Harmful Algal Blooms and Public Health Surveillance: The One Health Harmful Algal Bloom System (OHHABS)

Virginia Roberts

Epidemiologist, Great Lakes Project Coordinator

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National Center for Emerging and Zoonotic Infectious Diseases

Division of Foodborne, Waterborne, and Environmental Diseases

Acknowledgments

- ❑ **Great Lakes Restoration Initiative (GLRI)**
  - ▪ Regional working group
- ❑ **Harmful Algal Bloom Surveillance Working Group**
  - ▪ State Partners
    - • FL, IL, IN, IA, KS, MD, MA, MI, MN, NY, OH, OR, SC, VA, WA, WI
  - ▪ Federal and Other Partners
    - • ATSDR, CDC, EPA, FDA, NOAA, NPS, USGS
    - • IJC
- ❑ **CDC Surveillance Partners**
  - ▪ CDC/National Center for Emerging and Zoonotic Diseases
  - ▪ CDC/National Center for Environmental Health
  - ▪ CDC/National Center for Immunization and Respiratory Diseases
  - ▪ IT Development: Northrup Grumman

Harmful Algal Blooms (HABs)

❑ **Adversely affect humans, animals, and the environment**

- Economic (e.g., beach closures, shellfish harvest closures)
- Ecologic (e.g., oxygen depletion, sunlight deprivation)
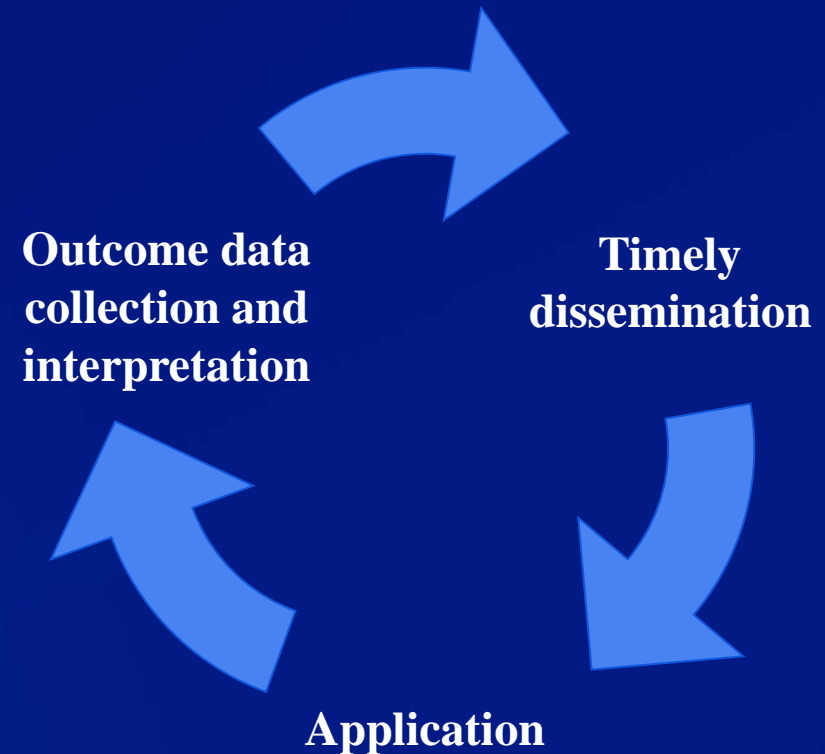- Health (e.g., human and animal illnesses)—exposure through ingestion (water or food), inhalation, dermal contact
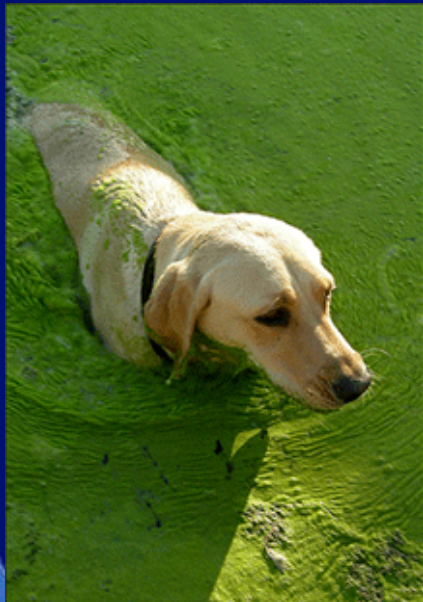
An Emerging Public Health Issue

- Challenges: identifying and characterizing HAB-related illnesses
- Questions include:
  - Frequency and geographic distribution
    - How many cases of illness annually? Where? When?
    - Illnesses occurring more/less frequently?
  - Case definitions
    - What are the symptoms of HAB-related illness? How do they vary by toxin? Concentration?
    - How to interpret the clinical, epidemiological, and environmental data?
  - Risk factors
    - How do factors such as age, route of exposure, and immune status affect susceptibility?
  - Prevention efforts—needs? impacts?

Public health surveillance can help to answer these questions

❑ Public health surveillance:

