

Global mercury pollution threatens to impact the energy metabolism of birds

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Mercury is a highly toxic and pervasive pollutant that has dramatically increased in the environment as a result of coal combustion, gold mining, cement production, hospital waste incineration, and various other human activities around the globe. Its impacts on birds and other wildlife are not yet fully understood, but a new study published in the journal

Environmental Pollution suggests that current levels of mercury contamination in many parts of the world are capable of compromising the ability of birds, and likely other vertebrates, to both conserve and rapidly exert energy when needed.

The research team from the University of Massachusetts-Amherst, College of William & Mary, and Great Hollow Nature Preserve & Ecological Research Center found that exposure to environmentally relevant dietary levels of mercury significantly increased the resting metabolic rate of zebra finches while significantly reducing the maximum rate at which they could sustain high-intensity activity (i.e., their "peak [metabolic rate](#)").

"The ability of [birds](#) and most other living things to conserve and efficiently manage their [energy](#) is critical for reproduction, self-maintenance, and even their overall survival," said one of the study's authors, Chad Seewagen. "During winter, for example, when temperatures are cold and food is extremely limited, a bird's ability to conserve energy can easily mean the difference between life and death. At the same time, the ability of birds to rapidly exert large amounts of energy for behaviors like predator escape and long-distance flight is also of critical importance."

The authors think that the increase in the birds' resting metabolic rates, which represents the energetic cost of maintaining basic bodily functions while at complete rest, was likely due to the energy required to detoxify and eliminate a poison like mercury from the body. This is energy that could otherwise be put towards beneficial processes like reproduction or put into storage, but is instead wasted on the elimination of the toxin. They believe the decrease in the birds' peak metabolic rates was likely a result of the negative effect that mercury has on the capacity of blood to deliver oxygen from the lungs to the working muscles. It could also be due to interference with carbohydrate and fat metabolism pathways,

which would limit the rate at which the birds could burn fuel for energy.

"What this all means," says the study's lead author, Alexander Gerson, "is that birds living in mercury-contaminated environments may not be able to efficiently budget or rapidly draw upon their energy reserves, which could ultimately impact their reproductive output and survival."

The findings of the study join a growing body of evidence that even atmospheric mercury pollution, far away from factories or other "point-sources," is having harmful effects on songbirds, and further strengthening of mercury emissions regulations is needed in many world regions. This includes the United States where the Environmental Protection Agency recently introduced new rules to weaken restrictions on [mercury](#) pollution from power plants.

More information: Gerson, A.R., D.A. Cristol, and C.L. Seewagen. 2019. Environmentally relevant methylmercury exposure reduces the metabolic scope of a model songbird. *Environmental Pollution* 246(2019):790-796. [DOI: 10.1016/j.envpol.2018.12.072](https://doi.org/10.1016/j.envpol.2018.12.072).

Provided by Great Hollow Nature Preserve & Ecological Research Center

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