By Paula
BIO

Could there be a link between cyanobacteria and ALS?

New Hampshire lakes, scientists are exploring idea

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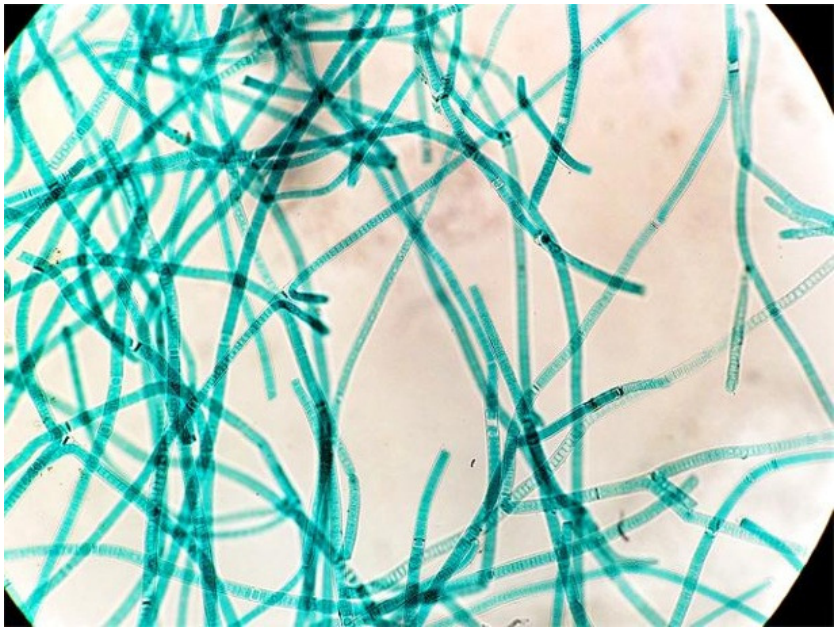

File Image of Cyanobacteria **(Wikimedia Commons/Matthewjparker)**

LEBANON, N.H. — Doctors and scientists at Dartmouth College and the University of New Hampshire are among a team exploring whether environmental toxins may be related to neurodegenerative diseases.

They have found that cyanobacteria, formerly known as blue-green algae, may be linked to amyotrophic lateral sclerosis (ALS), or Lou Gehrig's disease.

Dr. Elijah Stommel, of the Dartmouth-Hitchcock Medical Center, and his neurological resident, Dr. Tracie Caller, began using Google Maps to plot the residences of their patients with ALS.

"We found that people who live next to lakes with persistent cyanobacterial blooms have up to a 25-fold increased chance of developing ALS," Stommel said. "These results have been of deep concern to me and my colleagues."

The report, published a study Jan. 20 in the Proceedings of the British Royal Society indicates that chronic exposure to the environmental toxin BMAA, derived from cyanobacteria, may increase the risk of ALS and other neurodegenerative illnesses in certain individuals.

ALS is a progressive, neurodegenerative disease which causes muscle weakness and eventually respiratory failure.

More than 450,000 people worldwide have been diagnosed with the disease.

There is currently very little treatment available and once it attacks the brain and spinal cord, the life expectancy is two to five years.

Rilutek is a drug that is given, but it only extends life an average of three to five months.

While ALS is the focus, there are other diseases which may have an environmental trigger as well

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from these toxins, including Alzheimer's disease.

Working with the Institute for EthnoMedicine, a nonprofit medical research organization based in Jackson Hole, Wyoming and the University of Miami Brain Endowment Bank, the study looks at two separate experiments on vervet monkeys.

"Our findings show that chronic exposure to BMAA can trigger Alzheimer's-like brain tangles and amyloid deposits," said Dr. Paul Alan Cox, lead author of the study. "As far as we are aware, this is the first time researchers have been able to successfully replicate brain tangles and amyloid deposits in an animal model through exposure to an environmental toxin."

Jim Haney, professor of biological sciences, who directs the UNH Center for Freshwater Biology, and Amanda Murby, a doctoral student, are among the 50 scientists working on the project.

He said it is exciting to begin to explore whether there is an environmental trigger to these illnesses, particularly because there is so little known and so little doctors can now do to help patients.

At UNH, they have developed a system to collect aerosols produced by cyanobacteria and are working with state officials to help them test for its presence.

Cyanobacteria can be found in freshwater lakes throughout the world. These harmful blooms produce many toxins including microcystins (liver toxins) and BMAA (nerve toxins).

Exposure to large amounts of microcystins can cause liver damage. Exposure to smaller amounts can cause breathing problems, skin irritation, upset stomach and other gastrointestinal problems.

"Few studies have examined the risk to wildlife and humans from exposure to airborne cyanotoxins. However, recent research has indicated that cells may be transported as aerosols from lakes with high concentrations of cyanobacteria and microcystins. Since aerosols may be a more direct route of exposure to public health for those recreating or living by a contaminated body of water, we set out to design a method that could address the aerosolization of cyanobacteria released from lake water," Haney said.

Lakes which had cyanobacteria blooms in New Hampshire which were studied by UNH include Willard Pond in Antrim, Nippo Pond in Barrington, Lake Kanasatka in Moultonborough, Naticook Lake in Merrimack, Goose Pond in Canaan, Baboosic Lake in Amherst and Lake Attitash in Amesbury, Massachusetts.

The Dartmouth researchers studied a number of lakes in the Upper Valley and Vermont where their patients live, including Lake Mascoma in Enfield, New Hampshire.

Haney said, "Our preliminary research results raise concerns over potential exposure of humans and wildlife to aerosolized cells of cyanobacteria and their toxins. The methods we have developed could be useful for monitoring air in proximity to bodies of water for toxic cyanobacteria for public health purposes."

Another area of study is whether this can be transferred to crops growing near blooms of cyanobacteria.

"We have determined that microcystins may be transferred to crops. We detected microcystins in lettuce that was irrigated with water from a lake that frequently experiences blooms of cyanobacteria. Similarly, we found moderate to high levels of microcystins in blueberries grown near a lake with persistent cyanobacteria. Soil samples taken at varying distances from the shore of a cyanobacteria-dominated lake tested positive for microsystins as well as for living cyanobacteria," Haney said.

Reported incidences of harmful cyanobacteria blooms in freshwater have increased worldwide. There are frequent reports of deaths of dogs and cattle caused by drinking water contaminated with high levels of toxic cyanobacteria and as the earth warms, it is expected to increase, Haney said.

He noted that increased incidences could be that awareness has increased the number of reports.

He said UNH will be submitting a grant request to the National Institutes of Health to further study lakes in New Hampshire with cyanobacteria. He noted that researchers are also working with the New Hampshire Department of Environmental Services to set up a lab to study cyanotoxins.

DES samples more than 100 lakes and issues warnings for cyanobacteria in the summer months.