November 4, 2005

# Human Exposure to Cyanobacterial Toxins in Water

Lorraine C. Backer
Health Studies Branch
National Center for Environmental Health
4770 Buford Hwy NE, MS F-46
Chamblee, Georgia 30341
Phone: 770-488-3426
Fax: 770-488-3450
Email: lfb9@cdc.gov

## PROJECT OVERVIEW

**Title:** Human Exposure to Cyanobacterial (blue-green algal) Toxins in Water

**Protocol Summary:**

We originally planned to conduct a study of human exposure to microcystins in drinking water from a source with a cyanobacterial bloom. However, regional weather patterns over the last 2 years have not supported blooms in the lake that is the source of drinking water for our cooperating utility. Therefore, we have decided to redirect our activities to assess work-related and recreational exposures. The protocol, questionnaire, and consent forms have been modified to reflect this change.

**Phase 1**

Evidence of adverse human health events from exposure to these cyanobacterial blooms is primarily anecdotal, but continues to accumulate. In a recent study of Florida jet-skiers, Dr. Ian Stewart found increases in some symptoms and in respiratory illnesses in people who had been jet-skiing in bloom-contaminated waters. However, the sample size for this study was small, and there were a number of issues regarding recruiting, etc. that could be addressed in a larger study. We have identified recreational lakes in Florida and other states that have historically had blue-green blooms, including those with cyanobacteria that produce microcystins. At each site we will recruit up to 100 study participants who are at risk for swallowing water or inhaling spray (i.e., water skiers, jet skiers, people sailing small boats) and who would normally be doing these activities, even in the presence of a bloom. We will also recruit people who train for organized swimming events (e.g., triathlons) in small lakes. In addition, we will recruit 50 study participants from lakes with no blooms as a comparison group to assess the health effects associated with recreational activities on "clean" lakes.

We will recruit people when they arrive at the lake or river for their recreational activities. We will ask them to answer questions do their intended activities, and then answer another set of questions. If we identify a recreational area with an algal bloom that is producing microcystins, we will also ask people to provide one blood sample to be

collected after they do their recreational activities. The blood samples will be assayed for microcystins using a newly developed molecular assay for levels of microcystin L-R. We will also re-contact all study participants after about 10 days to ask about symptoms that have developed since their visit to the recreation area. We will do the same set of activities with 50 people from the "clean" lake. We will collect environmental samples including water samples (for algae identification, toxin analysis, and microbial water quality assessment) and aerosols (for toxin analysis).

In addition to recreational exposures, there are a number of occupational settings where workers are exposed to cyanobacteria and cyanobacterial toxins when doing job-related activities. For example, during the 2005 blooms on the St. Johns River in Florida, the Florida Department of Health Aquatic Toxins Program received many calls from workers who were engaged in water sampling activities. The reported symptoms included skin rashes; eye, nose, and throat irritation, respiratory symptoms, nausea, and headache. We will recruit workers who are exposed to cyanobacterial HABs during their work activities and will follow the same protocols and use the same data collection forms as with the recreationally exposed group. Because respiratory symptoms, including wheezing and chest-tightness, have been reported, we plan to do spirometry (pulmonary function tests) with the occupationally-exposed study participants.

We will evaluate whether we can 1). Detect increases in symptoms after people engage in recreational or work-related activities on water bodies during cyanobacteria blooms, 2). Detect low levels of microcystins (<10 ng/ml of blood) in the blood of people who are exposed to very low levels of this toxin while engaged in work-related or recreational activities, and 3). Detect cyanobacterial toxins in aerosol samples.