PUBLIC HEALTH DIVISION
Acute and Communicable Disease Prevention

OREGON HEALTH AUTHORITY

Waterborne Disease Outbreak

Investigative Guidelines

July 2025

1. DISEASE REPORTING

1.1 Purpose of Reporting and Surveillance

1. To detect waterborne disease (WBD) outbreaks that can be controlled with public health measures (boil water alert, pool closure, point of use filters).
2. To confirm the etiology of WBD outbreaks, thereby guiding treatment and control measures to prevent further exposures and additional cases of illness.
3. To assess whether implemented control measures are effective in stopping further transmissions.
4. To expand current understanding of the transmission, pathogenesis and community impact of illness caused by WBD agents.
5. To identify new WBD agents, hazards, or gaps in the water safety system.

1.2 Laboratory and Physician Reporting Requirements

Health care providers are legally obligated under Oregon Administrative Rule 333-018-0000 to report cases of many of the WBD pathogens including: *Campylobacter*, *Cryptosporidium* and C*yclospora,* Shiga toxin-producing *E. coli*, *Giardia*, *Legionella*, *Shigella*, and *Vibrio*. In addition to individual case reporting, health care providers are also obligated to report, day or night, any disease outbreaks and any uncommon illness of potential public health significance. Reports are made to the local public health authority (LPHA).

Laboratories are required by law to report results indicative of the reportable diseases listed above. Reporting within 24 hours (including weekends and holidays) is required for *Vibrio cholerae*. Reporting within one working day is required for infections with *Campylobacter*, *Cryptosporidium*, *Cyclospora*, Shiga toxin-producing *E. coli*, *Giardia*, *Legionella*, *Shigella*, and *Vibrio* species (other than cholera).

Read more about the Oregon reporting requirements.

1.3 Local Health Department Reporting and Follow-Up Responsibilities

Report suspected WBD outbreaks to Public Health Division (PHD) epidemiologist on call (971-673-1111) within 24 hours of receiving a report of a suspected outbreak. An epidemiologist from Acute and Communicable Disease Prevention (ACDP) will be assigned to review the situation with you and assist if there is agreement that an investigation is warranted. The epidemiologist will

notify OHA-Drinking Water Services (OHA-DWS) if suspected WBD outbreak may be associated with a regulated public water system.

1. Interview cases and conduct environmental field visits. If waterborne transmission is suspected ensure the field visit includes an Environmental Health (EH) Specialist with the appropriate experience (drinking water, pool or spas, built environment). In many cases, the best team will be from multiple disciplines.
2. Facilitate collection and transport of specimens to the Oregon State Public Health Laboratory.
3. Implement public health measures to control further spread; Exposures from drinking water, recreational waters, or aerosolized inhalational exposures require different control measures. Consult with EH.
4. Complete outbreak summary reporting in the Outbreaks database.

In some settings, such as in the midst of a widespread outbreak, resources will not allow investigation of every single case report. In those situations, potential triggers for investigation include: evidence of severe illness (deaths, or hospitalizations), large numbers of cases suggesting ongoing transmission, or a vulnerable population affected.

Report suspected cyanobacteria harmful algae blooms (CyanoHABs) or suspected illnesses or symptoms that could be associated with a bloom to the OHA HABs program (971-673-0440) or at the following links:

- Report a CyanoHAB
- Report a CyanoHAB-related human illness
- Report a CyanoHAB-related animal illness

Single cases of chemical exposure, wound infection (e.g., *Vibrio* skin infection) and other illnesses, (e.g., *Naegleria* infections) that are epidemiologically linked to water exposure as well as aquatic facility-related health events (e.g., chemical mixing accidents or air quality problems) are also of interest to us.

1.4 Confidentiality

Data about individuals collected for outbreak investigations are strictly confidential under Oregon law (OAR 333-019-0005) and official OHA policy. For this reason, data collection is the sole responsibility of either state or local public health officials and must never be delegated to a third party unless that third party is obligated to maintain confidentiality under the Health Insurance Portability and Accountability Act of 1996 (HIPAA), the Family Educational Rights and Privacy Act (FERPA), or similar protective legislation.