■ *The ongoing, systematic collection, analysis, and interpretation of outcome-specific data for use in the planning, implementation, and evaluation of public health practice.*
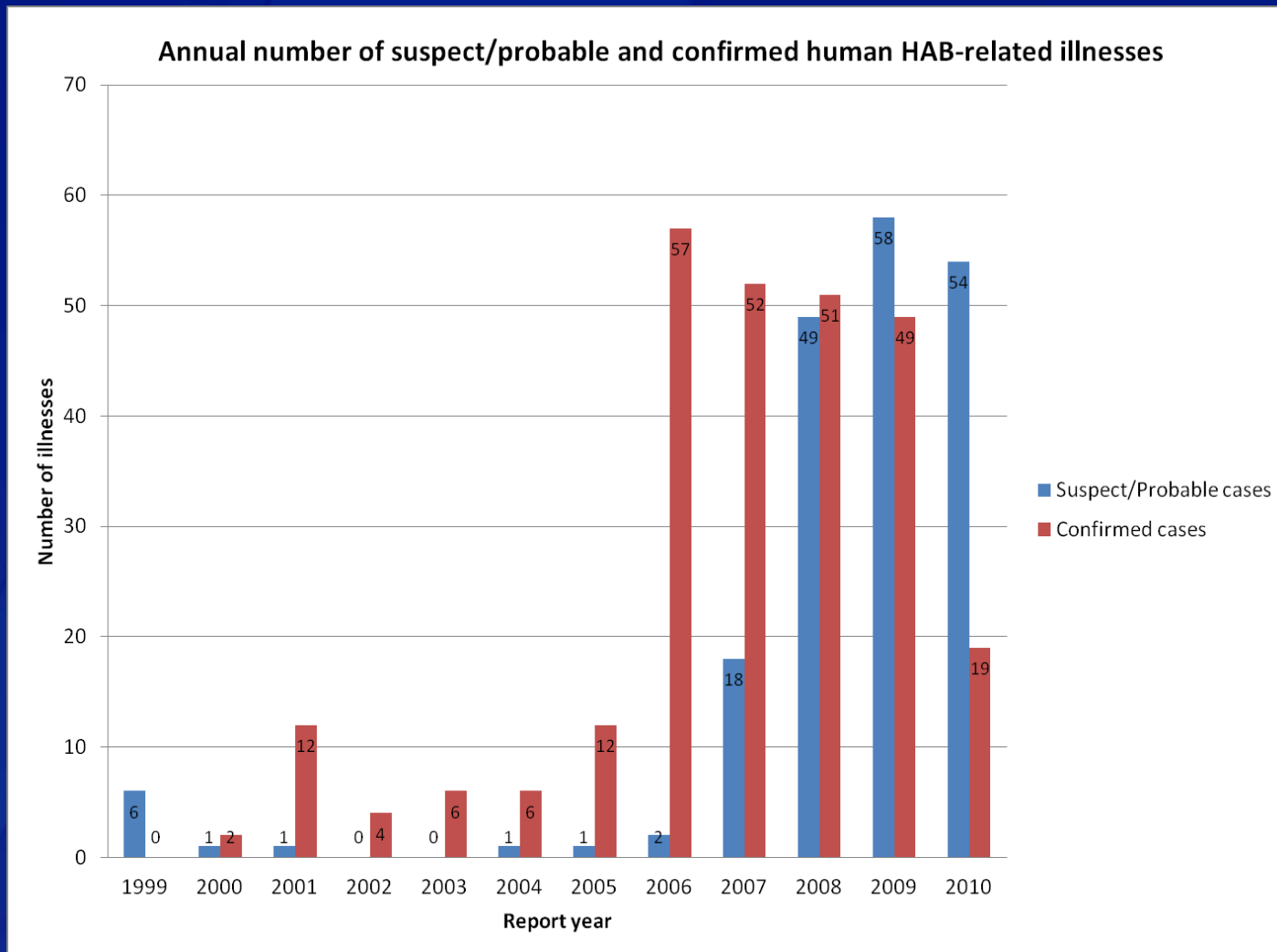
Outcome data collection and interpretation

Timely dissemination

Application

Teutsch and Churchill , Principles and Practice of Public Health Surveillance. 2000. Oxford University Press

Harmful Algal Bloom-related Illness Surveillance System (HABISS)

- ❑ 2009-2013
- ❑ Data
  - ▪ Temporally and geographically related
  - ▪ HABs, human cases, and animal cases
  - ▪ Select number of states
- ❑ Goals
  - ▪ Detection, mitigation, prevention
  - ▪ Link cases of illness with environmental data
  - ▪ Generate case definitions
- ❑ Developed a network and increased expertise

FY 2009 Harmful Algal Bloom Grantees and Partners

HAB Grantees (10)
Public Health Partners (4)
PIC Partners (3)
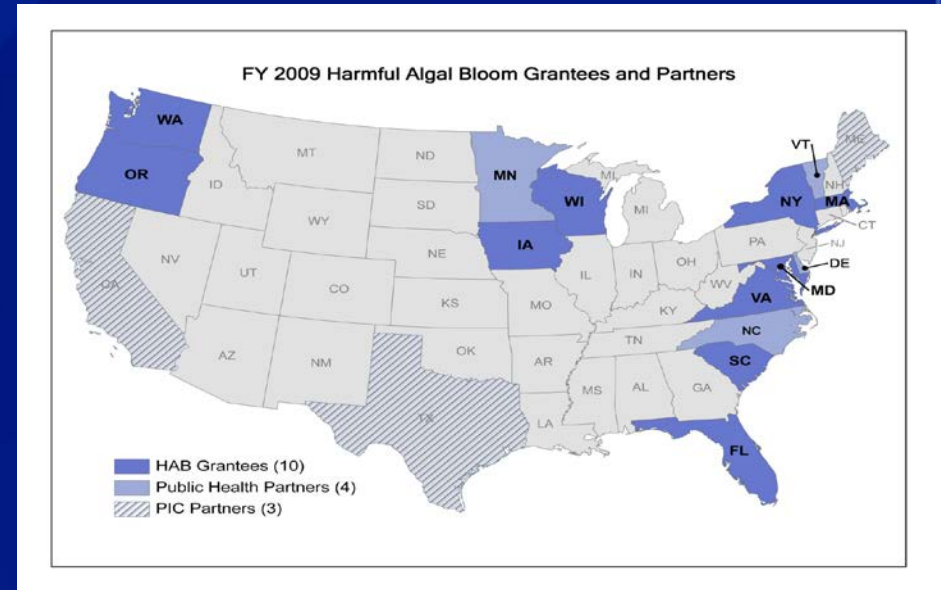
Reported HAB-related Human Illnesses

