



Type E *Clostridium botulinum* May Grow In Great Lakes Algal Mats

The USGS Great Lakes Science Center is studying the potential role of *Cladophora* in transmitting botulism to fish-eating birds along shorelines of Lake Michigan.

Researchers at the USGS Great Lakes Science Center's Lake Michigan Ecological Research Station (LMERS) are studying the occurrence of a bird pathogenic bacterium in algal mats along the Lake Michigan shoreline. The bacterium, called *Clostridium botulinum* (Type E), has been implicated in shore and water bird die-offs in recent years. Scientists suspect the alga *Cladophora* may promote the growth of the bacterium by providing a suitable habitat, but until now there was no evidence that the bacteria occurred in algal mats. "We're not sure that the bird die-offs are connected to algal accumulations, but findings demonstrate the potential for *Cladophora* to act as a reservoir and even promote the growth of these



Cladophora growing on hard substrates.

bacteria," said Dr. Richard Whitman, LMERS station chief. *Cladophora*, a green alga that grows on hard substrates and the lake bottom in the Great Lakes, becomes detached throughout the summer, and large masses accumulate along shorelines. *C. botulinum* (Type E) is commonly found in soils and lake bottoms but was not commonly reported in aquatic plants.

In 2006 about 3000 fish-eating birds died in northeastern Lake Michigan from botulism. Bird die-offs appear to coincide with massive shoreline accumulations of *Cladophora*, suggesting a cause-effect relationship. LMERS scientists analyzed *Cladophora* for *C. botulinum* from 14 locations using DNA analysis (see figure). Samples from Wisconsin and Michigan were allowed to decompose under lab conditions. *C. botulinum* increased at three locations, all in the area of the 2006 bird die-off.

While it is not known whether *Cladophora* may play a direct or an indirect role, the present findings show that *Cladophora* may promote pathogen growth. Related research has shown that other human pathogens also grow readily within decaying algae.



Piping plover and shoreline *Cladophora*.

These results suggest that *Cladophora* may promote *C. botulinum* growth, potentially leading to the accumulation of the associated pathogen toxin within algal mats. Toxin ingestion causes severe neurological damage which often leads to bird death.



 *C. botulinum* positive
 *C. botulinum* negative

