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Florida Department of Health

PUBLIC HEALTH IMPACTS OF FLORIDA COMMUNITIES EXPOSED TO CYANOBACTERIAL HARMFUL ALGAL BLOOMS (HABS)

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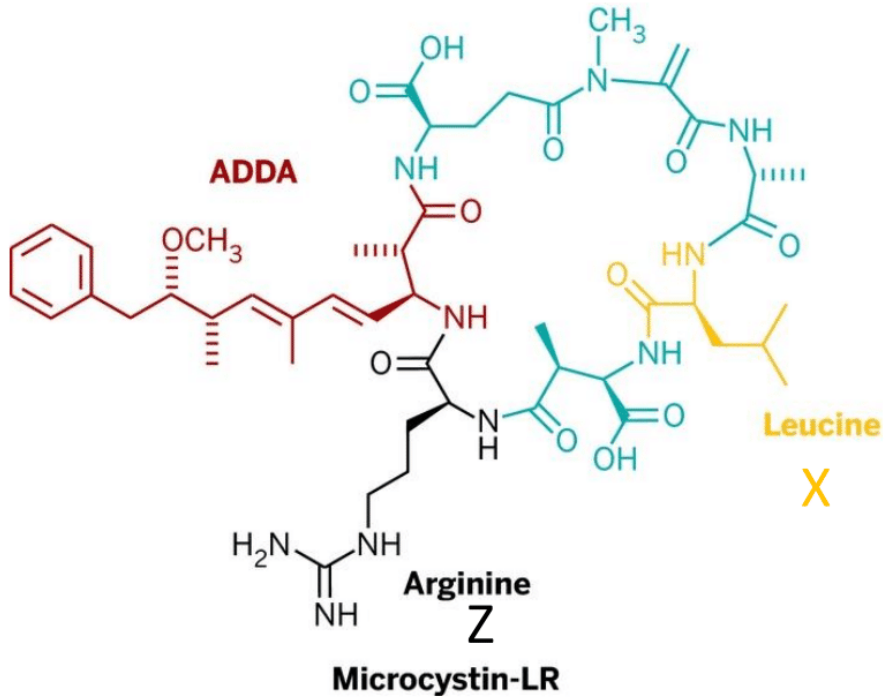
HABs – why are they so important?

- Overgrowth of microscopic algae - cyanobacteria
- Major Public Health concern in the last decades.
- Short & long-term health effects.
- Multiple exposure pathways: dermal, ingestion, inhalation.
- Affect populations that live, work or recreate in nearby areas.