Annual number of suspect/probable and confirmed human HAB-related illnesses

CDC HAB Illness Surveillance System

One Health

❏ Human health is connected to animal health and the environment

❏ Animals are also susceptible to HABs, and animal illnesses can serve as early indicators of algal bloom toxicity

❏ Cooperation among human health, animal health, and environmental health communities will be critical

National Outbreak Reporting System (NORS)

- ❑ **Electronic web-based reporting system**
    - ▪ Launched in 2009
    - ▪ Voluntary reporting by local and state health departments
    - ▪ Aggregate data on outbreaks
    - ▪ Passive surveillance (no active search)
    - ▪ Outbreaks reported after investigation complete

- ❑ **Outbreak**: ≥ 2 human cases of illness epidemiologically linked by time, exposure and illness characteristics
    - ▪ Waterborne disease outbreaks
    - ▪ Foodborne disease outbreaks
    - ▪ Enteric disease outbreaks associated with other exposures

- ❑ **Waterborne and foodborne outbreak data feed into national surveillance systems that have been in existence since the 1970s**

More information: http://www.cdc.gov/nors

The NORS surveillance process

People exposed to an infectious/non-infectious pathogen → **People get sick, may seek treatment** → **Health departments notified of possible outbreaks**

↓

CDC checks data for accuracy and analyzes ← **Health department enters outbreak data into NORS** ← **Health department conducts outbreak investigation**

↓

Data summarized and published
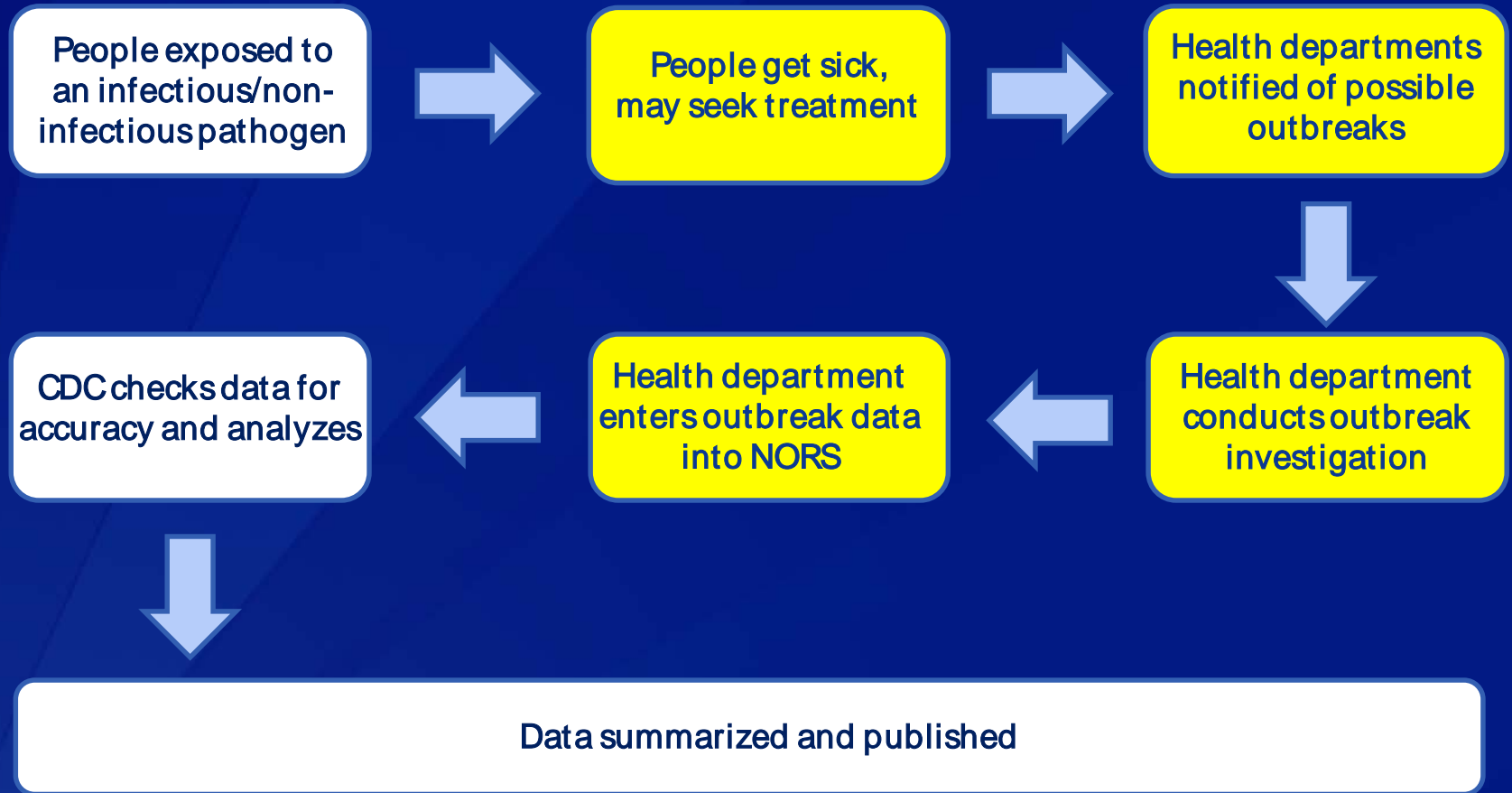
Data uses:
Summary reports, other publications, data and statistics
Development and support of programs, health promotion, and policies

Great Lakes Restoration Initiative (GLRI)

- CDC funded since 2013 by the Great Lakes Restoration Initiative (GLRI) to expand public health surveillance
  - Build state and regional public health capacity related to harmful algal blooms and ambient waterborne disease in the Great Lakes
  - Engage in state and federal partnerships, data and information sharing
  - Collect better data to assess Great Lakes ecosystem health & GLRI project impacts

