EXPLORING THE RELATIONSHIP BETWEEN CYANOBACTERIAL TOXINS AND HUMAN DISEASES IN FLORIDA

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Recent massive cyanobacteria blooms experienced in Florida in 2016 and 2018 have heightened public anxiety about harmful algal blooms. In fact, the incidence and intensity of harmful algal blooms involving toxic cyanobacteria have increased in recent decades in the United States and worldwide, driven by cultural eutrophication of water bodies and rising temperatures which favor cyanobacteria. In Florida, while the driving factors supporting cyanobacteria blooms in certain ecosystems have been the focus of intensive research, many uncertainties remain over the consequences for human health. First, it is necessary to better understand the geographic distribution of toxins and regional modes of human exposure, and to identify geographic locations of unusually high rates of human diseases related to the toxins, including the hepatotoxin microcystin produced by *Microcystis aeruginosa* and the neurotoxin saxitoxin produced by *Anabaena circinalis* (aka *Dolichospermum circinalis*). Second, there is a need to better describe the presence and distribution of BMAA (β-N-methylamino-L-alanine), a potential contributor to neurodegenerative diseases, as well as its potential human health impacts in Florida.

With anticipated funding from the Florida Department of Health, we are working to address these issues. First, we will link electronic heath record data from the OneFlorida clinical research consortium with Florida LAKEWATCH data on regional distribution of aquatic ecosystems subject to intense toxic cyanobacteria blooms and significant human interactions. We will identify the spatial clusters of significantly higher rates of human diseases by performing a Hot Spot Analysis using the Getis-Ord Gi* statistic in ArcGIS. We will then build geographically weighted regression models to test whether exposure to harmful algal blooms is related to the possible occurrence of relevant human diseases. Second, we will establish monitoring networks to confirm the presence of toxin-producing cyanobacteria in major blooms in representative freshwater ecosystems identified in the first aim, with a focus on three key cyanobacteria toxins known to be prevalent in Florida and associated with human health risks: microcystin and saxitoxin, and a suspected, but poorly described, toxin threat, BMAA.