HABs toxicity

- Microcystins are toxins produced by HABs
- Organic cyclic heptapeptides
- More than 200 natural variants
- Different forms have different toxicities

https://cen.acs.org/articles/92/i32/Dange
Microcystins-Toledo-Water-Unclear.html



9 common congeners that we study

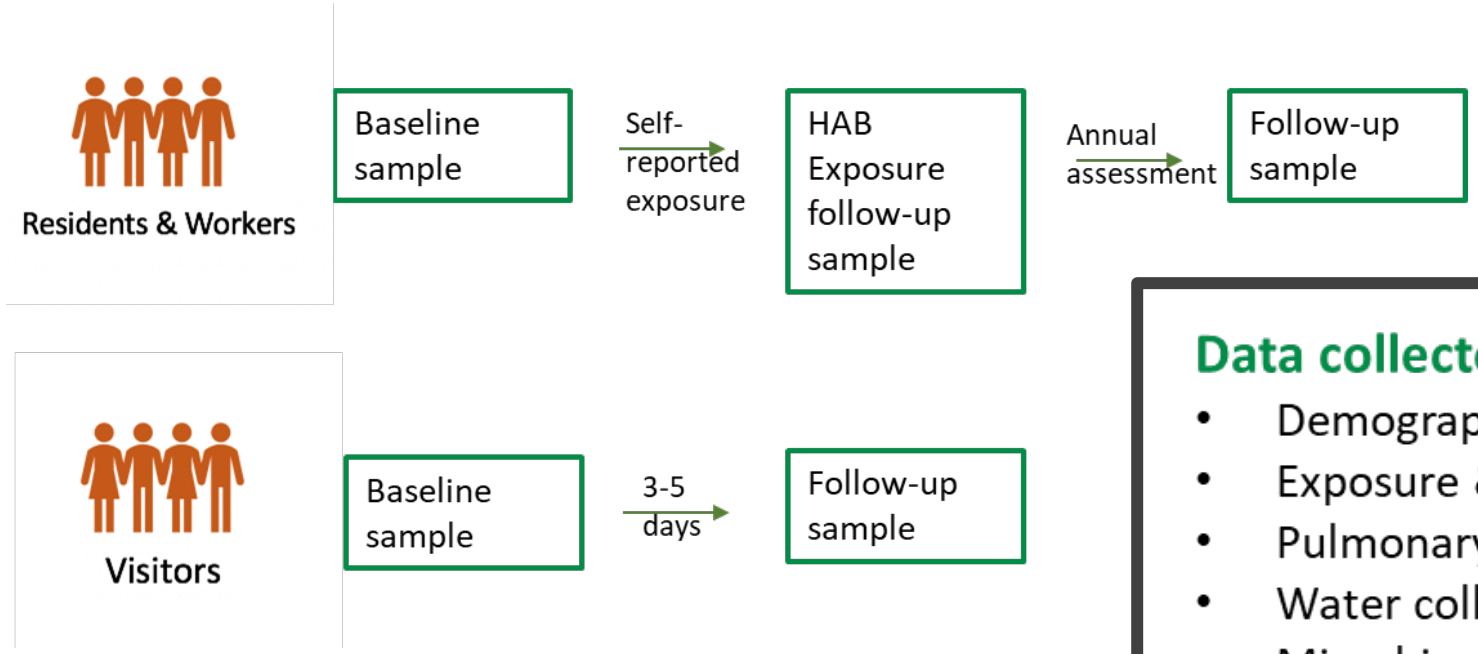
Microcystin compounds	X	Z
MC-LR	leucine	arginine
D-Asp3-MC-LR	leucine	arginine
MC-LA	leucine	alanine
MC-LF	leucine	phenylalanine
MC-LY	leucine	tyrosine
MC-LW	leucine	tryptophan
MC-RR	arginine	arginine
MC-YR	tyrosine	arginine
MC-WR	tryptophan	arginine

