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Stommel, right—and his colleagues Callier, left, and Field, center—wonder if a toxin in algae might be a trigger for ALS.

## Dartmouth neurology researchers probe murky waters for clarity about ALS

The causes of Lou Gehrig's disease are as murky as the algae-infested waters suspected of playing a role in the disorder. But Dr. Elijah Stommel believes cyanobacteria, also called blue-green algae, may hold secrets to understanding the fatal disease.

During nearly two decades at Dartmouth, Stommel has seen no small number of patients with Lou Gehrig's—officially known as amyotrophic lateral sclerosis (ALS). A few years ago, he observed an unusually high number of ALS cases around Lake Mascoma in Enfield, N.H., and other bodies of water containing cyanobacteria. Since then, he's been hard on the trail of figuring out whether these ALS clusters are purely random, or if there's a link to cyanobacteria.

**Hunt:** The hunt has put Stommel in the national spotlight. His work on ALS was featured prominently in the May 2011 issue of *Discover* magazine. And he

was a member of the organizing committee and a plenary lecturer for a national meeting at Bowdoin College titled *Cyanobacteria and Human Health: Merging Ecology, Epidemiology, and Neurologic Disorders*.

**Blooms:** "If you Google 'harmful algal blooms,' or 'cyanobacteria blooms,'" says Stommel, "you'll see that it's a problem in nearly every U.S. state." He and Dr. Tracie Callier, the chief resident in neurology, and Nicholas Field, a research assistant, are investigating a toxin that is produced by these blooms, beta-methylamino-L-alanine (BMAA). It overstimulates a neurotransmitter called glutamate, eventually causing nerve-cell damage and death. ALS patients suffer progressive muscle weakness as cells in their brain and spinal cord are destroyed, and it's plausible BMAA is in-

involved in this neuronal carnage.

Stommel subscribes to the theory that BMAA, a chemical relative of the amino acids that make up all proteins, enters the brain and is incorporated into nerve-cell proteins. Deposits of BMAA in the brain could lead to misshapen nerve-cell proteins; misfolded proteins are now known to be linked to neurological disorders such as ALS and Alzheimer's disease.

Stommel's team began by testing local lakes for BMAA, but their focus has shifted. "Other [research] groups have found BMAA in multiple bodies of water," Callier says. "Rather than replicate this [work], we're trying to look at other things that might support our hypothesis."

Those "other things" include working with Dartmouth College geographers to improve the mapping of ALS patterns. "We

need to distinguish true clusters from artifacts," Field says. "You'd expect more cases in places with greater population density—Manchester, N.H., for instance—but a spike in rural areas would be much more of a cluster."

**Toxin:** Cyanobacteria are found all over, so humans can be exposed to BMAA in many ways. The toxin has turned up in seafood. Cow manure sprayed on farm fields may contain cyanobacteria. And they're not limited to watery habitats; a higher incidence of ALS during the Gulf War was speculatively traced to dormant cyanobacteria in desert sands revived by water.

But Stommel emphasizes that there's not yet a clear link between BMAA and ALS. He is devoted to ensuring that the research's uncertainties and nuances are carefully reported. "Exposure to BMAA is probably a risk factor for those who are genetically predisposed to develop ALS," he says. "But . . . not everyone who gets exposed will develop ALS, just like not all smokers get lung cancer."

**Scum:** "The genetic susceptibility is what people still don't understand," Callier agrees. "Any time you talk about things over which people have little control, like public water sources, it causes a huge scare. We have no data substantiating the idea that drinking public water is a cause for concern, and we still can't draw conclusions about what else may or may not be safe," she adds. "We can only recommend that people avoid areas with active blooms and visible scum."

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