2. THE DISEASE AND ITS EPIDEMIOLOGY

Waterborne disease (WBD) outbreaks can be categorized by etiologic agent (multiple agents rarely co-occur though it has happened), type of water (drinking, recreational), and means of water contamination.

During recent years, Oregon Public Health Division (PHD) has received between zero to two reports of WBD outbreaks yearly, all have been *Legionella* outbreaks. This is similar to the national rate of reported WBD outbreaks, although the true burden of WBD is likely many times higher.

Known agents causing waterborne outbreaks in Oregon include *Campylobacter*, *Cryptosporidium*, norovirus, shiga toxin-producing *E. coli*, *Giardia*, and hepatitis A. In 2013 a large drinking water outbreak of *Cryptosporidium* occurred in an Oregon municipal water system. Legionella outbreaks are increasing in Oregon and the U.S. See the Oregon Legionella toolkit for suspected *Legionella* outbreaks.

2.1 Etiologic Agents, Descriptions of Illness and Incubation Periods

WBD agents may cause gastrointestinal, skin, or less commonly respiratory or systemic illness. As a result, symptoms may include abdominal cramps, vomiting, diarrhea (bloody or non-bloody), hives, rashes, irritated eyes, sore throat, pneumonia, or systemic illness. Etiologic agents of WBD outbreaks can be grouped into four general categories (see Compendium for an overview of agents and symptoms):

1. Bacteria include *Shigella*, shiga toxin-producing *E. coli* [e.g., *E. coli* O157:H7], *Campylobacter*, *Salmonella* Typhi other *Salmonella* serotypes, *Vibrio cholerae*, and other *Vibrio* species causing gastrointestinal symptoms certain other less common agents such as *Francisella tularensis*, *Legionella*, *Leptospira*, and species of *Mycobacterium* and *Pseudomonas*.
2. Viruses include hepatitis A virus, norovirus and historically poliovirus. Cases usually present with gastrointestinal symptoms.
3. Parasites include *Cryptosporidium*, *Giardia* and *Cyclospora* which cause gastrointestinal symptoms, invasive amoeba (e.g., *Naeglaria* causing meningitis), Schistosoma (causing schistosomiasis), and endemic trematodes causing cercarial dermatitis (swimmer's itch).
4. Noninfectious agents include cyanobacteria (blue green algae) toxins, copper, nitrates, and various chemicals that contaminate flood waters. Symptoms depend on the agent.

2.2 Reservoirs

Most microbial contaminants are due to fecal contamination of water. Humans are the reservoir of *Shigella* species, hepatitis A virus, *Salmonella* Typhi (typhoid), *Vibrio cholerae* (cholera), norovirus, and other viruses such as rotavirus and poliovirus. Humans can also carry and have caused waterborne outbreaks due to shiga toxin-producing *E. coli*, *Cryptosporidium* and *Giardia*.

Animals and birds are the primary reservoirs of *Campylobacter jejuni*, *Cryptosporidium*, shiga toxin-producing *E. coli*, *Francisella tularensis*, *Giardia,* leptospires, schistosomes, and *Salmonella* species, and can contaminate recreational water, typically with feces. Wild or domestic animal carcasses can also contaminate water.

Drinking water systems can become contaminated at the source, or if wells or pipes (the distribution system) are breached and surface water enters. Water

treatment failures can also result in illness. Human sewage can also contaminate natural bodies of water.

There are environmental reservoirs for *Legionella* species, non-cholera *Vibrio*, non-tuberculosis *Mycobacterium* species, schistosomes, amoeba, and algae.

Biofilm development in building water holding and delivery systems can support the growth of *Legionella*, non-tuberculous *Mycobacterium*, and *Pseudomonas*.

WBD can result from an altered aquatic environment such as excess added chlorine, added copper sulfate, or altered water pH. Exposure may be through inhalation of aerosolized water or volatilized chemicals. Intentional water contamination could occur.