The DISPEL project

Diversity and Innovation in Screening and Prevention of Exposure over the Long-term (DISPEL) to Harmful Algal Blooms

- Funded by the Florida Dept. of Health since 2019
- 126+ recruited participants
- Study cohort: Florida residents, workers & visitors
- **"Citizen science project"**: samples provided by participants

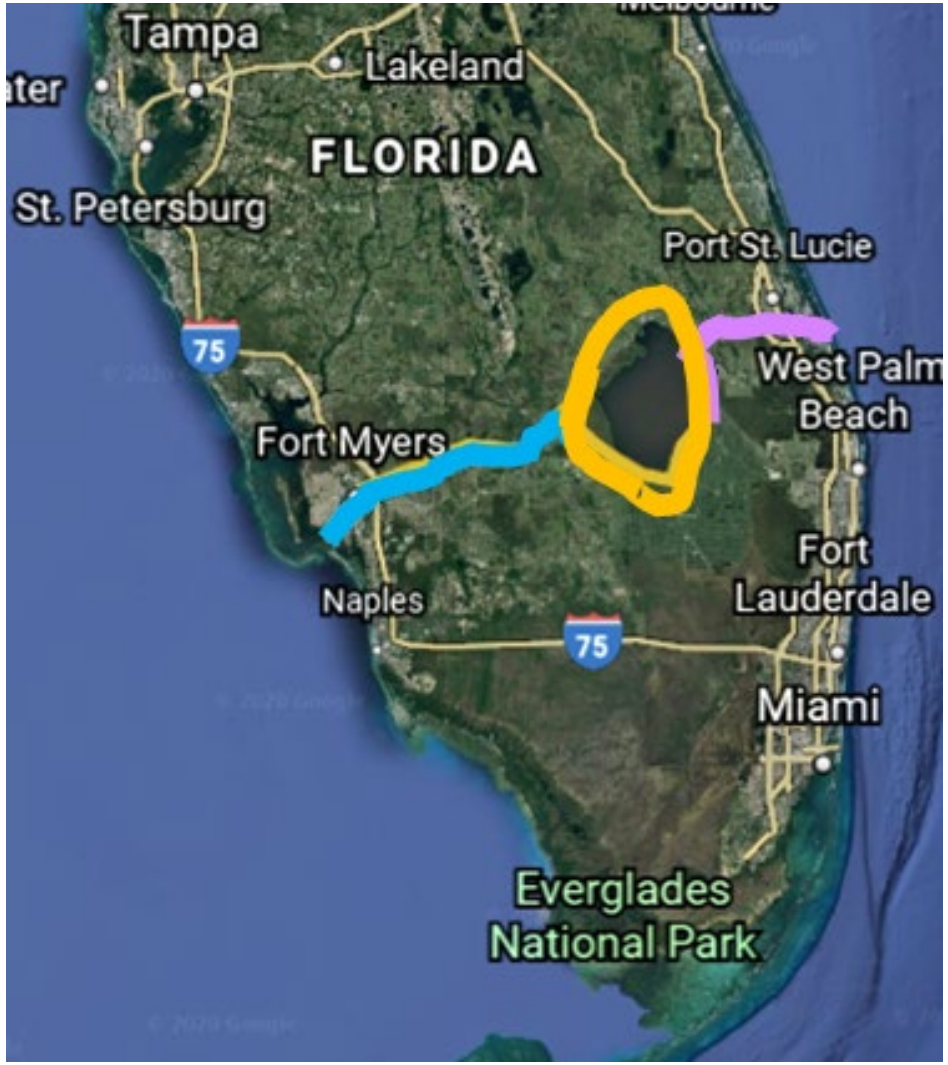
DISPEL Study website



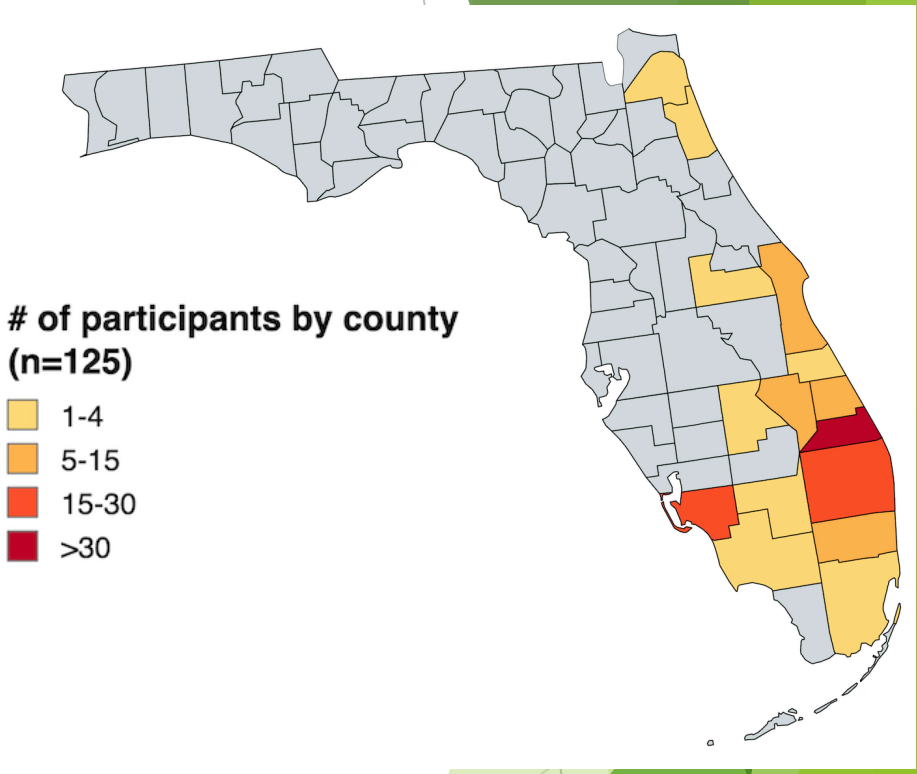
Data collected:

- Demographic & activity survey--monthly
- Exposure & symptom survey
- Pulmonary function test--monthly
- Water collection
- Microbiome sample
- Nasal swab

South Florida HAB hot spots = participant recruitment areas



We're interested in recruiting anyone in Florida who lives or works near areas that historically have blue-green HABs

