Cryptosporidiosis
Investigative Guidelines

1. DISEASE REPORTING

1.1 Purpose of Reporting and Surveillance

1. To identify potential outbreaks and community sources of infection (e.g., a swimming pool, public water supply or child care facility) and to minimize further transmission.
2. To reduce the risk of person-to-person transmission from recognized cases.

1.2 Laboratory and Physician Reporting Requirements

Laboratories, physicians and others providing health care must report confirmed or suspected cases to the Local Health Department (LHD) and physicians are required to report within one working day of identification or diagnosis.

1.3 Local Health Department Reporting and Follow-Up Responsibilities

1. Report all confirmed and presumptive (but not suspect) cases (see definitions below) to the Oregon Public Health Division (OPHD) by the end of the calendar week of initial physician or lab report. See §3 for case definitions.
2. Interview all confirmed and presumptive cases.
3. Identify significant contacts and educate them about the signs and symptoms of illness. Offer testing at the Oregon State Public Health Laboratory (OSPHL) as appropriate. Enter all data into Orpheus by the end of the week.
4. For recognized outbreaks, report to PHD within one day, complete investigation complete investigation in conjunction with the assigned Acute and Communicable Disease Prevention (ACDP) epidemiologist , and complete the outbreak summary report within 30 day of last case onset.

2. THE DISEASE AND ITS EPIDEMIOLOGY

2.1 Etiologic Agent

Cryptosporidiosis is an infection with a protozoan parasite in the genus *Cryptosporidium*. Two species are recognized that commonly affect humans: *C. parvum* and *C. hominis*. As the epithet would imply, the latter infects primarily humans, but the former can infect many species; cattle may be the most important reservoir. Other species in the genus *Cryptosporidium* typically infect other mammals and birds, but rarely if ever humans. *C. parvum* and *C. homini* are rarely distinguished—virtually never in common diagnostic testing—so

unless specified we are talking about undifferentiated "*Cryptosporidium* sp." From an epidemiological and clinical perspective, *C. parvum* and *C. homini* infections are pretty much indistinguishable, aside from the fact that the former are more likely to be cattle-related.

Infected animals and people can excrete large numbers of oocysts in stool—109 or more. Oocysts are immediately infective to other susceptible hosts. The infectious dose can be very low—less than 100 if you have bad luck. Oocysts are relatively hardy in the environment, and in the right conditions can survive for weeks or months. They are resistant to the typical concentrations of chlorine and other disinfectants commonly used for water treatment. They can be killed by heat (e.g., bringing water to a rolling boil), inactivated by ultraviolet light or ozone, removed by adequate filtration (often hard to obtain), or inactivated by prolonged disinfection processes that in practice may be difficult to achieve. At a pH of 7.5, in the absence of a chlorine stabilizer, it takes 10.6 days (15,300 minutes) to disinfect a chlorinated water source. A lengthy wait compared to 45 min for *Giardia* and less than 1 minute for *Escherichia coli* O157. Practically, that means that a Crypto-contaminated pool may need to be closed for days, or in some cases drained and refilled.

2.2 Description of Illness

Infections are often asymptomatic, but illness is characterized by mild to severe diarrhea, sometimes watery, usually accompanied by moderate to severe abdominal cramps. Nausea, vomiting, and low-grade fever are common. Uncommonly, some may experience predominantly upper GI symptoms. Illness can be intermittent and prolonged, lasting from days to weeks in many patients; to over a month in some. Severely immunocompromised persons with AIDS might never recover from the infection.

Cryptosporidiosis is grossly under-diagnosed, in part because the parasite is rarely identified on a routine stool culture; providers must specifically order an "O & P" (ova and parasite) for parasites. Shedding may be intermittent, and, more importantly, special laboratory methods are usually required. Thus, "negative" stool exams should be interpreted with caution. Persons with chronic exposure may develop partial or complete immunity to infection or illness..

2.3 Reservoirs

A wide variety of mammals can be hosts for these parasites. Young livestock, notably calves and lambs, are commonly infected with *C. parvum* and may excrete huge numbers of oocysts ($>10^8$). While many wild animals are infected, their importance as a source of human infection is not clear. Humans appear to be the only hosts of significance for *C. hominis*. Unfortunately, it is difficult to speciate oocysts (which includes distinguishing pathogenic from non-pathogenic species in environmental testing).

