Mercury & dioxins in fish

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Here is a paper from the European Food Safety Authority (EFSA) on the safety and nutritional contribution of wild and farmed fish.

As far as I understand, high consumption of contaminated fish, like top predatory fish or Baltic fish, might be a risk especially for foetal development and young children. Women going to have a baby should take care.
What about adult males? Is there a risk for men as well?

http://www.efsa.europa.eu/en/press_room/press_release/2005/1017.html

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EFSA provides advice on the safety and nutritional contribution of wild and farmed fish
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The European Food Safety Authority (EFSA) has published an opinion on the health risks related to the consumption of wild and farmed fish.

Press release
EFSA provides advice on the safety and nutritional contribution of wild and farmed fish

The European Food Safety Authority (EFSA) has published an opinion on the health risks related to the consumption of wild and farmed fish. EFSA s Opinion says that there are no consistent differences between wild and farmed fish both in terms of safety and nutritional value *. Consumption of fish, and in particular fatty fish due to its richness in long chain n−3 polyunsaturated fatty acids, is beneficial to cardiovascular health and also to foetal development. In general, dietary recommendations suggest weekly consumption of one to two portions of fatty fish. The greatest susceptibility to the critical contaminants, methylmercury and dioxin−like

compounds, occurs during early human development. Scientific experts therefore advise that − in particular for vulnerable groups such as the unborn child, pregnant women and women of child−bearing age − the nutritional benefits of fish should be weighed against the potential risks related to the presence of contaminants in certain types of fish. Overall, nutritional guidelines concerning fish consumption will not lead to intakes of dioxins and dioxin−like PCBs which cause safety concern, with the exception of fatty fish caught from the Baltic sea (e.g. herring and salmon) where the available data concerning contaminant levels support the more specific recommendations established by Swedish and Finnish food safety authorities ** . The Panel notes however that advice regarding fish consumption should also take into account other sources of these contaminants in the diet. With respect to methylmercury, women eating up to two portions of fish per week are unlikely to exceed tolerable intake levels provided that certain types of top predatory fish are avoided. Additional guidance regarding the types and quantities of fish most suited to consumers diets is provided by national food safety authorities in Member States. Finally, the EFSA Panel on Contaminants in the Food Chain recommends the development of a consistent and agreed methodology for carrying out quantitative assessments of risks and benefits related to food consumption.

EFSA was asked by the European Parliament to assess the health risks related to human consumption of wild and farmed fish and to include an overall impact and risk assessment related to the consumption of Baltic herring. EFSA s advice concentrates on the most relevant heavy metals and persistent organic contaminants, namely methylmercury *** , dioxins **** and dioxin−like PCBs ***** and also reviews the nutritional value and benefits from consuming fish. In order to carry out this assessment requiring multi−disciplinary expertise, EFSA established an Inter−panel working group consisting of members from the following Scientific Panels: Contaminants in the Food Chain (CONTAM); Dietetic Products, Nutrition and Allergies (NDA); Additives and Products or Substances used in Animal Feed (FEEDAP); and Animal Health and Animal Welfare (AHAW).

Fish makes an important nutritional contribution to the diet, providing proteins, fatty acids (such as long−chain n−3 polyunsaturated fatty acids − LC n−3 PUFAs) and certain vitamins and minerals. Consumption of fish is beneficial to cardiovascular health and may also benefit development of the unborn child. Dietary recommendations often advise one to 2 portions (130g per portion) of fatty fish (such as herring and salmon) per week, or greater amounts of lean fish, in order to achieve intake levels of LC n−3 PUFA favourable to the cardiovascular system.

In assessing the safety of wild and farmed fish, EFSA s CONTAM Panel reviewed a wide range of contaminants and concluded that the two contaminants for which high consumers of fish might exceed the provisional tolerable weekly intake (PTWI) are:
(i) methylmercury which is found at elevated concentrations in tuna and other top predatory fish which are mostly caught in the wild, and
(ii) dioxins and dioxin−like PCBs for which higher levels are found in

fatty fish, e.g. herring and salmon.

Methylmercury is particularly toxic to the nervous system and the developing brain. Exposure during pregnancy and early infancy is therefore of particular concern. Pregnant women eating up to two portions of fish per week are unlikely to exceed provisional tolerable weekly intake (PTWI) levels for methylmercury, as long as they do not consume blue fin or albacore tuna. (These species are not likely to be found in canned tuna in Europe). Other top predatory fish, such as marlin, pike, swordfish, and shark also frequently contain high levels of methylmercury. EFSA already recommended in March 2004 ****** that women of childbearing age (in particular, those intending to become pregnant), pregnant and breastfeeding women, as well as young children, select fish from a wide range of species without giving undue preference to top predatory fish, such as swordfish and tuna.