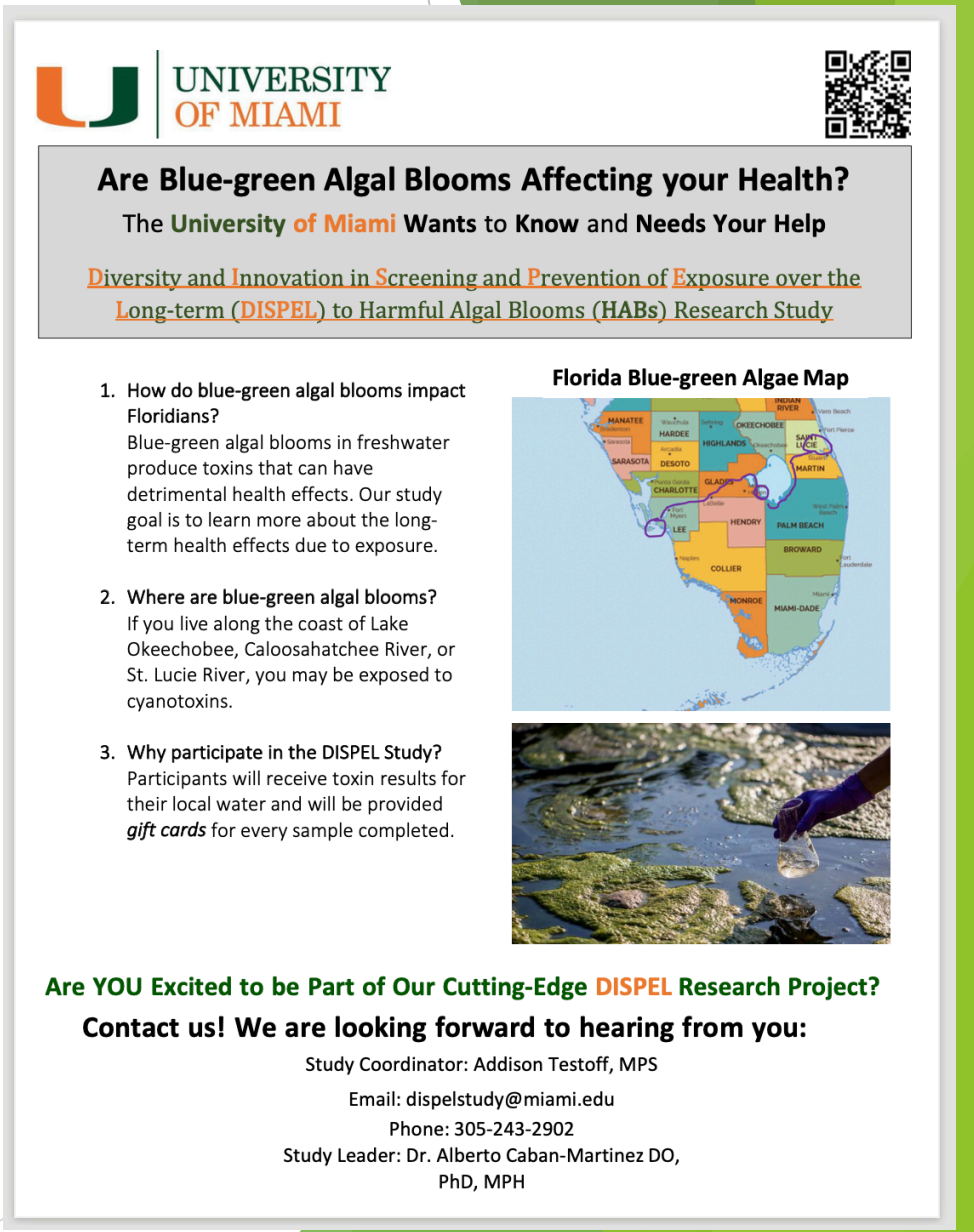


Sampling targeted around Lake Okeechobee down the Caloosahatchee River to Cape Coral & in the St. Lucie estuary

Remote recruitment and participant sample contribution

Recruitment strategies:

- **Working with community organizations and stakeholder groups**
  - Presentation to organization leadership
  - Presentations at community meetings
- **Postal mail flyers**
  - Areas of interest identified by present and historical HAB incidence
  - Addresses accessed from registered voter roles
  - Typical mail volume: approx. 1000-5000 flyers in a town/geographic area
- **Media coverage**



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Are Blue-green Algal Blooms Affecting your Health?

The **University of Miami** **Wants** to **Know** and **Needs Your Help**

Diversity and Innovation in Screening and Prevention of Exposure over the Long-term (DISPEL) to Harmful Algal Blooms (HABs) Research Study

1. How do blue-green algal blooms impact Floridians?
   Blue-green algal blooms in freshwater produce toxins that can have detrimental health effects. Our study goal is to learn more about the long-term health effects due to exposure.
2. Where are blue-green algal blooms?
   If you live along the coast of Lake Okeechobee, Caloosahatchee River, or St. Lucie River, you may be exposed to cyanotoxins.
3. Why participate in the DISPEL Study?
   Participants will receive toxin results for their local water and will be provided *gift cards* for every sample completed.

Florida Blue-green Algae Map

Are YOU Excited to be Part of Our Cutting-Edge DISPEL Research Project?

Contact us! We are looking forward to hearing from you:

