Viable Microbes in Lake Vida but Not Lake Vostok So Far

David C. Holzman

Microorganisms that were isolated from the rest of the world under ice more than 3,000 years ago continue to thrive at -13°C in the dark, salty, and anoxic liquid depths of Lake Vida in the Antarctic that is covered with about 65 feet of ice, according to Alison Murray of the Desert Research Institute in Reno, Nev., and her collaborators. “We found 32 different—what I would define as operational taxonomic units by ribosomal gene sequence—spread across eight phyla,” she says. Details appear in the December 11, 2012 Proceedings of the National Academy of Sciences (doi:10.1073/pnas.1208607109).

“The unique composition of organisms probably speaks to their relationship with the geochemistry of their environment, and how they obtain energy,” Murray continues. Deduced from ribosomal sequences, at least one is a fermenter, while others are likely denitrifiers that use organic carbon, and some appear to be chemolithoautotrophs that use hydrogen or oxidize sulfur. That geochemistry is “remarkable,” with a “very high concentration of nitrogen in all its forms,” she says. Hydrogen is also present in high concentrations, along with ample organic carbon and iron. In short, the lake is “resource rich,” a condition that is reflected in the metabolic diversity of its inhabitants.

These findings come little more than a month after Sergey Bulat of the Petersburg Nuclear Physics Institute in St. Petersburg, Russia, reported that he and his colleagues found no evidence of microbial life in the waters of frozen Lake Vostok. However, they barely pierced the ice of this very large lake, and will be taking more samples. Lake Vostok is nearly a kilometer deep, with a surface area comparable to that of the much-shallower Lake Ontario, and is the largest of Antarctica’s subglacial lakes. It lies beneath several kilometers of ice, and has been isolated from the rest of the world for an estimated 15–34 million years. Bulat reported those preliminary findings at the 12th European Workshop on Astrobiology, convened in Stockholm, Sweden, last October.

Last December, members of another research team from the European Community began drilling through ice overlying Lake Ellsworth in Antarctica. This lake is smaller than Lake Washington next to Seattle. Lake Ellsworth was buried under ice between 100,000 and 1 million years ago, and that mostly glacial ice cover is about 3 km deep.

Whether they find microorganisms or come up empty handed will still be informative, according to Murray. “If we find places on earth that have water but don’t support life, that will teach us about what’s habitable,” she says. These lessons about life adapted to extreme environments on Earth should apply elsewhere in the solar system.

Mars, Europa, the ocean-covered moon of Jupiter, and Saturn’s moon Enceladus are the top extraterrestrial environments that might support microbial life similar to that found here. Meteors can blast rocks containing microbial life from planetary surfaces, experts say, noting that Martian rocks are found on Earth. Whether such mechanisms distributed viable microbes from here—or Mars—to those moons is a subject of active conjecture.

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