2.3 Modes of Transmission

By definition, WBD agents are transmitted through water, although many WBD agents are also transmitted through other routes, such as food, animal contact, or direct person-to-person. Typical route of entry is through ingestion or skin contact, less commonly by inhalation or intra nasally. A WBD outbreak may initially be investigated as a foodborne outbreak until water exposure is recognized or vice versa.

WBD outbreaks can be grouped into six general types of water exposure:

1. Recreational water (treated), including swimming pools, interactive fountains, water slides, spas, whirlpools, and hot tubs.
2. Recreational water (untreated or wild), including lakes, rivers, streams, hot springs, and ocean beaches.
3. Drinking water (also used for showering or bathing) includes tap water, well water, bottled water, and contaminated water served as ice or in a beverage. Exposure to stagnant or slowed municipal water distribution systems where contamination of water supplied for drinking, bathing or showering, and ice and water dispensers has occurred.
4. Water exposures in healthcare settings associated related to development of biofilms in sinks, drains, and showers can contaminate hands during hand washing, areas around sinks, and equipment or supplies exposed to contaminated water. Exposure can also occur during oral health care due to biofilm development in dental waterlines.
5. Personal care services, such as nail salons, neti pots, tattoo parlors, and other personal care services.
6. Other water exposures include decorative or display fountains, grocery store and lawn misting devices, cooling towers, agricultural or industrial water, and flood waters during extreme weather events. In previous outbreaks, *Legionella* has traveled three miles through the air from the source of exposure.

2.4 Incubation Period

Variable depending on agent.

2.5 Period of Communicability

The communicable period of those infected with bacteria, viruses or parasites varies. See agent-specific guidelines.

The *Compendium of Waterborne Diseases* is also helpful to focus the investigation.

2.6 Treatment

Though treatment of cases varies with the etiologic agent, most WBD diarrheal illnesses require only adequate hydration. Treatment recommendations for some specific WBD agents would be the same as for foodborne infections and can be found in: Centers for Disease Control and Prevention. Diagnosis and Management of Foodborne Illnesses A Primer for Physicians and Other Health Care Professionals. MMWR 2004;53 (RR04):1–33.

Treatment recommendations for healthcare-associated WBD infections depend on antibiotic resistance and the severity of illness. Local health jurisdictions should recommend that patients with healthcare-associated WBD infections seek further evaluation by a clinical provider.

2.7 Susceptibility/Immunity

There is general susceptibility to WBD agents. Vaccines are available for a few agents that have the potential to be waterborne (e.g., hepatitis A, cholera, typhoid, polio). Infants[1] and persons with lowered gastric acidity[2] may be infected with lower inoculum of some bacteria. Infants, the elderly, immunosuppressed persons, and sometimes persons with chronic medical conditions[3] are more likely to suffer serious illness from diarrheal agents. Persons with frequent contact with the healthcare system are at higher risk.[4]

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[1] Young children have developing immune systems and gastrointestinal tracts, and they may not have acquired immunity to waterborne pathogens increasing their risk of illness following exposure.
Citation: Wade TJ, Arnold BF, Schiff K, et al. Health risks to children from exposure to fecally-contaminated recreational water. PLoS One. 2022;17(4):e0266749. Published 2022 Apr 12. doi:10.1371/journal.pone.0266749.
Environmental Protection Agency. Report to Congress. EPA studies on sensitive subpopulations and drinking water contaminants. 815-R-00-015. Office of Water, The Agency; 2000.
https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=20001YPX.txt

[2] There is evidence that impaired gastric acid secretion increases susceptibility to bacterial enteric infections, particularly non-typhoid salmonellosis and cholera.
Citation: Martinsen, T.C., Bergh, K. and Waldum, H.L. (2005), Gastric Juice: A Barrier Against Infectious Diseases. Basic & Clinical Pharmacology & Toxicology, 96: 94-102. https://doi.org/10.1111/j.1742-7843.2005.pto960202.x

