

# *Karenia brevis* Red Tides: Update on human health effects and what's next

Lorraine C. Backer

Senior Environmental Epidemiologist

Florida Harmful Algal Bloom State of the Science Symposium

St. Petersburg, Florida

August 20-21, 2019

**CDC AND HABS: HOW DID WE GET INVOLVED?**

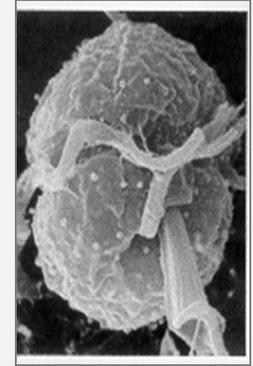
# *Pfiesteria piscicida* in Pokomoke River, MD

- October 1996: fish with lesions
- April 1997: Newly-identified alga blamed for fish kills and possibly human illness
  - Dr. Joanne Burkholder, NC State
- 1998: Congress funded NCEH
- 2003, 2014, 2018: Congress renewed funding



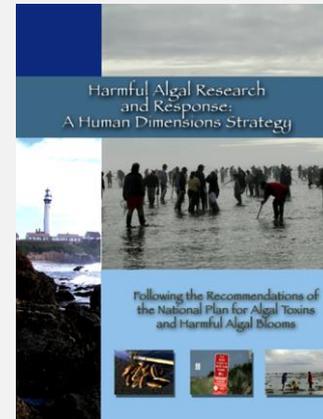
# Legacy of *Pfiesteria piscicida*

- Raised awareness of the potential impacts from overgrowth of algae in all water bodies
- Legislation
  - Harmful Algae Blooms and Hypoxia Research and Control Act (HABHRCA) of 1998 (reauthorized in 2004, 2014, 2018)
    - Provided NOAA with funding for grants
    - Required a number of interagency reports

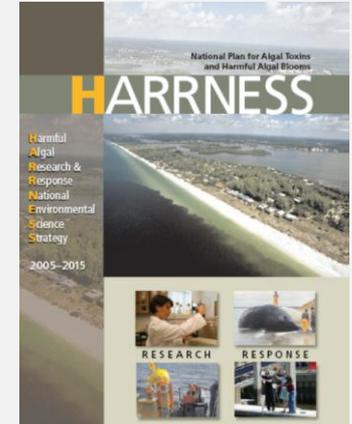


*Pfiesteria piscicida*

Socioeconomic issues



Science, food safety, analytic capacity, and public health



***KARENIA BREVIS* RED TIDES AND HUMAN  
HEALTH: WHAT DO WE KNOW?**

# *Karenia brevis* red tide-related illnesses

- Foodborne
  - Neurotoxic shellfish poisoning
    - Self-limiting disease with GI and neurologic symptoms
    - Milder version of ciguatera fish poisoning?
  - Some evidence of accumulation in fin fish



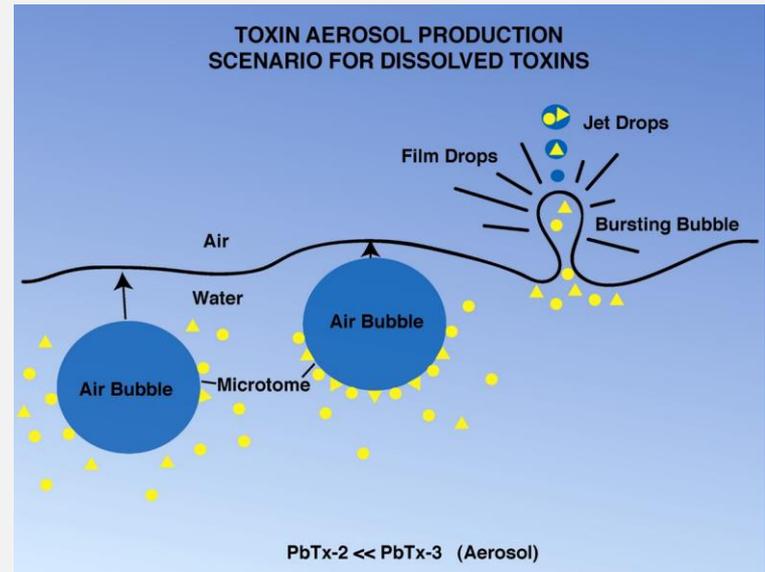
# What's the risk?

