

Arctic home to mysterious mercury deposits

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More mercury is deposited in the Arctic than anywhere else on the planet. Norwegian NTNU researchers think one explanation for this may lie in the meteorological conditions in the Arctic spring and summer.

The concentration of [mercury](#) in humans and animals that live in polar regions is on the increase. [Polar bears](#) and humans that eat marine mammals are the most affected. But why is there more mercury in the Arctic than elsewhere?

Scientists have been puzzling over this question since the beginning of the 1990s. Their first breakthrough came when it was discovered that under certain meteorological conditions, mercury from the air is deposited on the snow and ice in polar areas. The phenomenon occurs when the sun rises over the horizon in the spring, after a long polar night.

Now new research from NTNU PhD candidate Anne Steen Orderdalen and Professor Torunn Berg at the Department of Chemistry and the Norwegian Institute for Air Research (NILU) shows that this process also occurs in the summer as well as in the spring. In a series of publications, the researchers have documented the types of mercury found over the Arctic and are tracking its fate and transport. Essentially, far more mercury is deposited in the Arctic than initially thought, which may be due to the extended time period during which it can be transformed and deposited. Scientists still don't know exactly why and how the process occurs. But sunlight appears to be an important factor.

A dangerous transformation

Most of the anthropogenic mercury emissions come from industry. However, natural sources such as erosion and volcanic eruptions also contribute to atmospheric mercury. All the air around us contains gaseous mercury that is not that reactive and thus not harmful, either to animals or to humans, at normal concentrations.

Concentrations worldwide are fairly similar. But it appears that a reaction between sea salt, sunlight and atmospheric mercury transforms the less hazardous gaseous mercury in the air into more reactive mercury. When this more reactive type of mercury is deposited on the ground, it can be converted into toxic methylmercury - which then can poison the entire food chain.

Accumulates in the food chain

When mercury enters the food chain, it is taken up by microorganisms, and then by ever larger organisms. Marine mammals, [polar bears](#) and humans are the top of the food chain in the Arctic, and thus are subject to the most contamination, because the farther up the [food chain](#) you go, the higher the concentration of mercury becomes.

Mercury is stored in the body and there is much evidence that the contaminant damages the nervous system. Mercury can also have a serious effect animal health, but also threatens people who largely live off marine mammals. Some studies of children in the Faeroe Islands have shown learning disabilities which are suspected to be linked to high mercury concentrations in the food that they eat.

Long-term air measurements

The discovery may help to explain the high levels of mercury found in

marine mammals and polar bears, because the mechanism would enable significant amounts of mercury to be carried into the ocean during snowmelt. In addition, climate change can play a role.

The findings are based on air measurements at Svalbard, where a series of field studies have been undertaken at the air station in Ny-Ålesund on Svalbard. The measurement station records the concentration of mercury and other substances continuously throughout the year. Only Canadians have a longer record of mercury measurements than those that are available from the station in Ny-Alesund.

Provided by Norwegian University of Science and Technology

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