[3] Infants, the elderly, immunosuppressed persons, and persons with chronic medical conditions may be more susceptible to infection from waterborne pathogens due to weakened immune systems. These populations are also more vulnerable to fluid loss, dehydration and malnutrition resulting from diarrhea.
Citation: WHO. Diarrhoeal disease [Internet]. Geneva, Switzerland: WHO; 2024 March [cited 2025 May 15]. Available from: https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease.
Naumova EN, Egorov AI, Morris RD, Griffiths JK. The elderly and waterborne Cryptosporidium infection: gastroenteritis hospitalizations before and during the 1993 Milwaukee outbreak. Emerg Infect Dis. 2003 Apr;9(4):418-25. doi: 10.3201/eid0904.020260. PMID: 12702220; PMCID: PMC2957964.
Environmental Protection Agency. Report to Congress. EPA studies on sensitive subpopulations and drinking water contaminants. 815-R-00-015. Office of Water, The Agency; 2000.
https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=20001YPX.txt

[4] Persons with frequent contact with the healthcare system are at greater risk of infection from waterborne pathogens, such as *Legionella,* other Gram-negative bacterial species, such as Pseudomonas spp. and Acinetobacter spp.,

3. CASE DEFINITIONS, DIAGNOSIS AND LABORATORY SERVICES

A waterborne disease (WBD) outbreak is an incident in which 1) two or more epidemiologically-linked persons experience a similar illness after exposure to the same water source and 2) epidemiologic evidence implicates the water as the likely source of the illness.

3.1 Confirmed Case Definition

Any outbreak of an infectious disease, chemical poisoning, or toxin-mediated illness where water is indicated as the source by an epidemiological investigation.

The implicated water in a WBD outbreak may be drinking water, recreational water, water not intended for drinking (e.g., water used for agricultural purposes or in a cooling tower) or water of unknown intent. The route of exposure may be ingestion, inhalation, intranasal, or contact. The agent associated with the WBD outbreak may be a microbe, chemical, or toxin. Water testing to demonstrate contamination or identify the etiologic agent is preferred, but not required for inclusion as an outbreak. Chemicals (including disinfection by products) in drinking or recreational water that cause health effects either through water exposure or by volatilization leading to poor air quality are included.

Waterborne disease (WBD) outbreaks may or may not be laboratory confirmed. In general, confirming the specific etiologic agent in an outbreak requires detecting the agent in clinical specimens from at least two ill persons.

3.2 Services Available at the Oregon State Public Health Laboratories

Laboratory testing for multiple agents on all outbreaks is prohibitively expensive. Consulting PHD epidemiologists to develop “a differential diagnosis” based on case histories is, therefore, required prior to submitting clinical specimens for analysis.

OSPHL can test clinical specimens from patients for many waterborne bacterial agents and norovirus. OSPHL can speciate or subtype isolates of *Salmonella*, *Legionella*, *Shigella*, and shiga toxin-producing *E. coli*.

In outbreak situations involving unusual agents, additional testing may be available through Centers for Disease Control and Prevention (CDC). Consult with PHD Epidemiology prior to collecting specimens to assure proper handling (971-673-1111). Different specimens may be needed based on the differential diagnosis.

OSPHL has the capability to test water specimens for total coliforms and *E. coli*. These are considered water indicators for fecal contamination. Collection of environmental samples must follow established protocols. OSPHL cannot test water for norovirus, other bacteria, or for parasites.

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nontuberculous mycobacteria (NTM), and fungi, due to complex hospital water systems and water temperatures that create conditions for bacterial growth; underlying conditions; immunosuppression; and exposure to invasive devices and aerosol generating devices.
Citation: Decker BK, Palmore TN. The role of water in healthcare-associated infections. Curr Opin Infect Dis. 2013 Aug;26(4):345-51. doi: 10.1097/QCO.0b013e3283630adf. PMID: 23806897; PMCID: PMC5583640.

For complete instructions for collection, handling, and transport of clinical specimens, visit the OSPHL Lab Test Menu, available at www.healthoregon.org/labtests.

Water testing for *Legionella* may be available at an alternate laboratory with special arrangements made through ACDP.