Study Coordinator: Addison Testoff, MPS

Email: dispelstudy@miami.edu

Phone: 305-243-2902

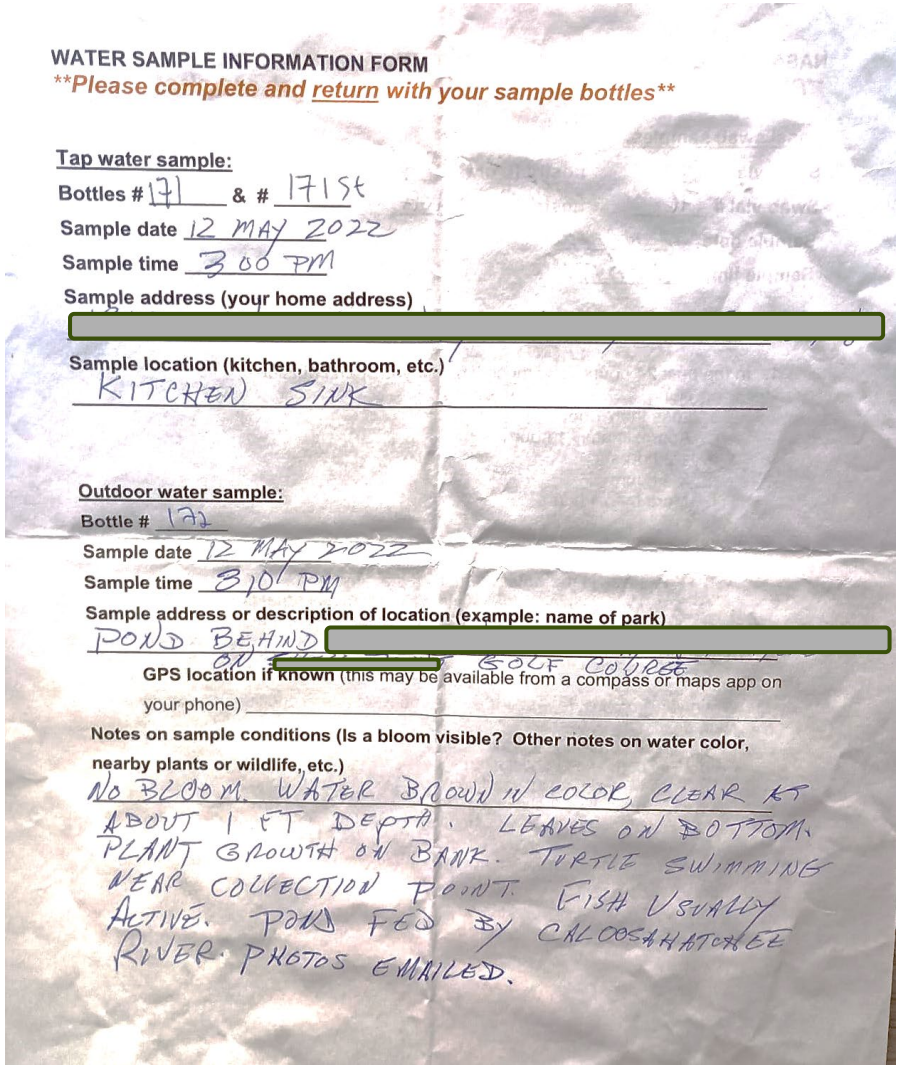
Study Leader: Dr. Alberto Caban-Martinez DO, PhD, MPH

Remote citizen science sampling

- Consent participants on Zoom
- Ship participants a sampling kit
- Video instructions and live telephone/Zoom instructions
- Participants return samples by mail to UM and University of Minnesota

Sampling kits

Water sample collection



WATER SAMPLE INFORMATION FORM
Please complete and return with your sample bottles

Tap water sample:
Bottles # 171 & # 171St
Sample date 12 MAY 2022
Sample time 3:00 PM
Sample address (your home address) [redacted]
Sample location (kitchen, bathroom, etc.)
KITCHEN SINK

Outdoor water sample:
Bottle # 172
Sample date 12 MAY 2022
Sample time 3:10 PM
Sample address or description of location (example: name of park)
POND BEHIND [redacted] GOLF COURSE
GPS location if known (this may be available from a compass or maps app on your phone)
Notes on sample conditions (Is a bloom visible? Other notes on water color, nearby plants or wildlife, etc.)
NO BLOOM. WATER BROWN IN COLOR, CLEAR AT ABOUT 1 FT DEPTH. LEAVES ON BOTTOM. PLANT GROWTH ON BANK. TURTLE SWIMMING NEAR COLLECTION POINT. FISH USUALLY ACTIVE. POND FED BY CALOOSAHATCHEE RIVER. PHOTOS EMAILED.

