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 and physicians are required to report within one working day of identification/diagnosis.

1.3 **Local Health Department Reporting and Follow-Up Responsibilities**

1. Report all confirmed and presumptive (but not suspect) cases to the OPHD by the end of the calendar week of initial physician/lab report. See §3 for case definitions.

2. Investigate all reported cases. Report using the cryptosporidiosis case investigation form or Orpheus, its electronic equivalent.

3. For recognized outbreaks, complete the appropriate investigation summary form in consultation with the assigned ACDP epidemiologist when the investigation is (reasonably) complete.

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 now 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. hominis* 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. hominis* 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. For example, CDC recently bumped their estimate for free chlorine contact time [CT] to kill *Crypto* from 9,600 to 15,300 minutes (10.6 days)—compared to 45 min for *Giardia* or 1 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. Before the advent of HAART, severely immunocompromised persons with AIDS might never recover from the infection.
Cryptosporidiosis

Cryptosporidiosis is grossly under-diagnosed, in part because the parasite is rarely identified on a routine stool exam (“O & P”) for parasites. It is not part of a normal stool culture for diarrhea and must be specifically ordered. 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 (>108). 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-documented 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

Nitazoxanide (Alinia®; Romark Laboratories) was approved in 2002: 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.

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, or by direct fluorescence assay (DFA) or EIA using commercial kits. Immunostat card 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 Definition

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

3.3 Suspect Case Definition

This is a pretty useless category that encompasses anyone with undiagnosed GI illness. People can also be asymptptomatically infected, so pretty much everyone is a suspect case. Do not report these people.
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3.4 Services Available at the Center for Public Health Laboratory

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 section, at (503)693-4100. Serotyping and molecular testing of raw stool is available at CDC in certain situations (i.e., outbreaks) after epi consultation.

3.5 Cryptosporidium Lab testing

Stool rapid card test or lateral flow assay/ImmunoCard STAT! Cryptosporidium/Giardia assay (Meridian)

Note: These lab tests only qualify a case as presumptive. A follow-up test MUST be done to consider the case confirmed.

- Good Samaritan (Corvallis)
- Legacy
- McKenzie-Willamette
- Mercy Medical Center
- Providence Portland
- Rogue Valley Medical Center
- Santiam Memorial Hospital
- Tillamook County General Hospital
- VA (Roseburg)
- Columbia Memorial Hospital – send out to Legacy
- Providence Hood River - send out to Providence Portland
- Samaritan Pacific Community Hospital - send out to Good Sam (Corvallis)

Use a rapid test, but confirm with microscopy of some sort:
- Providence Medford (plan to confirm with Kinyoun acid-fast stain)

Stool Immunoassay, such as EIA microplate:
- ProSpecT Cryptosporidium assay (Remel)
- Interpath
- Good Shepherd – send out to Interpath
- Grande Ronde – send out to Interpath

Direct Fluorescent Antibody (DFA) or direct immunofluorescent antibody (IFA):
- Adventist
- Bay Area Hospital
- Kaiser
- Quest
- St. Charles Medical Center
- VA (Portland)

Microscopy, e.g. modified acid fast stain:
- Peacehealth
- Salem Hospital
- LabCorp
- Bay Clinic – send out to Peacehealth
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- Corvallis Clinic – send out to Peacehealth
- North Bend Medical Center – send out to Peacehealth
- Silverton Hospital – send out to Peacehealth
- Willamette Valley Medical Center – send out to LabCorp
- Ashland and Sky Lakes – send out to Mayo Clinic, but don’t know method used.
- Mid-Columbia Medical Center, Portland Clinic, Salem Clinic send out testing, but don’t know where.

4. CASE INVESTIGATION

4.1. Identify Source of Infection

All cases should be investigated as a matter of routine. Ask about possible exposures in the 2 to 12 days before onset, including:

1. name, diagnosis, and phone number or address of 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);
2. attendance or work at a day care facility by the case or a household member;
3. source(s) of drinking water, including water at home and work, as well as streams, lakes or other untreated sources;
4. recreational water exposures: lakes, rivers, swimming pools, water slides, etc.;
5. travel outside the area;
6. contact with livestock and other animals;
7. consumption of high-risk foods;
8. other high-risk exposures as detailed in the routine questionnaire or Orpheus risk 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 Cryptosporidium; 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.

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

5.3 Followup of Cases

Generally not indicated
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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.

5.6 Safety Precautions

*Crypto* oocysts are extremely infectious. Use caution (and gloves, ideally) when handling stool specimens from potentially infected persons, and make sure that others who may get involved in the process (e.g., parents, child care staff) understand the risks and how to minimize them.

6. **MANAGING SPECIAL SITUATIONS**

6.1 Case Attends or Works at a Child Care 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 *crypto*.

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 or area 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 livestock 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.

6.4 Suspected Outbreaks

Consult with ACDP epidemiologists.

Resources: CDC guidelines
June 2008. First update since 1994, with considerable revisions throughout reflecting newer information about taxonomy, treatment options, and management strategies, as well as many editorial tweaks. 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]

January 2012 – updated case definitions to be in line with national case definitions. Immunostat card 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)