3.3 Laboratory Testing of Water

There are other environmental labs that test environmental samples from lakes and other water bodies for suspected freshwater biotoxins (HABs – harmful algae blooms). If the water is a drinking water source, consult with the State Drinking Water program (971-673-0405) for testing. If the water is untreated recreational water, consult with OHA-Environmental Public Health (971-673-0440). The DEQ Laboratory and Environmental Assessment Division (LEAD) has the ability to test for microcystins, anatoxin-a, saxitoxins, and cylindrospermopsin in water.

In situations where people have symptoms, but tests for the four biotoxins are negative, additional testing may be available through CDC. For guidelines specific to HABs and sampling techniques as well as a list of labs, visit: Oregon HAB Sampling and Testing

4. ROUTINE CASE INVESTIGATION

Waterborne disease (WBD) outbreaks can be detected through Notifiable Conditions reporting, bacterial isolate sub-typing and molecular analysis in the laboratory, citizen complaints, and syndrome surveillance systems. Investigations will vary greatly depending on the source: drinking water, building water system, treated recreational water, natural waters, etc. If public health resources are limited, focus activities on investigating outbreaks that meet the following criteria: severe symptoms, large numbers affected, ongoing transmission, vulnerable population affected, or possible contaminated commercial product (e.g., bottled water).

Note there are special investigations for even single cases of legionellosis involving a healthcare facility (hospital, long term care).

4.1 Epidemiological Evaluation

Interview the case (or parents) and others who may be able to provide pertinent information.

Collect data using a standardized method to characterize the cases

- Who is reporting illness: Age, Sex, Address, Occupation
- What is the symptom profile? Vomiting, diarrhea, fever, rash, abdominal cramps. Ask about all symptoms in a standard way. How long is the illness lasting?
- Are there ≥ 2 individuals with the same symptoms and onset dates close in time?
- How many individuals appear to be infected? Gather contact information (name and phone) for others they know are reporting illness.
- What are the common activities and water consumption history in the 7 days

prior to illness? Document any notable exposure if outside the 7 days. Use the case reporting form risk/ exposure questions if you have a known pathogen. Determine the name of the drinking water provider (city, town, facility, location) where drinking water is typically obtained, if possible.

- Does the individual have a history of travel in the last 30 days? If so, collect dates, locations and mechanisms of travel, use of pool, hot tubs, or other recreational water exposures. (Note that depending on pathogen, incubation period may be longer and so if take note of travel even if outside that timeframe)
- Is there a definable population at risk for whom immediate control measures might help mitigate disease?
- Is there evidence of severe illness (hospitalization or death) that could reasonably be expected to be communicable or from a common environmental source?
- Did the individual have any recent procedures done in the previous 7-30 days? Note procedures may include surgery, routine dental exam, cosmetic procedures, outpatient procedures, and more.

Confirm the existence of an outbreak

Local public health authorities should consider a number of questions, including the following:

- Are there persons from different households with illness following exposure to the same water or who visited the same recreational facility?
- Are illness signs and symptoms, along with the incubation period and symptom duration, consistent with an illness resulting from the reported exposure?
- Are all the illnesses similar and consistent with a WBD agent?
- Is the number of illnesses more than what would be expected in this group of people and in the population as a whole?
- Are there common exposures other than water (e.g., food, personal, occupational contact, or medical procedures) that could explain transmission?
- Does the demographic information (age, ethnicity, etc.) suggest a common source?

Make a "best guess" as to the cause of the illness using the *Compendium*.

4.2 Environmental Evaluation

The goals of the joint epidemiologic and environmental outbreak investigation are to identify the infectious agent, the mode of transmission, the water source, and the source of the contamination. Determine whether the suspected facility is licensed or regulated and by whom. If drinking water is suspected, determine whether it is a public water system with assistance from OHA-DWS. OHA-DWS may wish to conduct an investigation to identify potential pathways of contamination of the drinking water source (Level 2 Coliform Investigation).

If building water distribution systems are suspected, conduct an environmental assessment.

