Overview & Updates to Cryptosporidium & Shigella Case Investigations

August 30, 2022

Epidemiology Program | Bureau of Infectious Disease and Laboratory Sciences
MA Department of Public Health
Continuing enteric (gastrointestinal illness) disease case investigation today...

May 24th: Introduction to Enteric (Gastrointestinal Illness) Disease Case Investigations

- In MAVEN Help: Webinar recording, Webinar slides
- Presentation reviewed LBOH follow up of routine enteric disease cases (e.g., Salmonella, Campylobacter):
  - How to prepare for an enteric disease case interview
  - Completing MAVEN question packages for enteric disease events
  - When and how to create a MAVEN Foodborne Illness (FBI) Complaint
    - In MAVEN Help: FBI Complaint Tip Sheet
  - Restricting foodhandlers with enteric disease

June 21st: Cyclospora and Vibrio Case Investigations

- In MAVEN Help: Webinar recording, Webinar slides
- Presentation reviewed the seasonal, immediate disease follow up

Focus on two routine enteric diseases less commonly spread via food: Cryptosporidiosis and shigellosis

Today! New Risk Variables!
Crypto & Shigella in the context of all reportable enteric diseases

Five-year Average of Probable and Confirmed Reportable Enteric Disease Cases, 2017-2021

- Campylobacteriosis: 1442
- Salmonellosis: 1045
- Giardiasis: 459
- Norovirus: 428
- Shigellosis: 187
- Cryptosporidiosis: 177
- Hepatitis A: 134
- STEC: 119
- Vibriosis: 82
- Cyclosporiasis: 66

*All reportable enteric diseases with <50 cases were not included. Typhoid fever cases were included in the salmonellosis case count. Massachusetts Department of Public Health, Bureau of Infectious Disease and Laboratory Sciences. Data are current as of 5/18/2022 and may be subject to change.
Learning Objectives

• Learn the epidemiology and clinical presentation of these two infections
• Understand why additional risk history questions were added to *Cryptosporidium* and *Shigella* MAVEN events
• Become familiar with the new risk history questions
• Participants will understand how MDPH will use information from the additional risk questions to monitor disease trends and detect outbreaks
• Participants will understand the most pertinent information needed from case investigations
Cryptosporidium Overview
What is Cryptosporidium?

*Cryptosporidium* ("Crypto") is a parasite that causes diarrheal illness in humans when ingested:

- Leading cause of waterborne disease among humans in the United States
- Parasite is protected by an outer shell that allows it to survive outside the body for long periods of time and is tolerant to chlorine disinfection
How do people become infected with *Crypto*?

- *Crypto* lives in the intestine of infected humans or animals, who then shed it in their stool.
- Anything that gets contaminated by infected stool can potentially spread the parasite:
  - Recreational water
  - Drinking water (untreated)
  - Person to person
  - Animal to person
  - Contact with contaminated objects (toys)
  - Contaminated food/drinks (raw milk/apple cider)
**What type of illness does **Crypto** cause?**

<table>
<thead>
<tr>
<th>Clinical features</th>
<th><strong>Watery diarrhea</strong>, stomach cramps/pain, dehydration, nausea, vomiting, fever, weight loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incubation period</td>
<td>2-10 days (average 7 days)</td>
</tr>
<tr>
<td>Duration</td>
<td>1-2 weeks. <strong>Infectious period begins when symptoms begin and can last weeks after they resolve.</strong></td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Testing of a stool sample. Can be examined microscopically or detected via culture-independent diagnostic tests (EIA, PCR). Detection is difficult and may require multiple stool specimens collected over several days.</td>
</tr>
<tr>
<td>Treatment</td>
<td>Most recover without treatment. Nitazoxanide (<strong>Alinia</strong>®) can treat diarrhea caused by Crypto.</td>
</tr>
<tr>
<td>Risk groups</td>
<td>People with weakened immune systems (HIV/AIDS, inherited diseases that affect the immune system, cancer and transplant patients taking immunosuppressive drugs) may develop serious, chronic, and sometimes fatal illness.</td>
</tr>
</tbody>
</table>
Current Risk/Exposure questions asked in Cryptosporidium events