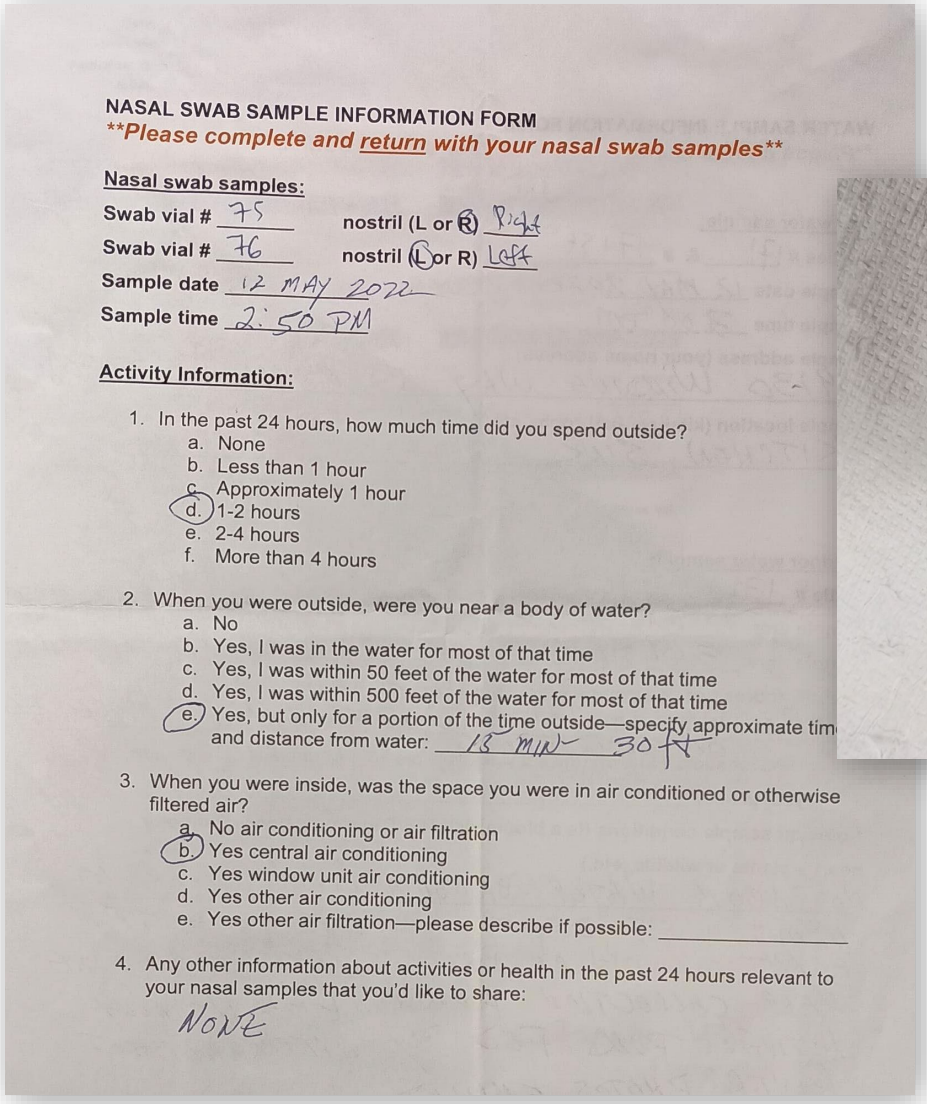
Participant Collection:

- One Outdoor water sample from place of exposure
- One tap water sample

Microcystin analysis via ELISA (Enzyme-linked immunosorbent assay)

Microcystin extraction and analysis via mass spectrometry

Nasal swabs collection



NASAL SWAB SAMPLE INFORMATION FORM

Please complete and return with your nasal swab samples

Nasal swab samples:

Swab vial # 75 nostril (L or R) Right

Swab vial # 76 nostril (L or R) Left

Sample date 12 MAY 2022

Sample time 2:50 PM

Activity Information:

1. In the past 24 hours, how much time did you spend outside?
   a. None
   b. Less than 1 hour
   c. Approximately 1 hour
   d. 1-2 hours
   e. 2-4 hours
   f. More than 4 hours

2. When you were outside, were you near a body of water?
   a. No
   b. Yes, I was in the water for most of that time
   c. Yes, I was within 50 feet of the water for most of that time
   d. Yes, I was within 500 feet of the water for most of that time
   e. Yes, but only for a portion of the time outside—specify approximate tim and distance from water: 15 MIN 30 FT

3. When you were inside, was the space you were in air conditioned or otherwise filtered air?
   a. No air conditioning or air filtration
   b. Yes central air conditioning
   c. Yes window unit air conditioning
   d. Yes other air conditioning
   e. Yes other air filtration—please describe if possible: _____

4. Any other information about activities or health in the past 24 hours relevant to your nasal samples that you'd like to share:
   NONE