- Risk for NSP is low because of ongoing monitoring
  - Victims likely to be visitors or non-English speakers



# Brevetoxins: Airborne Public Health Risk

- Respiratory complaints during Florida red tides
  - Music (1972)
- 12 out of 15 asthmatics reported attacks after beach exposure
  - Asai et al. (1982)
- Scientists on red tide research cruise complained of shortness of breath and/or difficulty taking a deep breath
  - Kirkpatrick (2001)



Slide courtesy of Dr. Richard Pierce, Mote Marine Laboratory

# *Karenia brevis* red tide-related illnesses

- Studies of aerosol exposures
  - Brevetoxin-induced respiratory irritation
    - Symptoms more severe in people with asthma
- People take action to protect themselves



# What's the risk?

- Risk for respiratory effects from aerosols ongoing during bloom events
  - People with asthma may experience lingering effects



# *Karenia brevis* red tide-related illnesses—marine mammals

- Poisonings via food web
  - 2004 dolphin mortality in the Florida Panhandle
- Adverse respiratory effects
  - 2003 Florida manatee rescue



Courtesy of Florida Fish & Wildlife Conservation Commission

Courtesy of Lori Schwacke

# *Karenia brevis* red tide-related illnesses—fish

- Poisonings



Photo by Lorrie Backer

# What's the risk?

- Loss of threatened and/or endangered animal populations
- Ecosystem damage



**GAPS IN OUR KNOWLEDGE**

# What's missing?

- Foodborne
  - What are the long-term health risks from NSP?
  - What are the health risks from eating contaminated finfish?



# What's missing?

- Aerosols
  - What are the long-term health risks?
    - Healthy populations
    - People with underlying conditions
      - Asthma



# What's missing?

- Contaminated recreational waters
  - Are there health risks?
  - Are there susceptible populations?



# What's missing?

- Regulatory requirements
  - How much brevetoxin in recreational waters is OK?
  - Are there susceptible populations?



**OPPORTUNITIES**

# Interagency Actions

- Consider public health in local jurisdiction laws and regulations
- Community engagement in protecting resources



# Public Health Actions

- Epidemiologic studies: CDC
- Aerosols from cyanobacterial blooms: Exposures and health effects in a highly exposed population
  - Biological specimens for exposure and effects
  - Symptom surveys for health outcomes
  - Environmental samples to assess exposure

# Public Health Actions

- One Health Harmful Algal Bloom System (OHHABS)
  - Encourage states to report human and animal illnesses and environmental information about the bloom

The screenshot shows the CDC website page for Harmful Algal Bloom (HAB)-Associated Illness. The page features a blue header with the title and a 'CDC A-Z INDEX' dropdown. Below the header are social media icons for Facebook, Twitter, and a plus sign. The main content area includes two images: a green algal bloom in a field and a brown algal bloom in a large body of water. A line graph titled 'Publications, Data, & Statistics' shows a sharp increase in data points. Below the images is a paragraph explaining that Harmful algal blooms (HABs) are the rapid growth of algae that can cause harm to animals, people, or the local ecology. The page is organized into several sections: 'GENERAL INFORMATION' (Frequently asked questions...), 'ILLNESS & SYMPTOMS' (Signs, symptoms, and outcomes...), 'SOURCES OF EXPOSURE & RISK FACTORS' (Who gets it and how...), 'HABS & THE ENVIRONMENT' (Factors that promote growth of HABs...), 'PREVENTION & CONTROL' (How to stay healthy and prevent illness...), 'HAB Resources' (Health Promotion Materials, One Health Harmful Algal Bloom System (OHHABS)), and 'Healthy Water Sites' (Healthy Water, Drinking Water, Healthy Swimming, Global WASH, Other Uses of Water, WASH-related Emergencies &...).

