Evaluation of the Wisconsin Harmful Algal Bloom Surveillance Program, 2009–2014

Sarah E Koske, DVM, MPH,[1,2] Emmy Wollenburg, MPH,[1] and Mark A Werner, PhD[1]

[1]Wisconsin Department of Health Services, Division of Public Health,

Bureau of Environmental and Occupational Health, Madison, Wisconsin; [2]CDC/CSTE Applied Epidemiology Fellowship

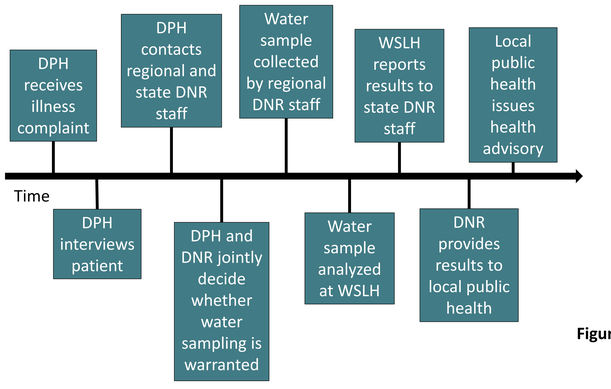
BACKGROUND

Harmful Algal Blooms (HABs) are caused by rapid overgrowth of aquatic cyanobacteria. Many cyanobacteria species produce cyanotoxins, which can cause severe illness in humans and animals.

Established in 2009 through the Centers for Disease Control and Prevention's (CDC) Harmful Algal Bloom Illness Surveillance System (HABISS), Wisconsin's HAB Surveillance Program collects data to track incidence of HAB-related illness, evaluate health impacts of HAB exposure, target outreach activities to increase HAB awareness, and inform public health interventions. Program activities are carried out through a partnership between the Wisconsin Department of Health Services (DHS), Division of Public Health (DPH), the Department of Natural Resources (DNR), and the State Laboratory of Hygiene (WSLH) (Figure 1).

During 2009-2014, DHS received 173 health complaints related to HAB exposure. Illnesses are reported voluntarily by citizens, medical and veterinary practitioners, the Wisconsin Poison Center, and referrals from other state and local agencies (Figure 2). After CDC funding for HAB surveillance was discontinued in 2013, case investigation and follow-up activities were integrated into a CDC/CSTE Applied Epidemiology Fellowship position.

Figure 1. Case investigation workflow and responsibilities by organization.



OBJECTIVES

- Assess the state's ability to detect, investigate, and confirm HAB-related illnesses (HABRI).
- Assess the state's ability to protect public health by identifying water bodies where health advisories are needed.
- Identify ways in which the HAB surveillance system could be improved.
- Identify program activities to prioritize during periods of low capacity.

METHODS

- Using the CDC Updated Guidelines for Evaluating Public Health Surveillance Systems,[1] system simplicity, flexibility, acceptability, timeliness, sensitivity, data quality, stability, Predictive Value Positive (PVP), representativeness, and usefulness were evaluated.
- Senior staff at each partner agency were interviewed and asked to reflect on program goals, performance, and barriers to optimal operation.
- Surveillance data were analyzed to quantitatively evaluate system timeliness, representativeness, and data quality.

Lake Chetek, 2014

Post-HAB exposure rash, Lake Tainter, 2009

Petenwell Lake, 2009

Gile Flowage, 2014

Fish kill in Lake Winnebago, 2009

Channel off Lake Winnebago, 2014

Lake Mendota, 2013

Figure 2. Illness Reporting Sources, 2009-2014 (n=161).

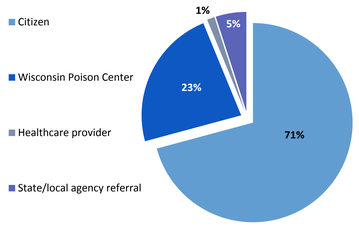


Figure 3. Effect of illness recognition and reporting awareness on data quality.