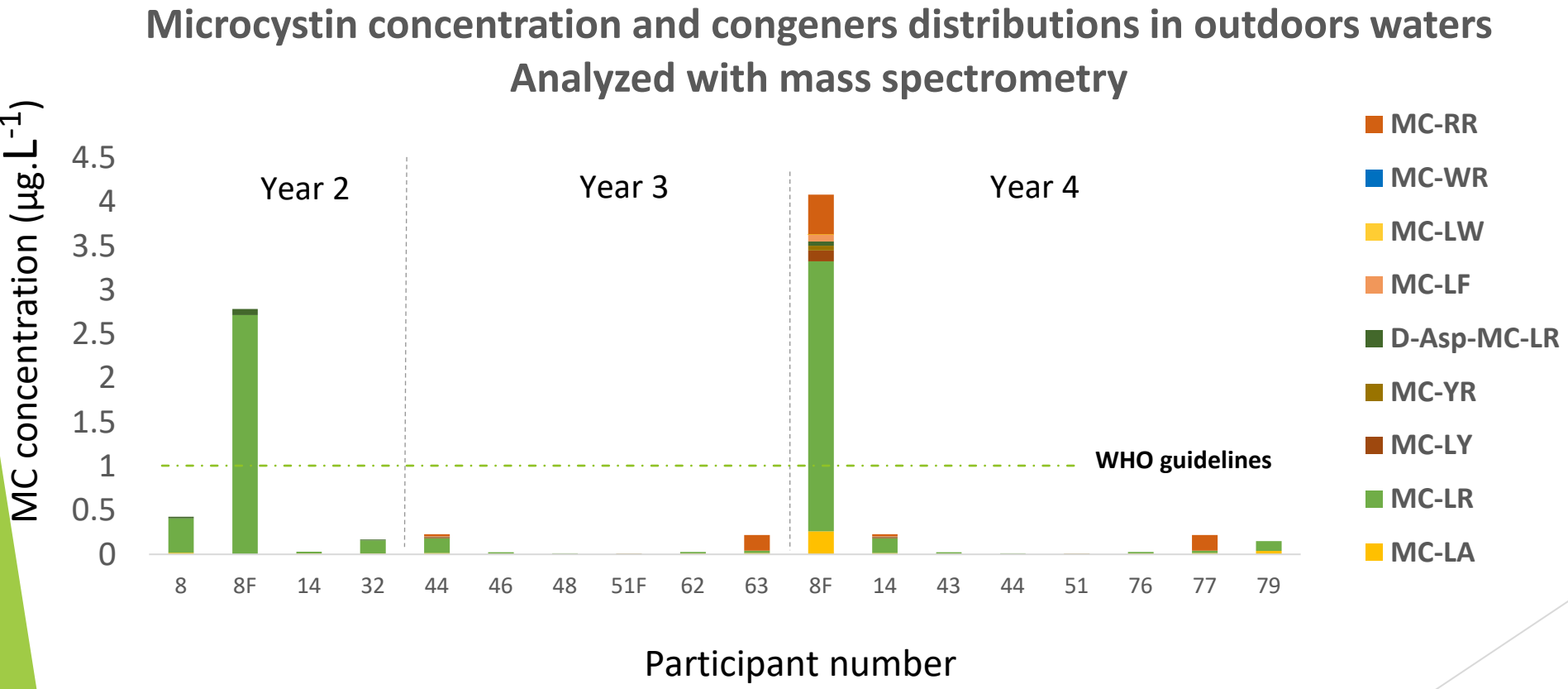
Microcystin extraction & analysis

ELISA (Enzyme-linked immunosorbent assay)

Mass spectrometry

Our findings

Microcystin in water samples
Total: 97 analyzed, 18 positive



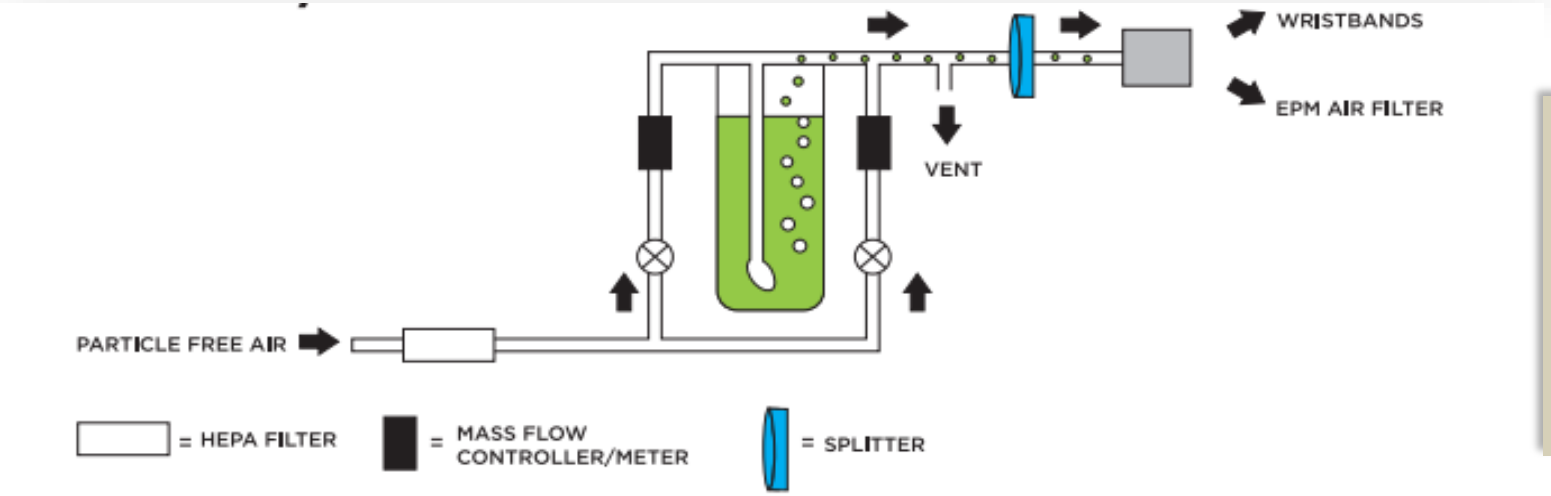
Microcystin in tap water samples
Total: 97 analyzed
No positives