- Project activities include
  - Placement of 2-year waterborne disease epidemiology fellows in state health departments
  - Building a web-based reporting system for harmful algal bloom-related health events

Great Lakes RESTORATION

Surveillance Capacity and Network: Great Lakes Waterborne Disease Epidemiology Fellows

Green=2013-2015 Fellow
Grey=2014-2016 Fellow
Red=2015-2017 Fellow
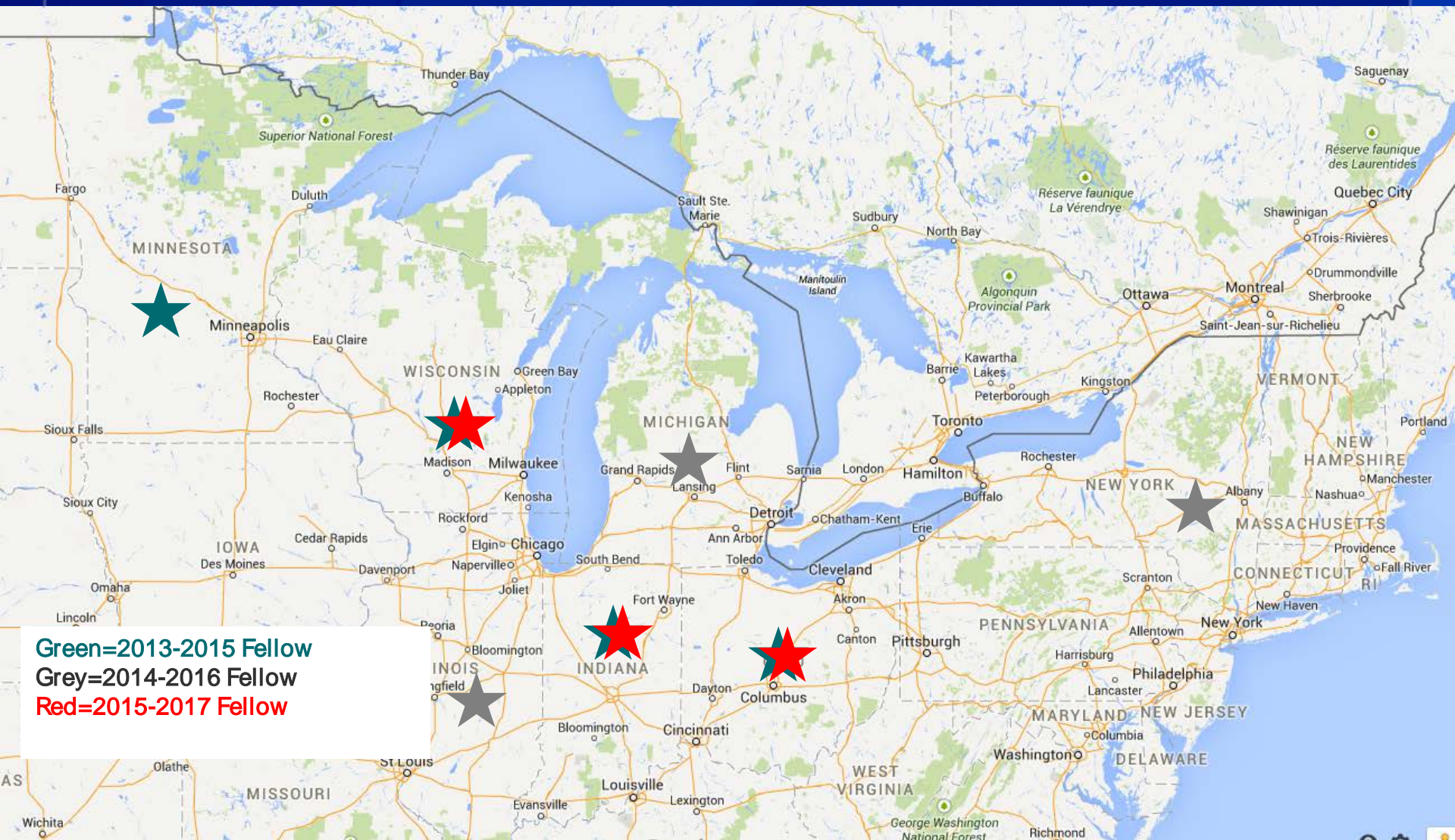
Harmful Algal Bloom–Associated Illness Surveillance: Lessons From Reported Hospital Visits in New York, 2008–2014

We identified hospital visits with reported exposure to harmful

Mary Figgatt, MPH, Neil Muscatiello, MPH, Lloyd Wilson, PhD, MA, and David Dziewulski, PhD
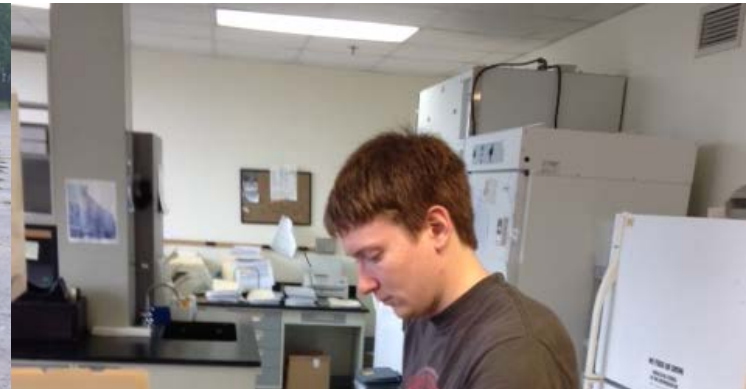
Keep Harmful Algal Bloom-Related Illness on Your Differential List this Summer

The Wisconsin Division of Public Health Seeks to Increase Illness Reporting with Veterinarians' Help

Sarah Koske, DVM, MPH, Wisconsin Department of Health Services, Division of Public Health

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Great Lakes
RESTORATION

One Health Harmful Algal Bloom System (OHHABS)

