



Advice

Biochemical Interaction between Selenium and Mercury in Fishery and Aquaculture Products

Brussels, 24 March 2026

1. Background

At previous opportunities¹, the MAC adopted advice to the European Commission on the nutritional benefits of the consumption of fishery and aquaculture products, which called for the recognition of the corresponding health benefits in policy initiatives as well as awareness raising among EU consumers.

According to the FAO and WHO², fishery and aquaculture products are an important source of several important nutrients, including high-quality proteins marine-long chain n-3 polyunsaturated fatty acids, or LC n-3 PUFAs (eicosapentaenoic acid and docosahexaenoic acid), vitamin A, vitamin D, vitamin B12, iodine, iron, selenium (Se), and zinc. The consumption of fishery and aquaculture products can potentially reduce micronutrient deficiencies and might further reduce the risk of diet-related non-communicable diseases. The FAO's flagship report³ emphasises that aquatic foods are an excellent source of protein and even more important source of other nutrients, being considered among the healthiest foods. Both iodine and long-chain omega-3 fatty acids are important for a child's brain development.

¹ [MAC Advice on "Health and Environmental Value of Seafood" \(8 October 2021\)](#) and [MAC Advice on "Vision for Fisheries, Aquaculture and their Market in 2040" \(15 July 2025\)](#)

² [FAO & WHO. 2024. FAO/WHO background document on the risks and benefits of fish consumption. Food Safety and Quality Series, No. 27. Rome](#)

³ [FAO. 2024. The State of World Fisheries and Aquaculture 2024 – Blue Transformation in action. Rome](#)

Across the supply chain, operators have promoted further scientific research on the nutritional aspects of fishery and aquaculture products⁴, highlighting fishery and aquaculture products as a fundamental component of a balanced diet with beneficial effects on cognitive development, prevention and improvement of chronic diseases. Furthermore, international⁵ and national dietary guidelines⁶ generally encourage the consumption of fish at least twice a week.

Besides health benefits, fishery and aquaculture products may contain undesirable components that may impact human health. Many contaminants are ubiquitously present in the environment and may be present in fishery and aquaculture products, depending on factors such as geography and the age and trophic level of aquatic animals.

2. Methylmercury

Mercury is a toxic non-essential element and metal that is naturally present in the earth's crust. It is distributed in the environment by both natural and anthropogenic processes, including volcanic eruptions, erosion, mining, coal incineration and other industrial processes. Mercury cycles between the atmosphere, water, ocean, biota and land, where it undergoes complex transformations. Humans are exposed to mercury during these biogeochemical cycles, and this may result in various health implications.

Humans are exposed to methylmercury predominantly through fish and seafood consumption. The content varies extensively and depends on a variety of factors, including species, trophic level, size, age and diet. Methylmercury accumulates in organisms and biomagnifies along the

⁴ See, as an example: [INTERFISH-España, «Decálogo Científico de Posicionamiento sobre consumo de Pescado, Salud y Sostenibilidad» \(2025\)](#)

⁵ [World Health Organization. Regional Office for the Eastern Mediterranean Promoting a healthy diet for the WHO Eastern Mediterranean Region: user-friendly guide \(2012\)](#)

⁶ https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/food-based-dietary-guidelines-europe-table-9_en

aquatic food chain, reaching the highest concentrations in animals at the highest trophic levels. Thus, long-lived predatory seafood species contain the highest concentrations⁷.

In 2003, the FAO/WHO Joint Expert Committee on Food Additives established a Provisional Tolerable Weekly Intake for methylmercury of 1.6 µg/kg of body weight⁸. In 2012, EFSA published a scientific opinion establishing a Tolerable Weekly Intake for methylmercury of 1.3 µg/kg of body weight⁹. The mentioned opinion explains that the average consumer does not exceed the Tolerable Weekly Intake, but that, in many European countries, consumers who eat large amounts of fish meat often exceed the Tolerable Weekly Intake. According to the opinion's recommendations, "exposure to methylmercury above the TWI is of concern, but if measures to reduce methylmercury exposure are considered then the potential beneficial effects of fish consumption should also be taken into account".

