

Cryptosporidiosis

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 standard cryptosporidiosis case investigation form or its approved 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*. Perhaps surprisingly, *Cryptosporidium* is more closely related to malaria parasites (*Plasmodium* spp.) than to *Giardia* or any of the other common parasites of humans. 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. Currently (2008) *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— 10^9 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), removed by adequate filtration, 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 9600 to 15300—compared to 45 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 days to weeks in many patients; over a month in some. Before the advent of HAART, severely immunocompromised persons with AIDS might never recover from the infection.

Cryptosporidiosis is grossly underdiagnosed, in part because the parasite is rarely identified on a routine stool exam (“O & P”) 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.

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2.3 Reservoirs

A wide variety of mammals can be hosts for these parasites. Young livestock, notably calves and lambs, are commonly infected and may excrete huge numbers of oocysts ($>10^8/\text{ml}$); these animals are very important reservoirs for human infections with *C. parvum*. 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.

2.7 Treatment

Nitazoxanide (Alinia[®]; Romark Laboratories) was approved in 2002: the first drug to show reasonable efficacy against this bug. 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.

3. CASE DEFINITIONS, DIAGNOSIS, AND LABORATORY SERVICES

3.1 Confirmed Case Definition

Those with *Cryptosporidium* oocysts identified in fecal specimen, regardless of symptoms. Identification can be done by light microscopy on concentrated and stained preps, or by direct fluorescence assay (DFA) or EIA using commercial kits. PCR tests have been developed but are not readily available.

3.2 Presumptive Case Definition

Acute diarrheal illness (≥ 3 loose stools in a 24-hour period) lasting ≥ 3 days in someone epidemiologically linked to a confirmed case.

3.3 Suspect Case

This is a pretty useless category that encompasses anyone with undiagnosed GI illness. People can also be asymptotically infected, so pretty much everyone is a suspect case. Do not report these people.

3.4 Services Available at the Center for Public Health Laboratories

Crypto oocysts are rarely detected in routine O & P (ova and parasite) stool examination. Only with special preparation or staining are the little devils readily apparent. The OSPHL can do such microscopic stool examinations (see their *Guide to Services*), but unless *Crypto* testing is specifically requested, specimens may be batched and run as time allows—sometimes weeks later. Furthermore, negative results will not be reported out. In other words, if complete and timely results are needed, you need to request *Crypto* testing by name. Use the Bacteriology/Parasitology form (#75 or its equivalent). Specimens must be submitted in the parasitology kit containing the formalin preservative. Add enough fecal material to reach the red “Fill Line” marked on the container, and thoroughly mix it into the preservative. All specimens must be properly packaged in double containers with absorbent material around them. It is not necessary to refrigerate specimens in formalin; they are dead (or at least will be within 24 hours).

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4. ROUTINE CASE INVESTIGATION

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.

5. CONTROLLING FURTHER SPREAD

5.1 Education

1. Provide basic instruction in fecal-oral modes of transmission and personal hygiene, emphasizing proper hand washing techniques.
2. 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.

5.2 Isolation and Work or Day Care Restrictions

1. Standard precautions are adequate to minimize the risk of further transmission.
2. 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).
3. Cases should be strongly discouraged from bathing in communal facilities (pools, fountains, etc.) until at least 1 week after resolution of diarrhea.

5.3 Follow up of Cases — 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.

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

1. If the case is a kid, determine if it should be excluded (see §5B).
2. If the center includes diapered children, interview the operator and inspect attendance records to identify suspect cases among other children or staff during the preceding month.
3. 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.
4. If other suspected 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.
5. Day care restrictions outlined above in §5B apply to all newly identified symptomatic cases. All infected preschoolers should be excluded or physically separated (cohorted) from other children.
6. 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.
7. 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 the 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

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 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.

6.4 Suspected Outbreaks

Consult with ACDP epidemiologists.

7. UPDATE LOG

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] ■