❑ Systematic collection of data on HABs and single cases of HAB-related human and animal illnesses

- ▪ Informed by HABISS
- ▪ "One Health" approach
- ▪ Event-based (not routine water monitoring)
- ▪ Voluntary reporting by states after investigation completed
- ▪ Waterborne and foodborne illnesses

❑ Web-based reporting system linked to the National Outbreak Reporting System (NORS)

OHHABS
(Single human & animal cases)

NORS
($\geq$2 human cases)
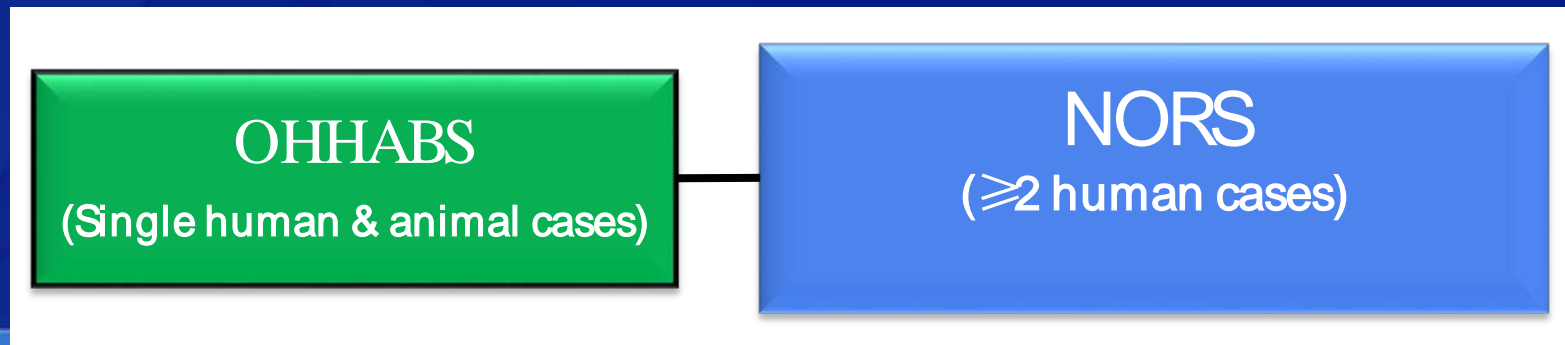
Surveillance Partnerships