[www.cdc.gov/habs](http://www.cdc.gov/habs)

# Public Health Actions

- Other sources of health data
  - Sentinel animals
  - Hospital discharge data
  - National Poison Data System



# Community Actions

- Community participation
- Citizen science



# Analytic Methods

- Toxins in biological media
  - Animals and people
  - Bench studies
  - CLIA certification for clinical tests
- Toxins in environmental samples
  - Technology transfer to State Public Health Laboratories

# Education and Outreach

## Physician Reference



Grand Lake, Saint Marys, Summer 2010

### Blue-green Algae Blooms When in doubt, it's best to stay out!

#### What are blue-green algae?

Cyanobacteria, sometimes called blue-green algae, are microscopic organisms that live in all types of water.

#### What is a blue-green algae bloom?

Blue-green algae grow quickly, or bloom, when the water is warm, slow-moving, and full of nutrients.

#### What are some characteristics of blue-green algae blooms?

- Algae usually bloom during the summer and fall. However, they can bloom anytime during the year.
- When a bloom occurs, scum might form on the water's surface.
- Blooms can be many different colors, from green or blue to red or brown.
- As the bloom dies off, you might smell an odor that is similar to rotting plants.

#### What is a toxic bloom?

Sometimes, blue-green algae produce toxins.

- The toxins can be present in the algae or in the water.

#### Other important things to know:

- Swallowing water that has algae or algal toxins in it can cause serious illness.
  - Dogs might have more severe symptoms than persons, including collapse and sudden death after swallowing the contaminated water while swimming or after licking algae from their fur.
  - There are no known antidotes to these toxins. Medical care is supportive.
- You cannot tell if a bloom is toxic by looking at it.**

### To report a blue-green algae bloom or related health event:

Call your local or state health department

For more information:

<http://www.cdc.gov/hab/links.htm>

or

Call the National Center for Environmental Health Harmful Algal Blooms Program (HABISS), Centers for Disease Control and Prevention: 866-556-0544

## Veterinarian Reference



### Blue-green Algae Blooms When in doubt, it's best to stay out!

#### What are blue-green algae?

Cyanobacteria, sometimes called blue-green algae, are microscopic organisms that live in all types of water.

#### What is a blue-green algae bloom?

Blue-green algae grow quickly, or bloom, when the water is warm, slow-moving, and full of nutrients.

#### What are some characteristics of blue-green algae blooms?

- Algae usually bloom during the summer and fall. However, they can bloom any time during the year.
- When a bloom occurs, scum might form on the water's surface.
- Blooms can be many different colors, from green or blue to red or brown.
- As the bloom dies off, you might smell an odor that is similar to rotting plants.

#### What is a toxic bloom?

Sometimes, blue-green algae produce toxins, such as microcystins.

- The toxins can be present in the algae or in the water.

#### Other important things to know:

- Swallowing water that has algae or algal toxins in it can cause serious illness.
  - Dogs might have more severe symptoms than persons, including collapse and sudden death after swallowing the contaminated water while swimming or after licking algae from their fur.
  - There are no known antidotes to these toxins. Medical care is supportive.
- You cannot tell if a bloom is toxic by looking at it.**

### To report a blue-green algae bloom or related health event:

Call your local or state health department

#### For More Information:

Call the National Center for Environmental Health Harmful Algal Blooms Program (HABISS), Centers for Disease Control and Prevention: 866-556-0544

# Summary of Priorities

- Interagency actions
- Conduct epidemiologic studies
- Understand the public health implications
- Engage local communities
- Develop and enhance analytic methods
- Education and outreach

# Thank you.

For more information, contact NCEH  
1-800-CDC-INFO (232-4636)  
TTY: 1-888-232-6348      [www.cdc.gov](http://www.cdc.gov)  
Follow us on Twitter   [@CDCEnvironment](https://twitter.com/CDCEnvironment)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