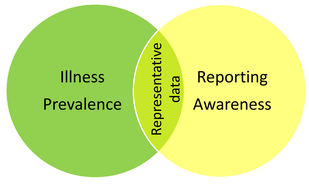
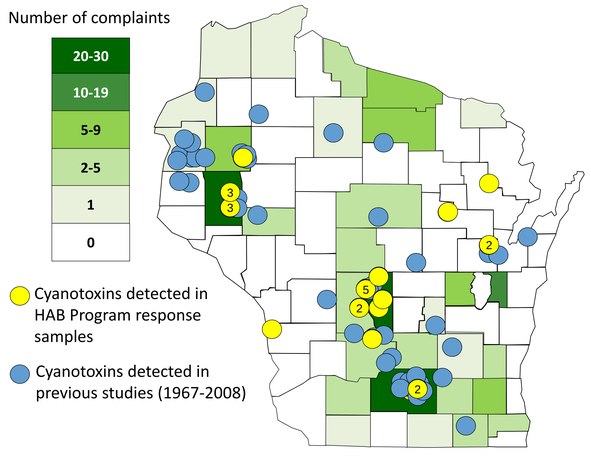


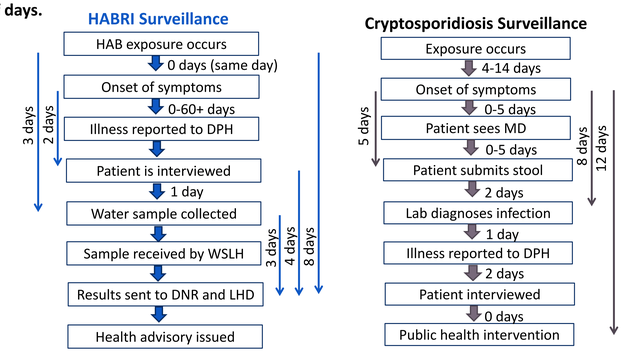
Figure 4. Distribution of Cyanotoxin Detects and Health Complaints Received by County of Exposure, 2009-2014 (n=161).



RESULTS

- ✓ **Simple system operation.**
- ✓ **Excellent agreement between case assessment conclusions and water testing results (PVP).**
  - Excellent ability of DPH staff to recognize probable cases and determine if water conditions are still representative of those at exposure.
  - Cyanobacteria and/or toxins present in 97.7% (n=43) of water samples collected in response to illness cases.
- ✓ **Excellent case investigation and response timeliness when illnesses are reported quickly (Figure 5).**
  Delayed illness reporting dramatically affects the program's ability to collect representative samples and intervene to prevent additional exposures.

Figure 5. Timeliness comparison of HABRI and cryptosporidiosis surveillance systems, described in median number of days.



- X **No dedicated HAB Surveillance Program funding.**
  Program response testing, outreach, and staffing is currently limited by poor funding capacity.
- X **Poor geographical representativeness.**
  - The number of water bodies in the state (15,074) makes routine statewide monitoring infeasible.
  - Understanding of HABRI distribution in the state is likely skewed by uneven distribution of HABRI awareness and illness reporting (Figures 3 and 4).
- X **Low sensitivity secondary to suspected under-reporting of illnesses and poor representativeness.**
  Under-reporting secondary to:
  - Poor awareness of HABRI symptoms and reporting avenues among citizens.
  - Voluntary reporting of illnesses.
  - Mild severity of illness in most cases (most cases do not seek medical attention).
  - Poor clinician/veterinarian case recognition and/or reporting awareness.
- X **Difficult to assess changes in incidence and prevalence of HABRI over time due to low sensitivity and poor representativeness.**
- X **Surveillance database design complicates meaningful analysis of surveillance data.**

RECOMMENDATIONS

- Pursue a source of dedicated program funding for testing, staffing, and outreach activities.
- Utilize stakeholders to maximize resources and outreach to increase program awareness.
- Use regional enhanced surveillance projects to evaluate HAB incidence and prevalence statewide.
- Consider moving toward immediate health advisory issuance while test results are pending.
- Modernize surveillance database and perform data cleaning to facilitate analysis.

ACKNOWLEDGEMENTS

This project was supported in part by an appointment to the Applied Epidemiology Fellowship Program administered by the Council of State and Territorial Epidemiologists (CSTE) and funded by the Centers for Disease Control and Prevention (CDC) Cooperative Agreement Number 1U38OT000143-02.

REFERENCES

[1]Centers for Disease Control and Prevention. Updated guidelines for evaluating public health surveillance systems: recommendations from the guidelines working group. *MMWR* 2001;50 (No. RR-13):1-36.

Contact: Sarah E. Koske, CDC/CSTE Applied Epidemiology Fellow, Sarah.Koske@dhs.wi.gov