- Internally at CDC
- Externally with state and federal partners
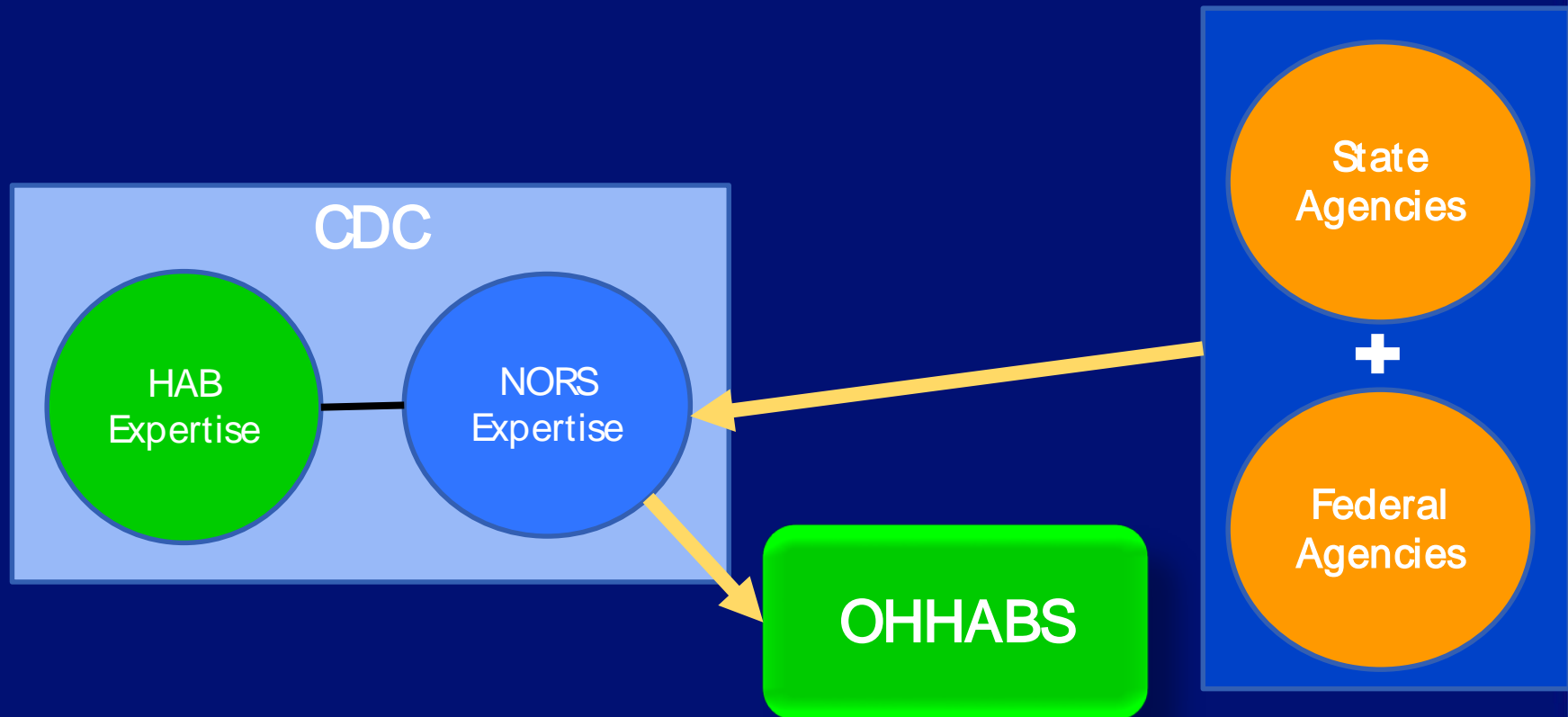
OHHABS Development Timeline
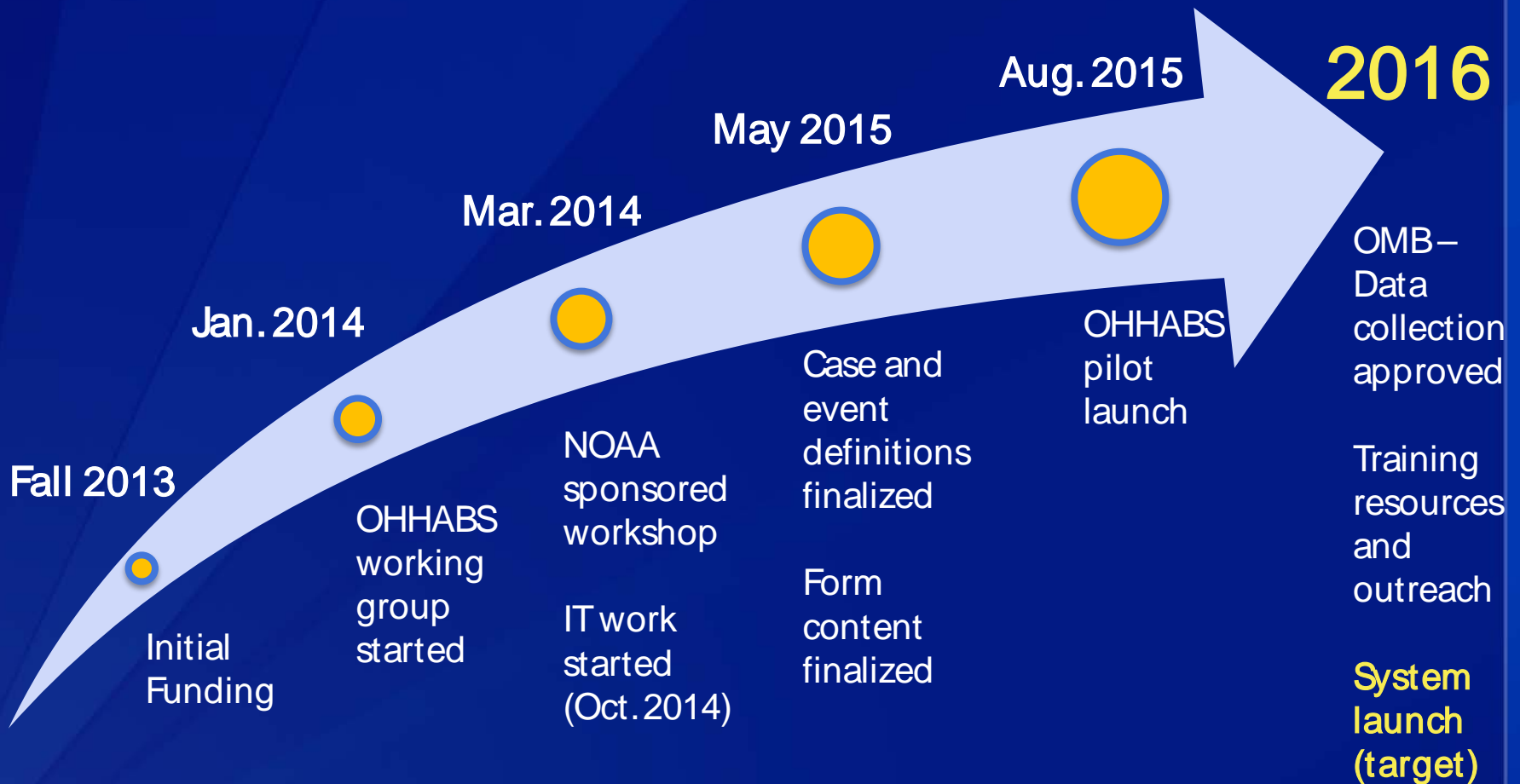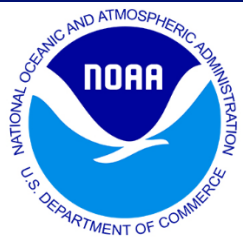
2016

Aug. 2015

May 2015

Mar. 2014

Jan. 2014

Fall 2013

Initial Funding

OHHABS working group started

NOAA sponsored workshop

IT work started (Oct. 2014)

Case and event definitions finalized

Form content finalized

OHHABS pilot launch

OMB – Data collection approved

Training resources and outreach

System launch (target)