For dioxins and dioxin−like PCBs, it would take several years to reduce levels in the human body. It is therefore not possible for women wishing to become pregnant to reduce these levels without excluding fish (as well as other possible food sources of dioxins and dioxin−like PCBs) from their diets completely for several years before conception. However, women consuming up to two portions per week of fatty fish will not exceed the provisional tolerable weekly intake for dioxins and dioxin−like PCBs provided that they take into account other possible sources in the diet so as not to exceed the PTWI.

According to EFSA s Opinion frequent consumers of fatty fish coming from the Baltic Sea, i.e. Baltic herring and wild Baltic salmon are more likely to exceed the PTWI for dioxins and dioxin−like PCBs than other consumers of fatty fish. On average, Baltic herring and wild Baltic salmon are respectively 3.5 and 5 times more contaminated with dioxin and dioxin−like PCBs in comparison with non−Baltic herring and farmed salmon. Specific advice concerning Baltic fish consumption, taking into account these higher contamination levels, is given by national food safety authorities in Sweden and Finland2.
Advice on fish consumption needs to take into account total dietary exposure of relevant contaminants, based on national consumption patterns. Guidance regarding the types and quantities of fish most suited to consumers diets is provided by national food safety authorities in Member States. Factors which affect the levels of contaminants found in fish include: species; life stage and fish s diet; season; and location of catch. These levels vary broadly within species and between species in both wild and farmed fish. Based on the data available, there are no consistent differences between nutrient and contamination levels of wild and farmed fish. In farmed fish, fish oil and fish meal are the most important sources of organic contaminants and possibilities for reducing contaminants levels in fish feed should be further explored. For wild fish the only action possible is the long−term control of emissions of pollutants to the environment.

Fish, whether wild or farmed, has its place in a well balanced diet and

overall there is no consistent difference between wild and farmed fish with respect to their safety for the consumer.

For additional information on the CONTAM Panel s Opinion on the Safety of Wild and Farmed Fish, see the background note attached.

The full text of the opinion.

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* This assessment is based on available data but there is a need for further development in the standardization of sampling methods in order to improve comparisons between wild and farmed fish.

** For Finland: www.nfa.fi and for Sweden:
http://www.slv.se/templates/SLV_Page____11374.aspx

*** Methylmercury (MeHg) is the predominant form of mercury in fish and is the most toxic form of mercury from the diet for human health. It occurs primarily as a result of microbial activity on the mercury present in the sea.

**** Dioxins can be divided into 2 principles types: PCDDs (polychlorinated dibenzo−p−dioxins) and (PCDFs) polychlorinated dibenzo−p−furans.

***** Dioxin−like PCBs are polychlorinated biphenyls (PCBs), which have the same mode of action as dioxins.

****** http://www.efsa.eu.int/press_room/press_release/258_en.html

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Background note on EFSA risk assessment related to the safety of wild and farmed fish (Request N° EFSA− Q−2004−23)

1. What types of fish were considered by EFSA in its risk assessment?

In carrying out its risk assessment, the Scientific Panel on Contaminants in the Food Chain focused on the principal fish species found in the European Union (EU) market: herring, salmon, tuna, rainbow trout, carp, anchovies, mackerels and pilchards.

2. Is it healthy to eat fish?

Fish makes an important contribution to an overall healthy diet by providing protein, fatty acids (such as long chain n−3 polyunsaturated fatty acids, LC n−3 PUFAs) and certain vitamins and minerals (vitamins A, B12 and D, iodine and selenium). Substantial dietary intake of LC n−3 polyunsaturated fatty acids can be obtained readily by eating fatty fish or larger amounts of lean fish. Therefore individuals who eat no fish will have difficulties in meeting the daily intakes of LC n−3 PUFA recommended with regard to cardiovascular health and foetal development.

However fish can also contribute significantly to the dietary exposure to contaminants such as methylmercury, dioxins and PCBs, brominated flame retardants, camphechlor and organotin compounds. Concentrations of these contaminants in fish vary with the nature of the contaminant and the type of fish. Fat soluble contaminants (such as dioxins and dioxin−like compounds) are especially found in fatty fish, e.g. salmon and herring. In contrast, methymercury levels are not related to the fat content of the fish but due to its accumulation in the food chain, methylmercury is present in higher amounts in large predatory fish (such as swordfish and tuna).

High consumers of top predatory fish such as pike or tuna (especially bluefin or albacore tuna, not likely to be found in canned tuna in Europe) may exceed the provisionally tolerable weekly intake (PTWI) for methylmercury. High consumers of fatty fish may exceed the PTWI for dioxins and dioxin−like compounds.

But it should also be kept in mind that there exist other dietary sources for the fat soluble contaminants. Consumers who have high meat intakes may also exceed the PTWI for dioxins (PCDD/F) and dioxin−like compounds, regardless of their level of fish consumption. Therefore replacing fish with meat will not inevitably lead to decreased dietary exposure to these contaminants.

