



The State of Mercury in Montenegro



The Minamata Convention on Mercury is the first global agreement specifically designed to address contamination from a heavy metal. Opened for signature in October 10, 2013 and entering into force on August 16, 2017, the Convention seeks to address issues related to the use and release of mercury in trade and in industrial processes. The treaty also addresses major sources of atmospheric emissions and releases of mercury into the environment, as well as long-term storage and disposal of mercury and mercury compounds.

Under the Minamata Convention, individual countries are charged with protecting human health and the environment from the risks of mercury exposure by

systematically controlling mercury emissions and releases, including phasing out the use of mercury in certain products and processes.

Montenegro became a signatory of the Convention on September 24, 2014. In order to meet its obligations under the treaty, Montenegro conducted a Minamata Initial Assessment (MIA) to quantitatively and comparatively determine the extent of local mercury pollution. Some findings from the MIA and recommendations from the Montenegro mercury team can be found in this brochure.



Findings from the Minamata Initial Assessment

What are the Sources of Mercury?

The origin of mercury can be natural (e.g., volcanoes) or anthropogenic (e.g., human-caused releases). The major sources of mercury in Montenegro, based on the mercury inventory conducted for the MIA, include the following:

- Coal-fired power plants and boilers (35%)
- Use and disposal of mercury-added products (28%)
- Mercury waste into landfills and waste water (27%)
- Mercury release from dental amalgam (7%)
- Other fossil fuels and wood burning (3%)



As a result of the MIA process, the magnitude and source distribution of these anthropogenic releases into the air, water, and land are now quantified for Montenegro. Based on the MIA findings, a major source of mercury emissions stems from coal-fired power plants and major sources of releases into the environment (land and water) are through waste disposal into landfills and waste water treatment plants. The total amount of mercury emissions calculated in the Montenegro MIA is 2,178 kg/year.



Rivers

How are People Exposed to Mercury?

Elemental mercury, which is found in manufactured products, is not necessarily toxic to humans. Exceptions may include dental amalgam and cosmetics, but these products are still under scientific investigation, so their potential harm is not yet fully characterized.

Methylmercury, the organic form of mercury, is toxic to humans because it can biomagnify in food webs and bioaccumulate over time in organisms. A neurotoxin, methylmercury can cause physiological harm and behavioral disorders in people.

Fish from the sea or freshwater systems can be a major source of methylmercury. In general, fish species that are small, short-lived, and forage low in the food web contain less methylmercury, while predatory species that are long-lived and grow larger can contain higher levels of methylmercury. Many of the fish available in Montenegro are safe to eat, although more information is needed about the mercury concentrations to better characterize how mercury is distributed in different species of fish in the waterscape of Montenegro.

Seafood with lower mercury levels (healthier choices):

- Anchovy, Cuttlefish, Salmon, Sardines, Scad, Squid, Trout

Seafood with medium mercury levels (moderate risk):

- Eels, Mackerel, Octopus, Seabream (or Dentex)

Seafood with higher mercury levels (riskier choices):

- Dogfish, Tuna



Atlantic Bluefin Tuna



Beaches/Estuaries

How Does Mercury Affect Ecological Health?

The process of methylation, the conversion of mercury to methylmercury, varies widely on the landscape and within the waterscape. Areas that are particularly sensitive to mercury deposition—where methylation rates are highest and biomagnification in the food web is greatest, and where animals experience significant reproductive harm—are called biological mercury hotspots. These areas generally represent aquatic ecosystems or have an aquatic connection within the food web.

Generally, aquatic ecosystems connected to wetlands, either marine (e.g., estuaries) or freshwater (e.g., lakes), are prime areas for high methylation rates. Fish and wildlife predators that live in estuaries and lakes, or that forage in a food web associated with these

habitats (e.g., beaches or forests), often contain elevated mercury levels. The combination of high methylation rates and longer-lived animals higher in the food web creates the greatest risk. It is unknown if Montenegro has biological mercury hotspots (i.e., where fish and wildlife reproductive success is harmed).

Habitats of Greatest Risk

- Wetlands, estuaries, lakes, reservoirs, and aquatic habitats near contaminated sites

Fish and Wildlife at Greatest Risk

- Dalmatian Pelican (one of the world's largest waterbirds), cormorants, herons and egrets, bitterns, grebes, and terns



Dalmatian Pelican



Forested Mountain Valleys



Lakes

What is the State of Mercury in the Mediterranean?

The impacts of mercury pollution can be challenging to identify and reverse. However, it is important because mercury can cause significant adverse effects to human and ecological health.

Findings from the Montenegro MIA indicate the input of mercury into ecosystems may be elevated in some areas, but with effort by the government, key stakeholders, and the general public, those inputs can be further identified and reduced.

The impacts of regional mercury loads in the Mediterranean Sea and the effect on commercial and recreational fisheries, specifically tuna and salmonids (on freshwater lakes), may require broader regional actions—but MIAs are being undertaken by

many countries in the region, which should significantly reduce mercury in the region's landscape and waterscape.