OHHABS Working Group

★ HAB Working Group State
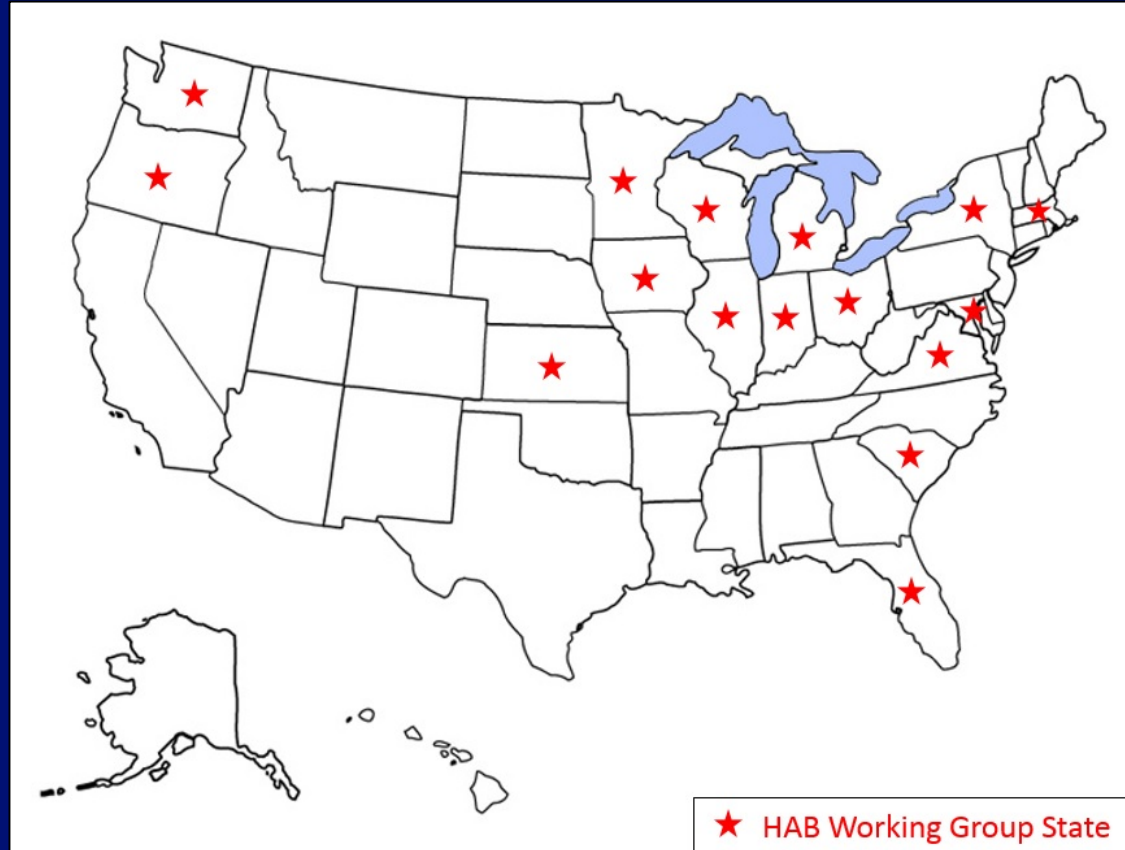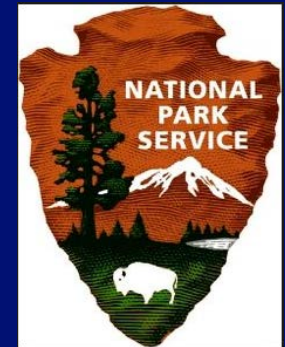
OHHABS Working Group Surveillance Materials

- **Reporting Criteria**
  - HAB event definition (suspected, confirmed)
  - Human case definition (suspected, probable, confirmed)
  - Animal case definition (suspected, probable, confirmed)

- **Forms**
  - Environmental form
  - Human case form
  - Animal case form

- **User guidance (in development)**

OHHABS Human Case Definitions

Table 2. Definition of a Human HAB-associated case

Definition	Criteria							
Human HAB-associated Case	Exposure[1]	Signs/ symptoms[2]	Public health assessment[3]	Professional medical diagnosis[4]	Other causes of illness ruled out	Observational or environmental data[5]	Laboratory-based HAB data[6]	Clinical data[7]
1. Suspect	Required	Required	Required					
2. Probable	Required	Required	Required			Required to have 1		
3. Probable	Required	Required	Required	Required	+/-	+/-	+/-	
4. Confirmed	Required	Required	Required	Required to have 1		+/-	+/-	Required
5. Confirmed	Required	Required	Required	Required	Required		Required	

[1] Exposure (i.e. physical contact, inhalation, ingestion) to water, algae, or seafood, dietary supplements

[2] Self-reported signs/symptoms after exposure

[3] Public health assessment is defined as the action of compiling all data available and deciding that the illness in question is likely HAB-related

[4] Professional medical diagnosis being provided by a medical practitioner (e.g. doctor, nurse, physician assistant) based on his or her medical assessment of the patient's symptoms, medical history, exposure, etc.

[5] Observational (e.g. scum, algae, water color change, sheen, photographic evidence, satellite data) or environmental (e.g. pH, chlorophyll, nutrient levels) data from a water body to supporting the presence of an algal bloom

[6] Laboratory detection of cyanobacteria or other potentially toxin-producing algae, (e.g. microscopic confirmation or DNA analyses) or algal/cyanobacterial toxins (e.g. bioassay, HPLC) in a water body, finished drinking water supply, seafood or dietary supplements

[7] Laboratory documentation of cyanobacteria, other potentially toxin-producing algae, or algal/cyanobacterial toxins in a clinical specimen

Blue shaded cells: you must have at least one of the criteria described in the shaded cell.

+/-: indicates that this criteria is optional and while it strengthens the case, but it does not change case classification (e.g. suspect to probable, probable to confirmed).