Intakes of contaminants in fish other than methylmercury and dioxins and PCBs, are not a health concern. Fish do not contribute significantly to total dietary exposure to these contaminants, and where it does, it is unlikely that even high consumers of fish exceed the tolerable intake levels (where these have been established).

3. Should I be eating fish leading up to or during pregnancy

Methylmercury is particularly toxic to the nervous system and the developing brain. Exposure during pregnancy and early infancy is therefore of particular concern. Methylmercury is removed from the body naturally but it takes about several months for the levels to fall. Canned tuna seems to have lower levels of methylmercury than fresh tuna due to different species and/or size of fish used.

Pregnant women eating up to two portions/week fish are unlikely to exceed the PTWI for methylmercury provided that one of these portions is not bluefin or albacore tuna. Such species are not likely to be found in canned tuna marketed in the EU. Other top predatory fish such as marlin, pike, swordfish and shark frequently contain high levels of methylmercury. More specific dietary recommendations regarding fish consumption are given by national food safety authorities in Member States.

Dioxins and dioxin−like compounds affect in particular the developing male reproductive system; therefore exposure of the unborn child through the mother during pregnancy is the most critical period. Dioxins and dioxin−like compounds accumulate in the body s fatty tissue and have very long half−lives which means that it takes many years for the body to clear these chemicals. Consequently the level found in the body or body burden during pregnancy is not determined by the dioxin intake at that time but by the accumulation of all previous intakes over many years.

Fatty fish such as salmon and herring contain higher levels of contaminants such as dioxins and dioxin−like compounds than lean fish.

Pregnant women eating up to two portions per week of fatty fish such as non−Baltic herring or salmon will not exceed tolerable intake values (i.e. the PTWI) for dioxin and dioxin−like compounds, although other sources of dietary exposure need to be taken into account.

In previous advice issued in March 2004, EFSA recommended that women of childbearing age (in particular, those intending to become pregnant), pregnant and breastfeeding women as well as young children select fish from a wide range of species without giving undue preference to top predatory fish such as swordfish and tuna. http://www.efsa.eu.int/press_room/press_release/258_en.html. This advice is still valid and should be taken into account in selecting the one or two portions of fish a week which are considered to contribute to a healthy diet. Further and more specific dietary advice regarding fish consumption is provided by national food safety authorities in Member States.

4. Why is Baltic fish getting special attention?

The Baltic Sea is heavily contaminated by a number of pollutants, e.g. dioxins and PCBs. Whilst the reason for this is not fully elucidated, it is thought that industrial activities of the past together with the long retention time of the water could be important factors. Contamination levels have declined in Baltic fish over the past three decades but no further decrease is seen today. On average levels of dioxin and dioxin−like

compounds in Baltic herring is about 3.5 times higher than in non Baltic herring. Wild Baltic salmon is about 5 times more contaminated with dioxin and dioxin−like compounds than farmed salmon.

As a result there is a greater potential to exceed the provisional tolerable weekly intake (PTWI) if people eat herring or wild salmon from the Baltic sea more than once a week. Specific national advice is given, notably in Sweden and Finland, and particularly for girls. This is due to the fact that dioxins and dioxin−like compounds are stored in the body for a long time with consequences on the levels found in a woman s body during pregnancy and in breast milk (for those women choosing to breastfeed).

5. Which fish are farmed

While EU fish catches have declined, fish consumption has increased by at least 1% per year during the last ten years. The increasing consumer demand for fish has been met mainly by greater availability of farmed fish both from the EU and imported. Fish caught from the wild represent however about two−thirds of total fish consumed. Examples of fish which are predominantly or exclusively farmed are salmon, rainbow trout and carp. Fish caught from the wild include herring, anchovies, tuna mackerels and pilchards.

6. Is consumption of farmed fish less safe than wild fish?

There are no consistent differences between wild and farmed fish both in terms of safety and nutritional contribution. (An exception is Baltic salmon where farmed Baltic salmon is less contaminated than that caught from the wild). Species, season, location, diet, lifestage and age all have a major impact on both the nutrient and contaminant levels of fish. These levels vary broadly within species and between species in both wild and farmed fish.

7. Is European fish more contaminated than North American fish?

In a scientific paper published about one year ago and a follow−up paper of the same authors published in May this year (Hites et.al., 2004 Foran et.al., 2005) the authors indeed suggested that North American salmon was less contaminated than European salmon. However, the authors did not take into account the seasonal, location, and fish s diet, lifestage and age factors which vary widely. When taking these factors into account no consistent differences in contaminant levels could be observed between European and North American fish, including salmon.

References:

Hites R.A., Foran J.A., Carpenter D.O., Hamilton M.C., Knuth B.A., Schwager S.J. (2004).

Global Assessment of Organic Contaminants in Farmed Salmon Science, 303: 226−229.

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