World Health Organization guidelines for **drinking** water → 1 µg/L MC-LR (WHO 2003).

Microcystin analysis in nasal swabs

Microcystin in nasal swabs samples
Total: 34 analyzed via mass spec.
18 positive

	ELISA	vs.	Mass spectrometry
Our results	94% of samples positive for MC, false positives?		56% of samples positive for MC
	Higher concentrations		Lower concentrations
Methods comparison	Total MC		Congener differentiation, only MC-LA detected
	Easier and faster analysis		Longer time, higher accuracy



Future work

Using silicon wristbands as personal sampling devices for microcystin detection

Thank you!

Questions?


Spare slides
for more info

DISPEL to HABs Case Exposure Definition

	Time Component	Place Component	Distance Component	Rapid Assessment
Dermal Exposure Skin contacting H_2O with Blue-green algae or touching Blue-green algae directly	A minimum of continuous 20 minutes	At Work At Residence Recreational	Direct Skin Contact	1. Spirometry 2. Nasal Swab 3. Blood 4. Water Samples 5. Microbiome (banked)
Inhalation Exposure Exposed to spray from fresh or brackish water that has Blue-green algae	A minimum of one hour	At work At Residence Recreational	Within 50 ft from water body	1. Spirometry 2. Nasal Swab 3. Blood 4. Water Samples 5. Microbiome (banked)

- Participants do *not* need to have a pre-existing exposure to enroll.
- Ideally we enroll participants and collect baseline data first
- Not all participants will have an exposure

DISPEL Research Team Response:

Rapid Response Team Activity

If the above Case Definition(s) are met, then the DISPEL team would meet the cohort participant in 24-48 hrs to collect PFT, nasal swab, microbiome, blood, and/or water samples.

Study links & information

DISPEL study site: https://www.dispelhabstudy.org/

Interested in participating? Sign-up:
Contact Addison Testoff: Addison.testoff@earth.miami.edu

Study team PSA video with information about toxin exposure prevention using masks and air conditioner filters:
https://www.youtube.com/watch?v=PyDgq40-oTw

Contacts:

Addiston Testoff
Addison.testoff@earth.miami.edu
Kim Popendorf
KPopendorf@earth.miami.edu
Alberto Caban-Martinez
ACaban@med.miami.e
Daniela Maizel
dxm1457@earth.miami.edu

Publications:

Gaston et al. 2021
https://aaqr.org/articles/aaqr-21-01-oa-0016
Hu et al. 2020
https://www.mdpi.com/2072-6651/12/12/787/htm

Microcystin extraction

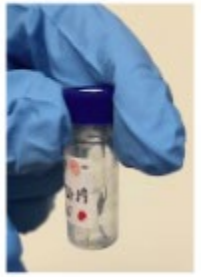
Filter HAB water
to collect particulate material
(47 mm GF/F)

Microcystin extraction

Add methanol + internal standard (ENK)

Extract by vortex & sonication

Filter and dry down to concentrate



200 uL sample

Ready for HPLC-MS analysis or ELISA analysis

Recruitment activities

Community engagement

- U.S. Army Corps of Engineers
- South Florida Water Management District
- Florida Dept. of Environmental Protection
- Rivers Coalition
- FL 18th congressional district office (Rep. Mast)
- Indian Riverkeeper
- Miami Waterkeeper
- Calusa Waterkeeper
- Friends of the Everglades
- Audobon Florida
- Florida Oceanographic Society
- Sierra Club (Belle Glade area)
- Captains for Clean Water
- HAB Assessment of Lake Okeechobee (HALO) research group at FAU
- Florida Poison Control Centers
- Various fire departments

Postal mail flyer distribution areas

- Alva: 4500 flyers
- Moore Haven: 500 flyers
- Taylor Creek: 1500 flyers
- Buckhead Ridge: 1500 flyers
- Palm City area: 6000 flyers