

Geoscientists compare micro-organisms in the polar regions

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Tübingen geoscientist Julia Kleinteich takes fresh water samples near Research Station Rothera in Antarctic. Credit: Daniel Farinotti

Although the Arctic and Antarctic regions are at opposite ends of the earth, they have a similar diversity of bacteria and other microscopic life. These are the findings of an international team of researchers headed by the University of Tübingen, the EMBL Heidelberg and the University of Konstanz. In their study, the team collated data from numerous studies and locations in order to make a direct comparison of the microbial diversity in these two distant regions for the first time. Their results have been published in the open access journal *Frontiers in Ecology and Evolution*.

The researchers examined the DNA of [bacteria](#) from freshwater biofilms from the terrestrial regions of the Arctic and Antarctica using high-throughput sequencing. The two lead authors, Dr. Julia Kleinteich of Tübingen's Center for Applied Geoscience and Dr. Falk Hildebrand of EMBL Heidelberg, analyzed samples which Julia Kleinteich took at the British Research Station Rothera in Antarctica and at the Norwegian archipelago of Svalbard in the Arctic. "Despite the large great geographical distance, the bacterial diversity partly includes the same species," the researchers say, "Some micro-organisms therefore have the potential to spread globally, across barriers like oceans."

The mechanisms for this are not yet clear; it may be that the bacteria spread via the atmosphere or are carried by birds and people. Since these polar micro-organisms partly overlap with samples taken in temperate zones, the bacteria in question are probably "generalists", which can survive in a wide range of environmental conditions.

But the researchers also found bacteria in their polar samples which only occur in the respective region. "The proportion of them was greater in the isolated Antarctic; this appears to have a partly unique diversity of micro-organisms and is therefore especially worth protecting," says Kleinteich.



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The study of distribution patterns of species—called biogeography—is giving us insights into the way ecosystems respond to environmental change such as [global warming](#). According to current findings, we should expect both Arctic and Antarctic micro-organisms to react to global warming in the same way, the researchers say. "This is already showing major effects at the poles, with a rise in temperatures to partially above zero degrees Celsius and the melting of glaciers and snow," Kleinteich says. While the Antarctic [region](#) still provides a sanctuary for micro-organisms, global warming in the Arctic means mammals adapted to the cold are fast running out of places they can live, according to Kleinteich.

In follow-up studies, the Tübingen researchers are investigating glacial areas of the Swiss Alps, which have similar climatic conditions to the poles. "We are seeking to find out whether Alpine regions are serving as

islands for organisms adapted to the cold, and whether global warming is changing the bacterial [diversity](#)—and thereby the ecosystem there as well."

More information: Julia Kleinteich et al. Pole-to-Pole Connections: Similarities between Arctic and Antarctic Microbiomes and Their Vulnerability to Environmental Change, *Frontiers in Ecology and Evolution* (2017). [DOI: 10.3389/fevo.2017.00137](https://doi.org/10.3389/fevo.2017.00137)

Provided by University of Tübingen

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