OHHABS Reports

What Can Be Reported to OHHABS

1. Environmental data, human case data, and animal case data
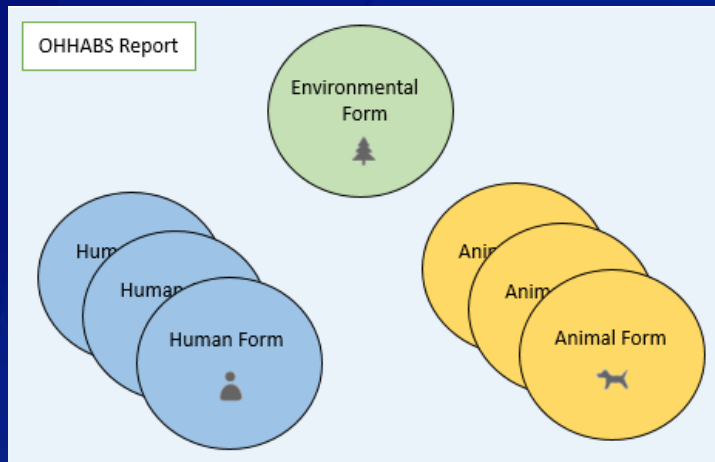
2. Only environmental data about a HAB or HAB-related event
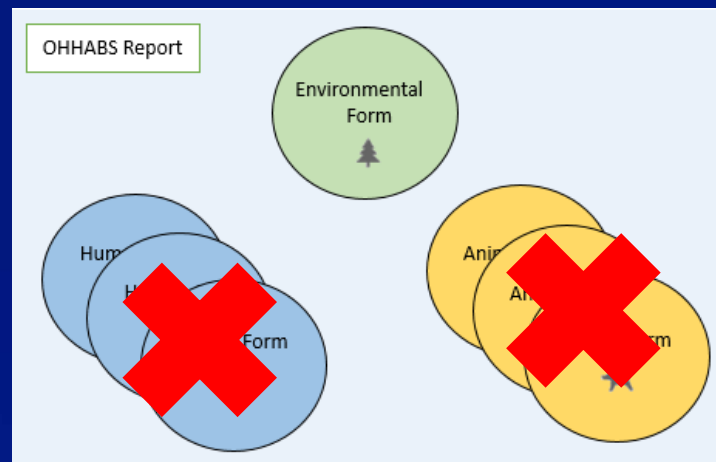
3. Human case data with environmental data about the HAB
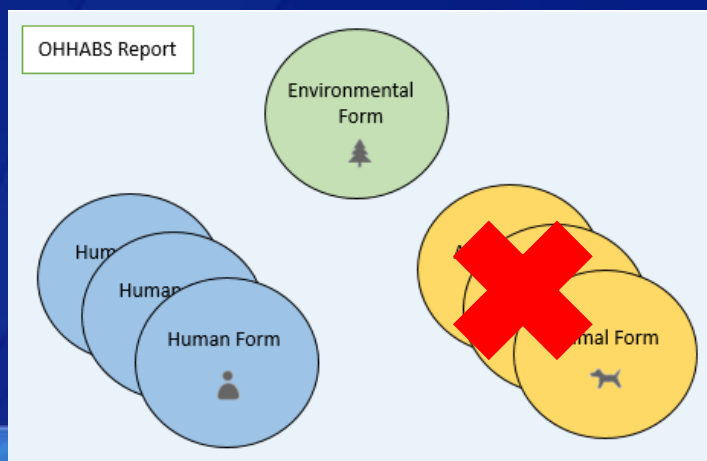
4. Animal case data with environmental data about the HAB
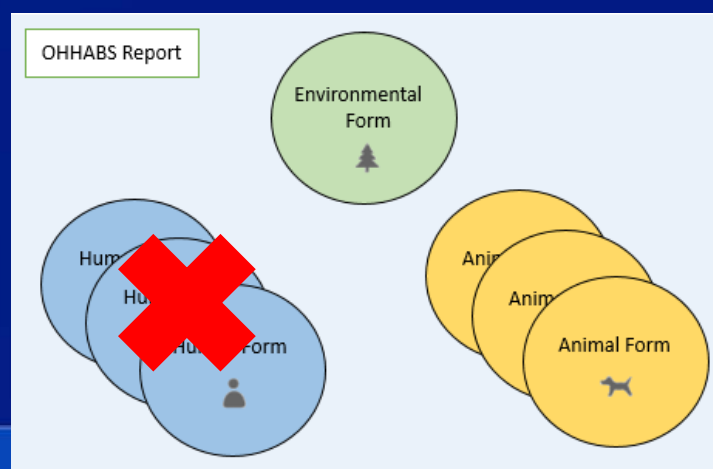
Direct login through OHHABS

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

OHHABS - One Health Harmful Algal Bloom System

Log In

Username:

Password:

Log In

DISCLAIMER: *The information contained herein is the property of the Centers for Disease Control and Prevention and its participating partners in the National Outbreak Reporting System (NORS). The holder shall keep all information contained herein confidential, shall disclose the information only to its employees with a need to know, and shall protect the information from disclosure and dissemination to third parties with the same degree of care it uses to protect its own confidential information.*

Content source: Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases (NCEZID)

OHHABS Landing Page

Environmental Form

Human Case Form

❑ **No personally identifiable information (PII) is collected in the human case form**

Animal Case Form

❑ Single case or large group of cases (e.g., fish kill)

Report Summary

❑ **New reports created with human or animal forms first will have an environmental form automatically created**

Additional Considerations

❑ Needs include

- Local and state resources/capacity for surveillance, water monitoring, investigation, and reporting
- Clinical diagnostic tests for algal toxin exposures (e.g., urine)
- Refined case definitions (clinical and environmental data)
- Increased awareness of HAB-related illnesses (e.g., general public, clinicians)
- National health-based regulations and guidelines for drinking water and recreational water exposures
- New and improved tools to facilitate data collection and analysis
- Optimization of environmental and health databases (e.g., data linkages)
- Multidisciplinary partnerships, training and communication resources

Conclusion

- ❑ **One Health surveillance**
  - ▪ OHHABS will be able to link human and animal illness data with HAB events
  - ▪ Health surveillance for HAB-related illness relies more than traditional infectious disease or human illness surveillance partnerships
- ❑ **Capacity extends beyond an electronic system**
  - ▪ Resources, tools, relationships, education, and outreach
  - ▪ Future database linkages to optimize data use
- ❑ **Data to inform Great Lakes restoration efforts, mitigate health effects of HABs, and prevent illnesses**
  - ▪ e.g., beach management, policy, communications and educational materials

Next Steps

- ❑ OHHABS launch
  - ▪ Training and resources (e.g., fillable PDFs for state internal use)
  - ▪ Technical support for users
  - ▪ New CDC Harmful Algal Bloom informational website
  - ▪ Communications
- ▪ **For more information**
  - • Virginia Roberts (evl1@cdc.gov)
  - • Joana Yu (jyo3@cdc.gov)

Thank you!