2.4 Modes of Transmission

Transmission is fecal-oral. Most recognized outbreaks to date have been waterborne or from direct animal contact. Well-docucmented problems include::

1. Contact with fecally contaminated recreational water (e.g., swimming pools, water slides, fountains);
2. Drinking fecally contaminated and inadequately treated water;
3. Person-to-person spread by direct/indirect contact (e.g., in daycare centers);
4. Drinking unpasteurized milk or cider;
5. Contact with infected animals;
6. Consumption of unpasteurized cheeses, raw shellfish, produce, or other contaminated food.

2.5 Incubation Period

Variable in the 2-12 day range; most commonly 5-8 days.

2.6 Period of Communicability

As long as oocysts are being shed, typically days to weeks. Shedding may persist after symptoms resolve, although the concentration of oocysts (and hence infectivity) soon declines. Outside the body, in moist conditions, oocysts can remain infective for 2-6 months or longer.

2.7 Treatment

Most people with healthy immune systems will recover without treatment. Oral rehydration should be encouraged if they are experiencing diarrhea. Young children and pregnant women may be more susceptible to dehydration and should increase their fluid intake. Anti-Diarrheal medication should only be taken in consultation with a health care provider. Nitazoxanide (Alinia®; Romark Laboratories) is the FDA-approved medicine for treatment of diarrhea caused by *Cryptosporidium*. This is the first drug to show reasonable efficacy against this bug in immunocompetent hosts. It is available in powder form that can be mixed with water as a suspension for children 1–11 years old, and in tablet form for older children and adults. Nitazoxanide is not proven effective for use in HIV+ individuals. For persons with AIDS, anti-retroviral therapy that improves immune status can reduce or eliminate symptoms; however, symptoms may return once immune status worsens.

3. CASE DEFINITIONS, DIAGNOSIS AND LABORATORY SERVICES

3.1 Confirmed Case Definition

Those with *Cryptosporidium* oocysts identified in fecal specimen. Identification can be done by light microscopy on concentrated and stained preps, by direct fluorescence assay (DFA) or EIA using commercial kits, or by PCR.

ImmunoCard STAT tests (see §3.5 for a list of labs that use this test) have a low positive predictive value and are not adequate for confirmation.

3.2 Presumptive Case Definitions

Acute diarrheal illness lasting 3 days in someone epidemiologically linked to a confirmed case or a person with a positive ImmunoCard STAT test for *Cryptosporidium*.

3.3 Suspect Case (*not* reportable to Oregon PHD)

Anyone with undiagnosed GI illness, including those epi-linked to a symptomatic person with a laboratory Immunocard STAT positive test result.

3.4 Suspect Available at the Oregon State Public Health Laboratories

Cryptosporidium oocysts are rarely detectable on routine O & P (ova and parasite) stool examination, as additional preparation and staining procedures are required.

Exams for *Cryptosporidium* must be specifically requested and test samples must be submitted using a collection kit containing formalin as a preservative. Collection kits containing the appropriate preservative and specific collection and submission instructions are available on request from the OSPHL stock room (refer to OSPHL guide to services).

Note: All specimen tubes must be double bagged and be packaged with absorbent material around them. Refrigeration of samples is not required.

Additional information or assistance is available by calling the OSPHL, General Microbiology. Serotyping and molecular testing of raw stool is available at CDC in certain situations after epi consultation.

Testing of water should be done using the EPA method1623, a list of certified Oregon labs is maintained at the state drinking water website.

3.4 *Cryptosporidium* Laboratory Testing

Listed below are the more common laboratories in Oregon, the test method that they use, and whether they send their tests out to a reference lab.

Note: Labs using a rapid cartridge/quick test, will meet a presumptive case definition. These labs are highlighted and bolded below. A follow-up test MUST be done to consider the case confirmed.