- Obtain a map and blueprint of facility and water distribution system, history of renovations or recent major construction, water disruptions and water disinfection methods. Ask if they have a building water safety management plan and request a copy.
- Review maintenance logs, testing results, WPM, temperature, pH, and residual disinfectant.
- Identify where and how water is distributed through the building including hot water heaters, cooling towers, storage tanks and secondary filtration or disinfectants.
- Identify aerosol generating devices (such as on taps)

Consider the likely infectious agent based on symptoms and incubation period. Consider likely modes of transmission for that agent to focus the environmental investigation. Source of exposure might also suggest an agent (e.g., fresh water organism or marine organism). For example: *Legionella* – may be hot tub, drinking water, ventilation, dialysis machines, toilet/showers. *Giardia* – may be water related, or person to person. *Shigella* – may be food or water related, or in recreational water venue specialists. Many pathogens should be removed by adequately functioning treatment and disinfection systems.

As appropriate, obtain the following additional information:

1. Were there any unusual circumstances or practices operative just before the outbreak began that could have contaminated water? Consult with OHA-DWS to determine if any treatment disruptions occurred at regulated public water systems during this time.
2. Were any staff ill during the incubation period of the suspect WBD agent? When did they become ill? With which water sources did they work?
3. Do the staff ingest or have body contact with the water they work with?

Get a copy of written procedures, if any.

Inquire about disinfection practices: agents used, length of time and frequency with which they are applied. Assess showering and toileting facilities and accessibility in the facility, as well as availability of soap, paper towels, and alcohol-based hand sanitizer.

5. CONTROLLING FURTHER SPREAD

Implement immediate control measures based on the likely WBD agent and source. Promote good infection control practice and making sure clean medical equipment next to sinks and not splashed upon.

Depending on circumstances, immediate control measures may include a boil water order, hyperchlorination of a pool, flushing of plumbing, posting warnings at a lake, closing a facility, recalling a commercial product like bottled water, or issuing a press release to advise citizens who may develop symptoms. A regulated public water system may issue a boil water notice /do-not-drink advisory as directed by OHA-DWS.

Treatment (prevention) of *Cryptosporidium* in treated venues is largely proactive. By the time one knows the pool is infected, it has generally been more than a week since exposure and it has likely treated itself through disinfection,

ultraviolet light and filtration. Once the water is contaminated with crypto, it won't show up in a victim until 7-10 days later; treatment of the pool or closure is likely pointless for a single case. The exception is where we can show illnesses over time, or when multiple pools are involved. CDC recommendations around hyperchlorination should be followed.

Develop a fact sheets and a press release if transmission is expected to be widespread. For suspect outbreaks in healthcare faciltiites, consult with Regional ACDP Infection Preventionist (IPs) where appropriate.

5.1 Education

For outbreaks due to confirmed or strongly suspected communicable waterborne diseases, provide basic information about the benefits of scrupulous hand hygiene, and recommend ready access to sinks with soap and warm water and alcohol-based hand sanitizer, as appropriate.

For recreational water outbreaks use this opportunity to promote healthy swimming behavior. Pool hopping is common and educational activities should involve all pools in the jurisdiction.

Do not enter swimming areas when ill with vomiting or diarrhea.

Do not let children ill with vomiting or diarrhea enter swimming areas even if they have special swim diapers or swim pants.

Don't swallow water unless it is intended for drinking.

Use proper diapering and give children frequent bathroom breaks.

Wash hands after using the toilet or changing diapers.

Shower with soap before swimming in pools.

During an outbreak, some jurisdictions have excluded diapered children from water recreation facilities. Generally, a more aggressive public media campaign has shown improved success where local park and pool managers, day care institutions, and other common areas of congregation work to inform the public of potential problems and educate the public to not enter the water for two weeks after any incidents of diarrhea.

Specified control measures may need to be re-initiated or expanded and may also include pool maintenance training or notifying state or federal regulatory agencies. If the outbreak is in a treated water venue, check with your pool resource person to see if further treatment is necessary and what it should be. Automatically closing the pool will push possibly ill bathers to other pools, expanding the problem. Sometimes, though, it does make sense to close, require special prophylactic disinfection treatment of a pool(s) and may make sense to prohibit certain populations from entering a recreational water venue (i.e. young diapered children).

