

7. MERCURY IN FISH

WHICH SPECIES REQUIRE GREATER ATTENTION

WHY MERCURY CAN BE FOUND IN FISH

Mercury (Hg) is an element naturally present in the environment, also released by human activities such as coal combustion, certain industrial processes and mining. In the atmosphere it can be transported over long distances; some of it reaches seas, lakes and rivers through deposition. Its presence in a fish therefore does not, on its own, demonstrate recent local pollution.

In aquatic environments, under certain conditions, microorganisms can convert some mercury into methylmercury, an organic form that enters food webs and accumulates in organisms' tissues. In the muscle of fish, especially predatory species, a substantial proportion of total mercury may be present as methylmercury. The two measurements are not chemically equivalent, however: total mercury includes all forms and does not always allow the concentration of the organic form alone to be determined precisely.

BIOACCUMULATION AND BIOMAGNIFICATION: WHY SPECIES DIFFER

Bioaccumulation occurs when a substance is absorbed and retained by an organism; biomagnification occurs when concentrations increase from prey to predator along the food chain. Methylmercury exhibits both properties. Consequently, large predatory fish, which are often long-lived, tend on average to have higher concentrations than many small, short-lived species.



In large predatory fish, such as tuna, methylmercury can accumulate through the food chain.

Actual concentrations also depend on species, size, age, catch area, diet and environmental conditions. It is scientifically incorrect to assign a fixed value to every individual of a given species, or to regard “wild-caught” or “farmed” origin as an absolute guarantee that the contaminant is absent. Species-level statistics can guide food choices, but they cannot replace analyses of representative samples.

WHICH FISH SPECIES REQUIRE GREATER ATTENTION

Species warranting particular attention with regard to methylmercury include swordfish, sharks, certain large tuna species and other large predators. In 2026, EFSA cited swordfish, shark, bigeye tuna and bluefin tuna among examples of particularly relevant species. Certain freshwater predators, such as pike, can also reach significant concentrations.

Species such as sardines, anchovies, herring, salmon and trout are generally considered useful options for varying fish consumption while reducing methylmercury exposure relative to large predators. This does not mean that every individual is “mercury-free”: natural variation, possible local contamination and differences between batches remain.



Small fish species with short life cycles generally have lower mercury concentrations than large predatory fish.

The commercial category “tuna” encompasses different species, sizes and products. Distinguishing bluefin tuna, bigeye tuna, skipjack tuna and other tuna species is more informative than assigning a single risk level to all products. Canned tuna, too, does not by definition have a constant concentration: the species used, fish size and origin matter.

PRESENCE, EXPOSURE AND HEALTH RISK

Presence refers to the analytical detection of mercury in food, generally expressed in mg/kg. Exposure, by contrast, is the amount of contaminant actually ingested over time: it depends on concentration, portion size, consumption frequency and the individual's body weight. Health risk is the assessment of the likelihood and severity of adverse effects in relation to that exposure, the chemical form and individual vulnerability.

For methylmercury, EFSA established a tolerable weekly intake (TWI) of 1.3 micrograms per kilogram of body weight, expressed as mercury. In June 2026 it confirmed the validity of this reference value, while noting that methodological advances and new data could justify an updated assessment in the future. The TWI is a guide for evaluating

repeated exposure over time: it is not the legal limit for an individual fish, and exceeding it in a single week does not automatically amount to a diagnosis of harm.

A purely illustrative example helps clarify the difference: a 150 g portion containing 0.5 mg/kg of total mercury provides 75 micrograms of total mercury. It would not be correct to compare all 75 micrograms automatically with the methylmercury TWI without considering chemical speciation. Moreover, a single meal does not describe habitual exposure. This distinction is crucial when interpreting laboratory results and dietary advice.

HEALTH EFFECTS AND MORE VULNERABLE GROUPS

The critical effect of methylmercury primarily concerns the developing nervous system. Pregnancy, the period before conception, breastfeeding and childhood therefore deserve particular attention. Advice aimed at more vulnerable groups seeks to limit exposure over time without foregoing the beneficial nutrients supplied by fish.

Fish provides high-quality protein, iodine and, depending on the species, long-chain omega-3 fatty acids and vitamin D. Scientifically balanced communication must therefore consider nutritional benefits and contaminant risks together. EFSA recommends choosing a variety of species and, especially for children and women of childbearing age, favouring those generally lower in methylmercury.

EU MAXIMUM LEVELS AND WHAT COMPLIANT FISH MEANS

Regulation (EU) 2023/915, as amended, establishes maximum levels of total mercury for different categories of fishery products, expressed in mg/kg wet weight. There is no single value for all fish. Section 3.3 of the Annex provides, among other values, 1.0 mg/kg for specified species including swordfish, sharks and tuna; 0.30 mg/kg for species including the anchovies, sardines, mackerel, herring, salmon and trout identified in the legislation; and 0.50 mg/kg for other categories not covered by the specific groups. Correct application requires identification of the species, including by scientific name, and consultation of the consolidated legal text.