Lab Name	*Cryptosporidium* testing method
Adventist	Merifluor DFA (Meridian)
Ashland	Done at Rogue Valley Medical Center
Bay Area Hospital	Merifluor DFA (Meridian)
Bay Clinic	Send to PeaceHealth
Columbia Memorial Hospital	Send to Legacy
Corvallis Clinic	Send out depends on insurance
Good Samaritan Corvallis	Immunocard STAT! Crypto/Giardia (Meridian)
Good Shepherd	Send out to Interpath
Grande Ronde	Send out to Quest
Interpath	ProSpecT Cryptosporidium (Remel)
Kaiser	Immunocard STAT! Crypto/Giardia (Meridian)
Legacy	Immunocard STAT! Crypto/Giardia (Meridian)
McKenzie-Willamette	Send out to LabCorp
Mercy Med Center	Immunocard STAT! Crypto/Giardia (Meridian)
Mid Columbia Medical Center	Send out to Quest
Multnomah County	Fluorescent stain microscopy
North Bend Medical Center	Send to PeaceHealth
Peacehealth	Immuocard STAT! Crypto/Giardia (Meridian)
Portland Clinic	Send out depends on insurance
Providence Medford	Testing done at Providence Portland
Providence Portland	Immunocard STAT! Crypto/Giardia (Meridian)
Rogue Valley Medical Center	Immunocard STAT (Meridian)
Salem Clinic	Giardia/Crypto Quik Chek (Alere)
Salem Hospital	Giardia/Crypto Quik Chek (Alere)
Santiam Memorial Hospital	BioFire Film Array
Silverton Hospital	Immunocard STAT! Crypto/Giardia (Meridian)
Sky Lakes Medical Center	Immunocard STAT! Crypto/Giardia (Meridian)
St. Charles Medical Center	Merifluor DFA (Meridian)
St. Alphonsus (Boise)	Merifluor DFA (Meridian)
Tillamook General Hospital	Immunocard STAT! Crypto/Giardia (Meridian)
Tuality Community Hospital	Send to Quest
VA Roseburg	Immunocard STAT! Crypto/Giardia (Meridian)
VAMC- Portland	Merifluor DFA (Meridian)
Willamette Valley Medical Center	Send to LabCorp
LabCorp (Seattle)	Modified Acid Fast, if EIA ordered send to LabCorp
Quest (Seattle)	Depends on physician order - DFA done at Quest West Hills, CA; EIA Nichols, Valencia, CA

- *Lab test information current as of June 2015

4. ROUTINE CASE INVESTIGATION

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

4.1 Identify Source of Infection

Ask about possible exposures in the 2 to 12 days before onset, including:

- Name, diagnosis, and phone number or any acquaintances or household member with a similar illness. (N.B. — anyone meeting the presumptive case definition should be reported and investigated in the same manner as a confirmed case);
- Attendance or work at a day care facility by the case or a household member;
- Source(s) of drinking water, including water at home and work, as well as streams, lakes or other un-treated sources;
- Recreational water exposures: lakes, rivers, swimming pools, water slides, etc.;
- Travel outside the area;
- Contact with livestock and other animals;
- Consumption of high-risk foods;
- Other high-risk exposures as detailed in the *Cryptosporidiosis* care report form or in the Orpheus risk/exposure section.

5. CONTROLLING FURTHER SPREAD

5.1 Education

Provide basic instruction in fecal-oral modes of transmission and personal hygiene, emphasizing proper hand washing techniques.

Use the results of the exposure interview to guide other health education efforts. For example, people who confess to drinking raw milk should get the raw milk lecture. Backpackers and hunters should be informed about the potential risks of drinking untreated surface water, including some private water supplies or water from streams or lakes. Emphasize that these and other high-risk habits are not just important for Crypto; many bugs can be spread this way. Generally, persons should be educated about the risks of both giardiasis and cryptosporidiosis. While some chemical disinfectants are effective against *Giardia*, most are ineffective against *Cryptosporidium*. Bringing water to a full, rolling boil is sufficient to kill both parasites. Several filters are also available that remove *Giardia* cysts and the smaller *Cryptosporidium* oocysts. Filters must be able to remove particles >2 µm in diameter and must be properly maintained.

Cases should be strongly discouraged from bathing in communal facilities (pools, fountains, etc.) until at least 2 weeks after resolution of diarrhea.

5.2 Isolation and Work or Day Care Restrictions

Standard precautions are adequate to minimize the risk of further transmission.