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspect food or drink</td>
<td></td>
</tr>
<tr>
<td>Did case travel out-of-state or out-of-country during incubation period?</td>
<td></td>
</tr>
<tr>
<td>Any outdoor activities</td>
<td></td>
</tr>
<tr>
<td>Any animal contact</td>
<td></td>
</tr>
<tr>
<td>Did the case consume any high-risk animal products during incubation period?</td>
<td></td>
</tr>
<tr>
<td>Did any others share above exposure(s)?</td>
<td></td>
</tr>
<tr>
<td>Employed or attend a supervised care setting</td>
<td></td>
</tr>
</tbody>
</table>

Foodhandler: a person directly preparing or handling food, including preparing trays of food, feeding other persons, administering oral medications, or giving mouth/denture care (see 105 CMR 300.000)

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is case a foodhandler?</td>
<td></td>
</tr>
<tr>
<td>Any household or other close contacts ill</td>
<td></td>
</tr>
<tr>
<td>Is contact of case employed or attending a supervised care setting?</td>
<td></td>
</tr>
<tr>
<td>Is household or close contact of the case a foodhandler?</td>
<td></td>
</tr>
</tbody>
</table>

Fall 2022 Updates to the Risk Question Package ask for more specifics on locations of waterborne and animal contact exposures.
Recreational Water

• *Cryptosporidium* is the leading cause of outbreaks in the U.S. associated with recreational water
• *Cryptosporidium*’s tough outer shell allows it to survive for more than 7 days even in properly filtered and chlorinated pools and water playgrounds.
• An individual can contaminate recreational water by having diarrhea in the water, or by having small amounts of poop on their bottom.

Diarrhea and swimming don’t mix!

**If you wouldn’t do this...**

Don’t swim or let your kids swim if sick with diarrhea!

Learn more at www.cdc.gov/healthyswimming

Don’t leave your mark at the pool this summer!

**It only takes one person with diarrhea to contaminate the entire pool.**

Learn more at www.cdc.gov/healthyswimming
Animal contact

- All mammals, especially young animals, can get cryptosporidiosis.
- Petting zoos, veterinarians or veterinary students
Shigella Overview
What is *Shigella*?

- *Shigella* is a bacterium that causes diarrheal illness in humans when ingested.
- Commonly reported *Shigella* species include *S. sonnei* and *S. flexneri*.
- Humans are the natural host.
How do people become infected with *Shigella*?

- *Shigella* spreads easily. People with a *Shigella* infection can spread infection to others for several weeks after diarrhea ends.
- You can get infected by swallowing *Shigella* bacteria. This can happen by:
  - Touching contaminated surfaces
  - Changing diapers of an infected child
  - Caring for someone with infection
  - Swallowing untreated recreational water (lakes, rivers) while swimming
  - Exposure to feces through direct or indirect sexual contact
  - Less commonly, contaminated drinking water
What type of illness does *Shigella* cause?

<table>
<thead>
<tr>
<th>Clinical features</th>
<th>Diarrhea (can be bloody), fever, stomach pain, tenesmus (urge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incubation period</td>
<td>1-3 days (average 12-96 hours)</td>
</tr>
<tr>
<td>Duration</td>
<td>About 7 days. <em>Infectious period begins when symptoms begin and can last up to two weeks after they resolve.</em></td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Testing of a stool sample. Can be detected by culture or via culture-independent diagnostic tests (PCR).</td>
</tr>
<tr>
<td>Treatment</td>
<td>Most recover without treatment, but antibiotics can shorten duration of symptoms. Ciprofloxacin and azithromycin are two recommended oral antibiotics.</td>
</tr>
<tr>
<td>Risk groups</td>
<td>People with weakened immune systems, young children, men who have sex with men (MSM), travelers</td>
</tr>
</tbody>
</table>
Historical Risk/Exposure questions asked in *Shigella* events

Fall 2022 Updates to the Risk Question Package ask for more specifics on locations of waterborne and person-to-person exposures.
New Risk/Exposure Questions
Goals of new risk/exposure questions

• Focus questions to more likely modes of transmission for these two diseases (waterborne, animal contact, person-to-person rather than foodborne)
• Improve and standardize collection of information among cases
  • Ensure sufficient details are collected during initial case interview by asking name and location of recreational water and animal contact exposures
• Facilitate identification of outbreaks across cases
  • Particularly important for cryptosporidiosis where we do not have whole genome sequencing to help identify cases more likely due to a common exposure.
• Monitor trends over time to target prevention efforts
• Align Massachusetts’ case report forms with high-priority data elements identified by CDC

Over the past 5 years we have been moving away from asking the same set of risk questions across enteric disease events and make them more specific to the epidemiology of the disease. Changes to Cryptosporidium and Shigella events are part of this shift.
Don’t panic!

