

Antarctic sea ice may be a source of mercury in southern ocean fish and birds

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An Iceberg in Antarctic sea ice. Credit: Caitlin Gionfriddo, University of Melbourne

New research has found methylmercury—a potent neurotoxin—in sea ice in the Southern Ocean.

Published today in the journal *Nature Microbiology*, the results are the first to show that sea-ice bacteria can change mercury into methylmercury, a more toxic form that can contaminate the marine environment, including fish and birds.

If ingested, methylmercury can travel to the brain, causing developmental and physical problems in foetuses, infants and children.

The findings were made by an international team of researchers led by Ms Caitlin Gionfriddo and Dr John Moreau from the University of Melbourne, and also included scientists from the Centre for Systems Genomics at the University of Melbourne, the US Geological Survey and Lawrence Livermore National Lab.

Methylmercury builds up in the food web through a process called 'biomagnification', said Ms Gionfriddo, PhD candidate from the School of Earth Sciences, University of Melbourne.

"Larger fish eat smaller contaminated fish, and continuously accumulate methylmercury at harmful levels for human consumption," Ms Gionfriddo said.

The team wanted to understand more about how the most toxic form of mercury enters the marine environment, and the food we eat.

Ms Gionfriddo spent two months aboard the icebreaker *Aurora Australis* to collect samples of Antarctic sea ice during an expedition mounted by the Australian Antarctic Division.

The ice was analysed for different forms of mercury, including methylmercury, at the US Geological Survey in Wisconsin (USA). The DNA and proteins from sea ice microorganisms were studied at the University of Melbourne (AUS) and Lawrence Livermore National Lab

(USA).

Mercury is a heavy metal pollutant that can be released into the environment through volcanic eruptions and re-released from vegetation during bushfires. It is also created through human activity, such as gold smelting and burning fossil fuels.

University of Melbourne geomicrobiologist and team leader, Dr John Moreau, said that the results confirmed the presence of bacteria in the sea ice with the genetic ability to convert mercury into the more toxic form.

These findings highlight the importance of eliminating [mercury pollution](#) from the environment, and following current recommendations to limit consumption of certain types of fish, say the researchers.

"These results are the first to identify a particular genus of bacteria, Nitrospina, as capable of producing methylmercury in Antarctic ice," Dr Moreau said.

"The presence of these potential mercury-methylating bacteria raises an interesting question," he added. "Could they also play a role in forming the [methylmercury](#) observed in the oceans worldwide?"

The team are keen to understand this process in the next steps of their research.

"Mercury has a long lifecycle in the atmosphere, up to a year," said co-author Dr Robyn Schofield. "This means that mercury released through fossil fuel burning from countries over 3000 km away goes up in the atmosphere and ends up in Antarctica."

"The deposition of mercury into the sea occurs all year-long but

increases during the Antarctic spring, when the sunlight returning causes reactions that boost the amount of mercury that falls onto [sea ice](#) and the ocean," Ms Gionfriddo added.

"We need to understand more about marine [mercury](#) pollution," said Dr Moreau, "Particularly in a warming climate and when depleted fish stocks means more seafood companies are looking south."

More information: [33] Microbial mercury methylation in Antarctic sea-ice, *Nature Microbiology*, [nature.com/articles/doi:10.1038/nmicrobiol.2016.127](https://doi.org/10.1038/nmicrobiol.2016.127)

Provided by University of Melbourne

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