Children with diarrhea or other symptoms referable to cryptosporidiosis may not attend day care until symptoms have resolved for at least 24 hours. An exemption should be granted only if cohorting (separating ill children from well children) and special care with hand washing after diaper changing and before food handling can be implemented to prevent transmission. Cohorting is generally not feasible unless the facility is equipped with separate toilet facilities and entrances. See also §6, Managing Special Situations.

5.3 Case Follow-up

Generally not indicated.

5.4 Protection of Contacts

Not applicable.

5.5 Environmental Measures

While those with a poor quality water source should be counseled about their risk, the general rule is that single, ostensibly sporadic cases can rarely if ever be linked to a specific source, and it is usually not worth a lot of time to try to confirm one. Provide education as indicated, but most of the time one can wait for that second (possibly) epi-linked case before getting too excited.

6. MANAGING SPECIAL SITUATIONS 4

6.1 Case Attends a Daycare Facility

If the case is a child, determine if they should be excluded (see §5.2).
If the center includes diapered children, interview the operator and inspect attendance records to identify additional cases among other children or staff during the preceding month.

Instruct the operator and staff about proper food handling and hand washing after diaper changing, and the importance of keeping diaper changing areas away from food preparation areas. Discourage use of water related play activities until any investigation is over. Operators should use hydrogen peroxide to disinfect diaper changing areas, toys, and other surfaces during an outbreak. Bleach solutions and alcohol based sanitizers are not effective against *Cryptosporidium*.

If additional cases have occurred, do stool exams on children who have contact with the confirmed case(s). A single specimen is adequate for asymptomatic children; three (collected on different days) from symptomatic children. If additional cases are confirmed by this first round of testing, second and third specimens should be collected from the asymptomatic children as well.

Day care restrictions outlined above in §5.2 apply to all newly identified symptomatic cases. All infected preschoolers should be excluded or physically separated (cohorted) from other children. Look for possible cases among family members of infected children. Stool exams are indicated for symptomatic household members and other children who attend day care.

The day care operator should be instructed to call the LHD immediately if new cases of diarrhea occur. The facility should be called or visited once each week for six weeks after onset of the last case to verify that surveillance and appropriate preventive measures are being carried out. Newly symptomatic children should be managed as outlined above.

6.2 Contaminated Swimming Pools

Fecal accidents in pools are a fact of life that pose risk to other bathers. That said, the risk from formed stools (which are most likely to be detected) is dwarfed by the risk from loose matter oozing out from a toddler with an infection. There are general guidelines for dealing with generic “stool-in-pool” events. Contamination from someone known to have cryptosporidiosis is a different problem, and one unlikely to show up outside the context of an outbreak investigation. Consult with ACDP epi staff.

6.3 Reported Incidence is Significantly Higher than Usual

If the number of reported cases in your county is higher than usual for the time of year, or you note possible epidemiological connections, consider the possibility of common-source outbreaks. Review the temporal, geographic, and demographic clues that you have. Recreational water, raw milk, and live-stock contact-associated clusters may be the most common kinds of outbreaks; drinking water outbreaks may be the biggest. In any event, consult with ACDP epi staff.

REFERENCES

1. CDC information : http://www.cdc.gov/parasites/crypto/index.html
2. EPA information on *Cryptosporidium*-approved testing: http://water.epa.gov/lawsregs/rulesregs/sdwa/lt2/lab_home.cfm

UPDATE LOG

November 2015 –Updated into new template, updated laboratories and their testing methodologies, added PCR as a confirmatory test. Some editorial tweaks. (June Bancroft)

January 2012 – updated case definitions to be in line with national case definitions. Immunocard STAT test used by many Oregon laboratories is not sufficient to confirm a case. Minor other edits including reporting via Orpheus application, services from OSPHL and disinfection recommendations for child care operators. (June Bancroft)

June 2008. First update since 1994, with considerable revisions throughout reflecting newer information about taxonomy, treatment options, and management strategies. Local health departments are now required to investigate all routine case reports; previously this was required only if there were abnormally high case counts. Given the obvious potential for outbreaks, the status quo ante is difficult to defend. [Bill Keene]