• You aren’t expected to remember which disease is acquired in what way. These updated MAVEN questions will appear in disease events if they are applicable. By following the specific questions in a MAVEN event, interviews will cover relevant information.

• MAVEN has you covered!
CRYPTO & SHIGELLA:

New water exposure questions

• **Drinking Water**
  • Main source of drinking water (private well, municipal/city/county, bottled, etc.)
  • Any drinking of untreated surface water (lake, stream, etc.)?

• **Recreational Water**
  • Collect specific details about recreational water exposures during incubation period:
    • Name and location
    • Dates visited
    • Recreational water type (swimming pool, fresh water, hot tub or whirlpool, etc.)
      • Swimming pool type (hotel/motel/resort, municipal/community, camp, etc.)
  • **For Crypto only**: similar question asked for recreational water visited during infectious period and if experienced diarrhea in recreational water.
NEW

Main source of drinking water:
- Private well
- Common well
- Any well
- Municipal or city or county
- Bottled water
- Unknown
- Untreated surface water
- Other

Any drinking of untreated surface water (such as from lakes, streams, etc.)?
- Yes
- No

Any outdoor activities?
- Yes
- No

Please specify:
- Hiking in NH. Drank water from a stream.
Recreational Water Exposure During Infectious Period

A similar question block is asked about recreational water exposures when someone was infectious (e.g., symptomatic) that also asks: Did the case experience diarrhea while in recreational water?
Recreational Water Exposure During Infectious Period

- Cryptosporidium can live in properly treated water for days. An individual infected with Cryptosporidium who has diarrhea in a pool can easily contaminate an entire aquatic venue.
  - A diarrheal incident is a higher-risk event than a formed fecal incident.
- Did the case experience diarrhea while in recreational water? This new question will help identify if further follow up is warranted at the recreational water venue.

<table>
<thead>
<tr>
<th>Germ</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli O157:H7 Bacterium</td>
<td>Less than 1 minute</td>
</tr>
<tr>
<td>Hepatitis A Virus</td>
<td>About 16 minutes</td>
</tr>
<tr>
<td>Giardia Parasite</td>
<td>About 45 minutes</td>
</tr>
<tr>
<td>Crypto Parasite</td>
<td>About 15,300 minutes or 10.6 days¹</td>
</tr>
</tbody>
</table>

Time to Kill or Inactivate Germs in Chlorinated Water

CDC: [https://www.cdc.gov/healthywater/swimming/aquatics-professionals/fecalresponse.html](https://www.cdc.gov/healthywater/swimming/aquatics-professionals/fecalresponse.html)
New animal exposure questions

• **Farm Animals**
  • Collect details on any farm animal exposures (visit to, work at, live on)
    • Name and location
    • Dates exposed
    • Exposing animal types (calf, chicken, cow, etc.)
    • Any contact with animals
    • Did any animals have loose stools

• **Household Pets**
  • Animal type
  • Did pet have loose stools

• **Contact with manure, feces, compost**
In 2019, an outbreak of E. coli O157 associated with the Minnesota State Fair identified illnesses among individuals with no direct contact with animals. Transmission likely occurred via contact with contaminated surfaces.
CRYPTO & SHIGELLA:

Improved evaluation of person-to-person transmission

- Did the case have contact with diapered children or adults?
- Enhanced existing question: **Employed or attend a supervised care setting?**
  - Provided clarifying text that supervised care settings can include daycares, schools, long term care, correctional settings.
  - Added additional facility options if YES is selected: School, daycare (adult), daycare (child), etc.
  - Collect information on type of children’s daycare, if selected
- Crypto only: **sexual activity question** that exists in *Shigella* events was added

**Reminder:** Children with Shigella infection who attend daycare should be excluded until diarrhea has resolved and two specimens taken at least 24 hours apart (and 48 hours after antimicrobial therapy has been discontinued) are negative for Shigella. From **MDPH Guide to Surveillance**
A concern will appear in *Shigella* events if this question is unanswered:

Please document whether the case is employed at or attends a supervised care setting in QP #5 (Risk/Exposure/Control & Prevention)
CRYPTO & SHIGELLA:  

Improved collection of foodborne exposures

• Did the case attend any events or large gatherings?
  • Could capture food exposures as well as opportunities for person-to-person spread (e.g., an individual with *Shigella* infection who participated in a Provincetown LGBTQ+ event or theme week)

• Did the case eat at any restaurants?
  • If yes, list name/location/dates/items consumed
  • This focuses on identification of ill foodhandlers causing illness rather than the food itself

• *Crypto only*: Did the case consume unpasteurized or raw products?
  • Improved wording and options compared to historical question “Did the case consume any high-risk animal products during incubation period?”
**NEW**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did the case attend any events or large gatherings?</td>
<td>Yes</td>
</tr>
<tr>
<td>List location, dates, and items consumed</td>
<td></td>
</tr>
<tr>
<td>Did the case eat at any restaurants?</td>
<td>Yes</td>
</tr>
<tr>
<td>List restaurant name, location, dates, and items consumed</td>
<td></td>
</tr>
</tbody>
</table>
NEW

Did the case consume unpasteurized or raw product(s)?

Yes

Specify product type:
- Cider
- Dairy
- Fruit juice
- Milk
- Vegetable juice
- Unknown
- Other

Specify name, location (address, city/town, state), and dates product(s) purchased:

Current/to be retired

Did the case consume any high-risk animal products during incubation period?

Yes

Product type:
- Raw milk/milk products

Add New

When purchased:

mm/dd/yyyy

When consumed:

mm/dd/yyyy

Where purchased/obtained:

Where consumed:

Where did the product originate from:
Key Variables in Demo & Clinical Question Packages
Demographic Question Package

- Employer information and occupation is important for all enteric diseases, including Cryptosporidium and Shigella infections
- Reminder: if individual meets the definition of a food handler, document restriction in the Risk QP
Food Handler Definition Reminder

Per [105 CMR 300: Reportable diseases, surveillance, and isolation and quarantine requirements]:

A food handler is defined as:

- **Any person directly preparing or handling food.** This could include the food handling facility owner, individual having supervisory or management duties, person on the payroll, family member, volunteer, person performing work under contractual agreement, or any other person working in a food handling facility.
- Food Handler also includes any person handling clean dishes or utensils.
- Any person who dispenses medications by hand, assists in feeding, or provides mouth care shall be considered food handlers for the purpose of 105 CMR 300.000.
- In **health care facilities**, this includes those who set up trays for patients to eat, feed or assist patients in eating, give oral medications or give mouth/denture care.
- In **day care facilities, schools and community residential programs**, this includes those who prepare food for clients to eat, feed or assist clients in eating, or give oral medications. Food Handler does not include individuals in private homes preparing or serving food for individual family consumption.
Clinical Question Package

- Presence of symptoms and symptom onset date
- Symptom resolution date
  - For *Cryptosporidium*: symptom resolution date is important to evaluate recreational water exposures during infectious period
Using collected information to detect outbreaks, prevent illnesses
Data for action

- MDPH will be monitoring case interview information collected by LBOH investigators for outbreaks by:
  - Case report form (CRF) review, which takes place after a LBOH completes their case investigation by signing off in the Admin Question Package that the CRF is complete
  - Routine extraction and analysis of MAVEN data to look for common exposures across cases
- **Suspected water, animal contact, or person-to-person outbreaks warrant creation of a cluster event in MAVEN**
  - General outbreak definition: The occurrence of similar illnesses in 2 or more persons from different households, epidemiologically linked by location and time of exposure
  - Outbreaks detected by LBOHs should be reported to MDPH immediately by phone, or by creating a cluster event in MAVEN
Prevention
Recreational Water Illness Prevention

- Individuals with diarrhea should not go in recreational water
  - If diagnosed with Cryptosporidium, stay away from recreational water for 2 weeks after diarrhea has completely stopped
  - Don’t poop in the water
- Don’t swallow recreational water
- Kids should take bathroom breaks or have diapers checked every hour
  - Change diapers away from water
- Shower before going in recreational water, and don’t pee in the water
  - Dirt, sweat, and oils on your body use up chlorine or bromine needed to kill germs. Similarly, peeing in a pool uses up chlorine or bromine leaving less available to kill germs.

