exposure to toxic chemicals. Consequently, the risk of associated negative effects will also increase.

The fact that good nutrition is beneficial to health is nothing new. Instead of pitting the negative and positive effects against each other, we need to work towards reducing the presence of toxins in food while preserving its nutritional content. Until this is achieved, the consumption of fatty fish must be reduced, especially in children, young people and pregnant women.

The article was written on behalf of the special interest group for environmental toxins and public health.

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