WHAT CAN YOU DO TO HELP?

- Choose healthier fish options (those with lower mercury levels) as part of your diet
- Use your buying power—purchase no- or low-mercury product replacements when possible (See Useful Links on back page for more information).
- Support legislation that helps reduce the impacts of mercury on the environment

Recommendations from the Montenegro Mercury Team

- Create legislation that can help facilitate a framework to comply with the Minamata Convention.
- Reduce the import and use of products that contain mercury by selecting no- or low-mercury product replacements:
 - Replace compact and linear fluorescent lights with LED bulbs
 - Check the ingredients in skin lightening creams and lotions to avoid products that contain mercury
 - Choose brands of batteries that do not contain mercury
- Properly store waste products with mercury and avoid using landfills by creating proper storage facilities for hazardous waste.
- Generate greater awareness and education through existing outreach programs; oversee the development and distribution of information on mercury to the public, including importers of manufactured products.
- Participate in global mercury database and monitoring programs and coordinate existing data with global efforts organized by UN Environment:
 - Use hair samples for people
 - Use muscle samples for fish
 - Use blood, feather, and egg samples for birds

About Montenegro

An independent country since 2006, Montenegro lies on the Adriatic Sea and is bordered by Croatia, Bosnia-Herzegovina, Serbia, Kosovo, and Albania. The name Montenegro, or “black mountain,” is derived from the dark mountain forests that cover the land. About 60 percent of the country is more than 1,000 meters (3,280 feet) above sea level, with the tallest peak Bobotov Kuk (Durmitor) reaching to 2,522 meters (8,274 feet). The coast of Montenegro is 294 kilometers (183 miles) long.

BRI's Mercury Work in Montenegro

Biodiversity Research Institute (BRI) collaborates with its partners in Montenegro to help identify and estimate any major mercury sources in the region. An international advisor on mercury, BRI serves as co-lead of the UN Environment's Mercury Air Transport and Fate Research partnership area to assist with the development of a global mercury monitoring and observation system. In addition, BRI serves as International Technical Expert with the United Nations Development Programme (UNDP) and with UN Environment and an Executing Agency for the United Nations Industrial Development Organization (UNIDO).

Useful Links

- BRI publications on mercury: www.briloon.org/hgpubs
- Minamata Convention: www.mercuryconvention.org

Global Health Trade-Off for Mercury and Omega-3 in Fish

		Milligrams of Omega-3 Fatty Acids/4 Ounces of Cooked Fish →			
MEAL FREQUENCY RECOMMENDATIONS		<500 mg	500-1,000 mg	1,000-2,000 mg	> 2,000 mg
Total Mercury in Muscle Tissue µg/g (ww) ↓	Unrestricted meals (< 0.05 µg/g)	Catfish, Clams, Crab* (most species), Croaker, Haddock, Scallops, Shrimp, Tilapia*	Blue Mussels,* Pink Salmon, Sockeye Salmon	Chinook Salmon,* Coho Salmon, Oysters	Healthier Choices Atlantic Salmon, Sardines, Shad
	1-2 meals per week (0.05–0.22 µg/g)	Atlantic and Pacific Cod, Flounder, Grenadier, Hake, Lobster,* Scad, Seabream, Sole	Atlantic Pollock, Mahi Mahi, Mullet, Scad, Squid, Skipjack Tuna, any canned tuna	Atlantic Horse Mackerel, European Sea Bass, Rays, Skates, Trout	Anchovies,* Herring
	1 meal per month (0.22–0.95 µg/g)	Grouper, Orange Roughy, Snapper	Barracuda, Bigeye Tuna, Bluefish, Halibut, Jack, Trevally, Yellowfin Tuna	Atlantic and Pacific Mackerel, Albacore Tuna,* Atlantic Bluefin Tuna, Chilean Sea Bass	 <p>Mercury concentrations vary widely across shark species. To learn more, visit: www.briloon.org/hgcenter</p>
	No consumption (> 0.95 µg/g)	King Mackerel	Marlin, Sailfish, Tilefish	Dogfish, Ground, and Mackerel Sharks; Pacific Bluefin Tuna, Swordfish*	

Data Sources: BRI's Global Biotic Mercury Synthesis (GBMS) Database; U.S. Environmental Protection Agency; U.S. Food and Drug Administration
*Pictured

MIA Stakeholders

- Ministry of Economy
- Ministry of Health
- Ministry for Sustainable Development and Tourism
- Administration for Inspection Affairs
- Agency for Nature and Environmental Protection
- Center for Eco-toxicological Research
- Chamber of Commerce
- Customs Administration
- EPCG (Elektroprivreda Crne Gore)
- Hemosan
- Institute for Public Health
- NGO Greens
- Statistical Office of Montenegro
- United Nations Development Programme
- Biodiversity Research Institute

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