A strong “chlorine” smell at a pool is from chemicals that form (chloramines) when chlorine mixes with body waste swimmers bring into pools (e.g., sweat and urine). These irritate the skin, eyes, and respiratory tract when they off gas from the water into the air above.
Staying healthy around farm animals

• **Wash your hands!**
  • After contact with farm animals, handling animal products (e.g., eggs), cleaning up animal stalls or feces, handling animal food or feeding equipment (e.g., bowls), touching fences or other equipment on the farm

• For individuals who keep or work with farm animals:
  • Always wear protective equipment (masks, gloves, boots) when cleaning stalls or doing any activities that would involve touching bodily fluids from animals.
  • Have dedicated shoes and gloves that are used only when working with animals. Keep and store these outside of your home.

• Supervise children when they are around farm animals
  • Prevent hand-to-mouth activities
  • Do not let children 5 or younger handle or touch chicks, ducklings, or live poultry
Preventing person-to-person transmission

- Wash hands!
- In childcare settings:
  - Separate diaper-changing areas from play and food preparation areas
  - Supervise handwashing of children
  - Highlight key times for staff to wash hands (before eating or preparing food, after using the bathroom, after changing diapers or assisting a child with the bathroom, etc.)
- Practice safer sex:
  - Do not have sex if you or your partner have diarrhea
  - If diagnosed with *Shigella*, wait two weeks after diarrhea ends to have sex
Summary
Resources

• GI Jane & Joe Program (*GI = Gastrointestinal*)
  • MDPH’s enteric case investigation assistance team. May be available to assist LBOHs and MDPH epidemiologists with *Shigella* and *Crypto* case interviews.

• **Foodborne illness information for healthcare and public health professionals**
  • *Guide to Surveillance, Reporting, and Control* *Disease-specific case investigation guidance*
  • *Infectious Disease Reporting and Regulations* *Regulations related to reporting requirements and exclusion of food handlers*
  • Disease-specific fact sheets *Includes Cryptosporidiosis and Shigella*

• CDC’s general webpages on *Crypto* and *Shigella*
• CDC’s general webpages on *Waterborne Disease & Outbreak Surveillance Reporting*
• CDC’s general webpages on *Healthy Swimming*
Key Takeaways

**Crypto**
- **Goal for each case:** Prompt and complete collection of key demographic and clinical questions, and all risk and exposure variables. Pay particular attention to any water and animal exposures.
- **Notification of cases:** Routine year-round, will flow into your routine disease event workflow
- **New Fall 2022:** New risk and exposure variables

**Shigella**
- **Goal for each case:** Prompt and complete collection of key demographic and clinical questions, and all risk and exposure variables. Pay particular attention to any water and person-to-person exposures (supervised care, sexual contact).
- **Notification of cases:** Routine year-round, will flow into your routine disease event workflow
- **New Fall 2022:** New risk and exposure variables

Use the questions in MAVEN to guide your case interview. You don’t have to memorize questions or modes of transmission; it’s all laid out for you!

Epidemiologists are always available to answer questions and assist! (617) 983-6800
Other Notes
Wizards in enteric disease events for case investigation

- **Bottom line: we don’t have them!**
- Most enteric diseases do not currently have a LBOH wizard to assist with case interview. Please complete all questions in the Demographic, Clinical, and Risk question packages for enteric disease events. This is particularly important for events with more extensive risk history variables: Shiga toxin-producing E. coli (STEC), Salmonella, Campylobacter, Cryptosporidium, Shigella.

- Please do not use “Enteric CRF Review,” which appears in many enteric disease events and is *also* out of date and was not designed to be used for case investigation.
- We will be incorporating LBOH case interview wizards in the coming year to assist with case interviews.
NEW: Food handler Exclusion Tip Sheet

• On MAVEN Help: Food Handler Restriction Tip Sheet
• Summarizes and provides more practical guidance for implementing MDPH regulations on food handler exclusion outlined in 105 CMR 300 and 105 CMR 590 (Food Code):
  • Regulatory Authority of Local Boards of Health
  • Case-Patient Notification
  • Meeting Clearance Criteria
  • Employer Notification
  • Documentation of Clearance
• Please also see: May 24th: Introduction to Enteric (Gastrointestinal Illness) Disease Case Investigations
  • In MAVEN Help: Webinar recording, Webinar slides
Q&A