Exceeding the maximum level applicable to a particular category makes a product non-compliant for marketing purposes. Compliance, conversely, does not mean the absence of mercury or guarantee that any consumption frequency is appropriate for every individual. Maximum levels are tools for product management and control; dietary advice also takes into account cumulative exposure and the sensitivity of different population groups.

OFFICIAL CONTROLS: VALUE AND LIMITATIONS OF TESTING

Public controls and those performed by food business operators play an essential role in identifying non-compliant products and describing contamination trends. To interpret a laboratory report correctly, it is useful to know which matrix was analysed, which species the sample represents, how sampling was carried out and whether the result refers to total mercury or methylmercury. Detection and quantification limits, analytical uncertainty and the representativeness of the batch also matter.



Total mercury analyses are particularly important for checking compliance with regulatory maximum levels, but they do not always establish what proportion is methylmercury. Chemical speciation provides more direct information for toxicological assessment where it is needed and technically available. Even an accurate measurement of a single sample cannot automatically be generalised to every individual of the same species or all catches from an area.

WHAT THE MOST RECENT EUROPEAN DATA SHOW

In February 2026 EFSA published the results of a European survey on consumption habits and awareness of advice about mercury in fishery products. It found that a substantial proportion of consumers, including pregnant women, frequently eat species associated with higher regulatory maximum levels. The survey addresses behaviour and awareness: it is not a chemical analysis of individual fish and, on its own, cannot estimate personal exposure.

In July 2026 EFSA also reported that a new integrated assessment of the benefits and risks of fish consumption was under way, with completion expected by the end of 2027. Future findings may refine dietary advice. Until then, established scientific knowledge, evidence still under review and current national recommendations should be clearly distinguished.

HOW TO REDUCE EXPOSURE WITHOUT GIVING UP FISH

For most consumers, the most useful approach is not to eliminate fish but to vary species and avoid concentrating habitual consumption on large predators. Children, pregnant women and women planning pregnancy should follow national health authorities' advice on species and consumption frequency. Recommendations are not identical in every country, partly because eating habits differ.

Cooking, freezing and removing the skin are not reliable ways of eliminating methylmercury from fish muscle. Prevention relies primarily on species selection, consumption frequency and controls throughout the supply chain. Access to batch-specific analytical data can improve transparency, provided the method, unit of measurement, species and limitations of interpretation are stated.

CONCLUSIONS

Mercury in fish illustrates the difference between environmental contamination and dietary risk. The presence of the contaminant results from complex environmental processes; concentrations vary widely between species and individuals; and risk depends on the ingested dose and the consumer's vulnerability. Official controls, reliable analytical results and nutritional recommendations support informed choices, avoiding both alarmism and excessive reassurance.

SCIENTIFIC AND REGULATORY REFERENCES

1. EFSA (2026). Metals as contaminants in food – update of 21 July 2026.
<https://www.efsa.europa.eu/en/topics/topic/metals-contaminants-food>
<https://www.efsa.europa.eu/en/topics/topic/metals-contaminants-food>
2. EFSA (2026). Fish and seafood consumption in the EU: awareness of dietary advice on mercury. <https://www.efsa.europa.eu/en/news/fish-and-seafood-consumption-eu-awareness-dietary-advice-mercury>
<https://www.efsa.europa.eu/en/news/fish-and-seafood-consumption-eu-awareness-dietary-advice-mercury>
3. EFSA (2026). Statement on the findings presented in the Toxicological Profile for Mercury issued by the US ATSDR. EFSA Journal.
<https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2026.10156>
<https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2026.10156>
4. EFSA CONTAM Panel (2012). Scientific Opinion on the risk for public health related to the presence of mercury and methylmercury in food.
<https://www.efsa.europa.eu/en/press/news/121220>
<https://www.efsa.europa.eu/en/press/news/121220>
5. EFSA (2015). Fish: scenarios indicate benefits versus risks.
<https://www.efsa.europa.eu/en/press/news/150122>
<https://www.efsa.europa.eu/en/press/news/150122>
6. European Commission. Regulation (EU) 2023/915 on maximum levels for certain contaminants in food, Annex I, section 3.3 (check the consolidated text for amendments). <https://eur-lex.europa.eu/eli/reg/2023/915>
<https://eur-lex.europa.eu/eli/reg/2023/915>
7. European Commission. Mercury – Food Safety: information and dietary guidance.
https://food.ec.europa.eu/food-safety/chemical-safety/contaminants/catalogue/mercury_en
https://food.ec.europa.eu/food-safety/chemical-safety/contaminants/catalogue/mercury_en