Commission Regulation (EU) 2023/915¹⁰ establishes maximum levels for mercury, which vary depending on the fish species, reflecting corresponding natural occurrence, nutritional benefits, and consumption advice. If a product exceeds the maximum levels, it is legally prohibited from being placed on the EU market. On February 2026, EFSA published a scientific report on "frequency of consumption of different fish, crustacean and mollusc species contributing to methylmercury exposure and consumer awareness of national advice on their consumption"¹¹, which concluded that "risk-benefit communication strategies related to dietary advice could focus on raising awareness of the health benefits of fish/other seafood consumption among low

⁷ [FAO. 2024. The State of World Fisheries and Aquaculture 2024 – Blue Transformation in action. Rome](#)

⁸ [World Health Organization. \(2004\). Evaluation of certain food additives and contaminants: Sixty-first report of the Joint FAO/WHO Expert Committee on Food Additives \(WHO Technical Report Series, No. 922\)](#)

⁹ [EFSA, Scientific Opinion on the risk for public health related to the presence of mercury and methylmercury in food \(2012\)](#)

¹⁰ [Commission Regulation \(EU\) 2023/915 of 25 April 2023 on maximum levels for certain contaminants in food and repealing Regulation \(EC\) No 1881/2006](#)

¹¹ [EFSA, Scientific Report on Frequency of consumption of different fish, crustacean and mollusc species contributing to methylmercury exposure and consumer awareness of national advice on their consumption \(2026\)](#)

consumers with low awareness, especially pregnant women, diversifying fish/other seafood species for high consumers with low awareness, especially among pregnant women, and explore how to access trusted sources of information on these topics”.

3. Selenium

Fish and seafood are a major source of selenium. Selenium is an essential trace element, the main function of which, in the human body, is as part of enzymes such as glutathione peroxidase, which has an important role in protecting against oxidative stress, and in the enzyme iodothyrodine 5'-deiodinase, which is important for the metabolism of the thyroid hormones. The FAO's flagship report¹² draws attention to the proposed protective effect of selenium against methylmercury toxicity, claimed to be achieved by influencing the transport, bioavailability, speciation and detoxification processes. Mechanistic in vitro studies and animal studies indicate a potential role of selenium in modulating methylmercury toxicity, including through effects on bioavailability and detoxification pathways. However, current evidence from human studies remains limited and does not yet allow for definitive conclusions in terms of risk assessment.

In 2023, EFSA published a scientific opinion on the tolerable upper intake level for selenium, focusing on selenium as a nutrient¹³. While EFSA acknowledges that both selenium and mercury are part of the diet-wide considerations of the consumption of fishery and aquaculture products, the agency has not addressed the biochemical interactions between both.

4. Recommendation

To ensure policymaking based on the best available science, the MAC considers that further work is needed to better characterise the biochemical interactions between selenium and mercury,

¹² [FAO. 2024. The State of World Fisheries and Aquaculture 2024 – Blue Transformation in action. Rome](#)

¹³ [EFSA, Scientific opinion on the tolerable upper intake level for selenium \(2023\)](#)



including potential dietary benefits and risks associated with the consumption of fishery and aquaculture products. Therefore, the European Commission should collate the existing scientific evidence and undertake further scientific studies on the mentioned potential benefits and risks.

To ensure policymaking based on the best available science, the MAC encourages the European Commission to support further work aimed at improving the availability and comparability of data relevant for risk–benefit assessment, particularly regarding methylmercury, selenium and key nutrients, as well as variability across species, production methods and consumption patterns. As the Commission is currently holding discussions with Member States on the maximum levels for mercury in different species of fish and seafood¹⁴, the MAC remains available to exchange and provide advice on the matter, including in relation to future risk–benefit assessments future risk-benefit assessments of mercury in food.

Any future assessment of mercury in fishery and aquaculture products should follow an integrated risk–benefit approach, taking into account both the potential risks associated with contaminants and the well-documented nutritional benefits of seafood consumption, supported by improved availability and harmonisation of data on key parameters such as methylmercury, selenium and essential nutrients (including omega-3 fatty acids, iodine and vitamin D) across species, origins and production systems. These future risk assessments should also take into account the available consumption advice and consumption practices in the EU.

¹⁴ <https://www.efsa.europa.eu/pt/news/fish-and-seafood-consumption-eu-awareness-dietary-advice-mercury>