Showering after swimming in a treated venue will remove any choloramine and in natural bodies of water will reduce the risk of swimmer's itch, and rinse off any fecal material.

Instruct people to only use safe sources for drinking water, including during recreational activities. If water quality is uncertain, boil or chemically treat water before using it for drinking, rinsing uncooked foods, or brushing teeth. Specific

boil water notice templates may be required by OHA-DWS to be used by regulated public water systems.

Review work, school and daycare restrictions for anyone symptomatic with diarrhea and remember there are additional restrictions on STEC, *Shigella* and *Salmonella* Thyphi cases.

If contaminated water in turn contaminates food (e.g., produce washed in bacteria-contaminated water, shellfish with *Vibrio*), the investigation is considered a foodborne outbreak.

If outbreak is determined to be a healthcare-associated infections outbreak, consult ACDP HAI epidemiologists and regional IP.

6. TEST HYPOTHESIS WITH AN ANALYTICAL STUDY [4]

1. Determine if initial interviews and the number of affected persons will support an epidemiologic study that compares groups of ill and well persons.
2. Get as complete a list as possible of all the people who likely shared the exposure; lists can be obtained from an event organizer or from reservation lists.
3. Obtain information about the specific source of water (e.g., utility company). If it involves a regulated public water system, consult with OHA-DWS to determine if any pathways to contamination have been identified, such as signs of entry or contamination of storage tanks, and to determine if any interruptions in required treatment to remove/inactivate pathogens have occurred, if applicable.
4. Develop a refined questionnaire to systematically collect information on symptoms and exposures. Consult with PHD Epidemiologists.
5. Administer the questionnaire to as many people as possible, both sick and well, as soon as possible after the first cases are reported. It is important to remember that people's memories may become less reliable over time.
6. After finalizing a case definition, analyze the data to obtain the following:
   - Demographic profile: the number of cases by age group and sex.
   - Symptom profile: the percentage of cases with vomiting, diarrhea, bloody diarrhea, fever, abdominal cramps, jaundice, respiratory symptoms, rash, and any other symptoms.
   - Epidemic curve: the number of cases by time of onset of symptoms.
   - Event attack rate: the number of cases divided by the total number of people exposed. Event attack rate can only be calculated if the total number of people attending is known.
   - Median incubation period: the time it takes 50% of the cases to get sick after exposure to the WBD agent. The median incubation period can only be calculated if the time of exposure is known.
   - Water-specific attack rate: the percentage of people who became ill after specific water exposure.

REFERENCES

1. CDC toolkits for waterborne outbreak investigation include extensive case/control interview forms, sample case tracking line lists (add columns for

symptoms reported), environmental health outbreak investigation surveys for swimming pools, and sample notification letters.

2. US Environmental Protection Agency – Microbiology – water-related issues, waterborne disease, regulations http://www.epa.gov/microbes/
3. US Environmental Protection Agency – Office of Ground Water and Drinking Water – consumer site for ground water and drinking water information, regulations http://water.epa.gov/drink/
4. US Environmental Protection Agency - Mycobacteria Health Advisory - Published Health Advisories for Microbial Toxins – https://www.cdc.gov/water-emergency/php/dwact/?CDC_AAref_Val=https://www.cdc.gov/healthywater/emergency/dwa-comm-toolbox/index.html
5. US Environmental Protection Agency - Microbiological Methods and Online Publications - https://www.epa.gov/water-research/microbiological-methods-and-online-publications.
6. US Environmental Protection Agency – Detection Methods for Cyanotoxins - https://www.epa.gov/ground-water-and-drinking-water/detection-methods-cyanotoxins
7. CDC Waterborne Outbreak toolkit

UPDATE LOG

July 2025 – Review and update references (June Bancroft)

November 2015 –Updated into new template. (June Bancroft, Leslie Byster)

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