



PUBLIC HEALTH

Long-Term Health Effects of Exposure to Harmful Algal Blooms (LEE-HABs) Study

Shirley C. Gordon, PhD, RN, AHN-BC, HWNC-BC
Professor | Director Initiative for Intentional Health
Florida Atlantic University, Christine E. Lynn College of Nursing



PROJECT SUMMARY

The overall goal of the LEE-HABs study is to advance the science related to long-term health effects of exposure to cyanotoxins from harmful algae blooms (HABs) in the state of Florida by using a transdisciplinary, multisite approach.

- Builds on a 2018 pilot study**
- In 2022 we added explore:**
 - A potential link between the COVID-19 virus and susceptibility to cyanotoxins**
 - Impact of stigma**

As recurring blooms of toxin producing algae represent an ongoing significant public health risk to local Florida residents, an additional aim of the study was to create a HAB biorepository within the FAU Clinical Research Unit (CRU) to support future research.

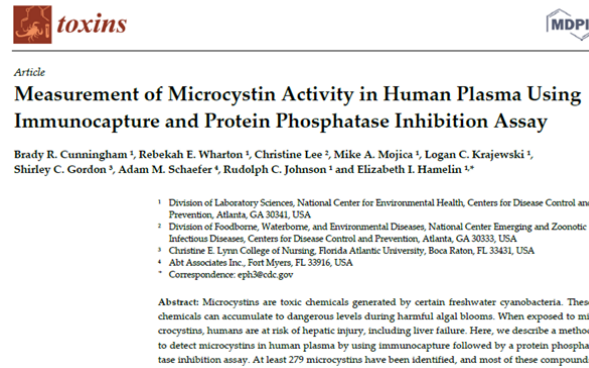
Answer a call from the community:

- Are there long-term health effects from HAB exposure?**



MAJOR TAKEAWAYS

Publications: (2021-2022)

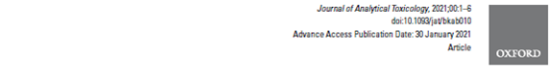


Article
Measurement of Microcystin Activity in Human Plasma Using Immunocapture and Protein Phosphatase Inhibition Assay

Brady R. Cunningham ¹, Rebekah E. Wharton ¹, Christine Lee ², Mike A. Mojica ¹, Logan C. Krajevski ¹, Shirley C. Gordon ³, Adam M. Schaefer ¹, Rudolph C. Johnson ³ and Elizabeth I. Hamelin ^{1,*}

¹ Division of Laboratory Sciences, National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, GA 30341, USA
² Division of Foodborne, Waterborne, and Environmental Diseases, National Center Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention, Atlanta, GA 30333, USA
³ Christine E. Lynn College of Nursing, Florida Atlantic University, Boca Raton, FL 33431, USA
⁴ Abt Associates Inc., Fort Myers, FL 33916, USA
* Correspondence: eph3@cdc.gov

Abstract: Microcystins are toxic chemicals generated by certain freshwater cyanobacteria. These chemicals can accumulate to dangerous levels during harmful algal blooms. When exposed to microcystins, humans are at risk of hepatic injury, including liver failure. Here, we describe a method to detect microcystins in human plasma by using immunocapture followed by a protein phosphatase inhibition assay. At least 279 microcystins have been identified, and most of these compounds

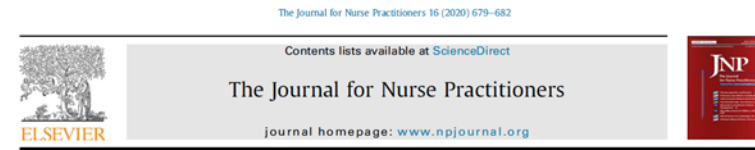


Article
Detection of Brevetoxin in Human Plasma by ELISA

Brady R. Cunningham ^{1,*}, Rebecca M. Coleman ¹, Adam M. Schaefer ², Elizabeth I. Hamelin ^{1,4} and Rudolph C. Johnson ¹

¹ Division of Laboratory Sciences, National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, GA 30341, USA and ² Harbor Branch Oceanographic Institute, Florida Atlantic University, Ft. Pierce, FL 34946, USA

*Author to whom correspondence should be addressed. Email: eph3@cdc.gov



Algal Bloom-Related Illness: Improving Health Outcomes in Primary Care

Nancy Harris, Kathi Voegel Harvey, Shirley C. Gordon, Pamela Alderman, Diane Esposito, John S. Reif, Adam M. Schaefer

Importance of Maintaining the Biorepository

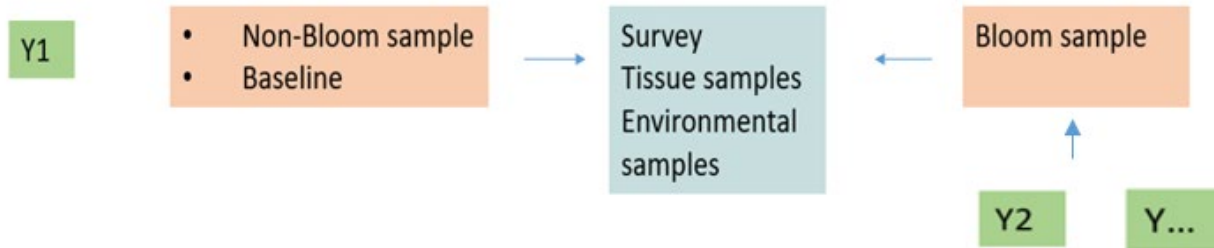
- Blood samples (Bloom & Non-bloom)
- Urine samples (Bloom & Non-bloom)

Long-term Cohort Challenges:

- Recruit new participants each year to replace persons potentially lost to follow-up or withdrawal
- Reduced community interest during non-bloom time periods
- Unpredictability of HABs



ADDITIONAL RELEVANT INFO



Multi-site Long-term Cohort Design

- ❑ Three Sites – historically impacted areas
- ❑ Validated Data Collection Methods
- ❑ Correlations between:
 - Self-reported HAB exposure/physical symptoms/pre-existing health conditions
 - Toxin levels in human samples (blood/urine/nasal swabs)
 - Liver function tests
 - Toxin levels in air and water samples

RESEARCH PRIORITIES

2019 Research Priorities Addressed by LEE-HABs Study:

- **Identify all toxins, risks, and levels of toxicity, including microcystin, BMAA, stress**
- **Develop more clear diagnostic criteria for health care providers**
- **Need clinically approved matrix-specific assays for cyanotoxins in biological samples**



NEW DATA GAPS

- **Lack comparative data collected during HABs.**
- **Explore design possibilities that will better accommodate long-term exposure studies when HABs do not occur regularly.**
- **Capture human exposure pathways through the food chain that may contribute to toxin exposure.**



ACKNOWLEDGEMENTS

Funding:

- Florida Department of Health**



Community Partners:

- Volunteers in Medicine – Stuart**
- Cape Coral Department of Public Works**
- Okeechobee County Health Department**

FAU Division of Research

- Clinical Research Unit (CRU)**

Centers for Disease Control and Prevention (CDC)

- Toxins and Drugs of Abuse Laboratory**

GreenWater Laboratories

- Testing laboratory for Cyanobacteria & Cyanotoxins**

