

Plants play leading role in cycling toxic mercury through the environment, researchers say

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Researchers studying mercury gas in the atmosphere with the aim of reducing the pollutant worldwide have determined a vast amount of the

toxic element is absorbed by plants, leading it to deposit into soils.

Hundreds of tons of [mercury](#) each year are emitted into the atmosphere as a gas by burning coal, mining and other industrial and natural processes. These emissions are absorbed by plants in a process similar to how they take up carbon dioxide. When the plants shed leaves or die, the mercury is transferred to soils where large amounts also make their way into watersheds, threatening wildlife and people who eat contaminated fish.

Exposure to high levels of mercury over long periods can lead to neurological and cardiovascular problems in humans, according to UMass Lowell's Daniel Obrist, professor and chair of the Department of Environmental, Earth and Atmospheric Sciences, who is leading the research group.

Obrist is an expert on the [cycling](#) of mercury in the environment. In his latest project, he and UMass Lowell Research Associate Jun Zhou collected more than 200 published studies with data on mercury levels in vegetation from more than 400 locations around the world. In evaluating this data, they determined about 88 percent of the mercury found in plants originates from plants' leaves absorbing gaseous mercury from the atmosphere. Globally, vegetation can take up more than 1,300 tons of mercury each year, accounting for 60 to 90 percent of it being deposited over land, according to Zhou.

The team's findings were published this month in the academic journal *Nature Reviews—Earth & Environment*. The study represents the largest comprehensive review of the uptake of mercury in vegetation and its impact on mercury cycling around the world, according to the researchers.

"When I walk outside here in New England, I am always amazed at the

greenness of our forest, grasslands and salt marshes. One goal of my research is to determine how strongly vegetation controls the cycling of elements—some of which can be toxic pollutants—so we can better mitigate damaging effects," Obrist said.

The work moves scientists toward a greater understanding of how mercury cycling works, according to Zhou.

"Researchers have worked on the role that vegetation plays on cycling of mercury for over 30 years now, but the full extent of these impacts are still not yet fully realized. It was timely to write this comprehensive review and communicate to colleagues and the public about the current state of knowledge in this area," Zhou said.

Other contributors to the study include scientists from the Environment and Climate Change Canada's Air Quality Research Division in Quebec, and the University of Basel in Switzerland. Support for the research was provided by the U.S. National Science Foundation and Swiss National Science Foundation.

In a separate but related project led by Obrist, researchers continue to measure how vegetation affects mercury cycling in New England forests, focusing on those in Maine and Massachusetts. Obrist's team is using a variety of instruments and sensors to measure the forests' uptake of mercury in the atmosphere at various heights from above the tree canopy down to near the forest floor, allowing for daily tracking of how mercury deposition may be different in each forest and may change with the seasons.

More information: Jun Zhou et al, Vegetation uptake of mercury and impacts on global cycling, *Nature Reviews Earth & Environment* (2021). [DOI: 10.1038/s43017-021-00146-y](https://doi.org/10.1038/s43017-021-00146-y)

Provided by University of Massachusetts Lowell

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