

Cryptosporidiosis

1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Cryptosporidiosis refers to disease caused by *Cryptosporidium*, a coccidian protozoan. *C. parvum* and *C. hominis* are the species associated with human infection. *Cryptosporidium* was not recognized as a cause of human illness until 1976.

B. Clinical Description

The most common symptom of cryptosporidiosis is profuse nonbloody, watery diarrhea. Other signs and symptoms include weight loss, stomach cramps, nausea, vomiting, and low-grade fever.

Symptoms often wax and wane, but remit in fewer than 30 days in most immunocompetent people (average is 10 days). Immunodeficiency, especially in HIV infection, is associated with an inability to clear the parasite, and the disease may have a prolonged and fulminant clinical course, contributing to death. Asymptomatic infections are common and serve as a source of infection for others.

C. Reservoirs

Humans, cattle and other domestic animals are reservoirs.

D. Modes of Transmission

Cryptosporidium is transmitted via the fecal-oral route. The most common mode of transmission is person-to-person, especially in institutions and childcare care centers. Transmission can also occur person-to-person through certain types of sexual contact (e.g., oral-anal contact). Large outbreaks traced to contaminated drinking water have been reported, including an outbreak in Milwaukee that affected 400,000 people. Localized outbreaks may occur from fecally contaminated water, such as stream/lake waters and swimming pools. Outbreaks have also occurred from eating food contaminated by animal feces (e.g., unpasteurized apple cider). An infected food worker could also be a source for foodborne transmission. In addition, zoonotic transmission can occur through contact with feces from infected animals (e.g. veterinarians or children visiting petting zoos).

Infected animals and people excrete large numbers of oocysts in stool. The infectious dose is not certain, but is probably very low. Oocysts are relatively hardy and can survive in the environment for weeks or months. They are resistant to concentrations of chlorine and other disinfectants commonly used for drinking water treatment. *Cryptosporidium* can be killed by bringing water to a full, rolling boil or removed by adequate filtration (use filters capable of removing particles 0.1 – 1.0 micrometers in diameter).

E. Incubation Period

The average incubation period is about 7 days, with a range of 1 to 12 days.

F. Period of Communicability or Infectious Period

The disease is communicable for as long as the infected person excretes *Cryptosporidium* oocysts, which generally begins at the onset of symptoms. Oocysts are excreted in the stool for several weeks

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after symptoms subside, and they may remain infective outside the body for two to six months in a moist environment.

G. Epidemiology

Approximately 90 cases of cryptosporidiosis are reported each year in Colorado. Cases occur year-round with a peak during summer and early fall. Cryptosporidiosis has a worldwide distribution. In developed countries, the prevalence of infection ranged from < 1% to 4.5% of individuals surveyed by stool examination. The prevalence is significantly higher in developing regions of the world. Cryptosporidiosis is among the most common causes of persistent diarrhea in patients with AIDS in the United States. Children under two years of age, animal handlers, travelers to endemic areas, men who have sex with men, and close contacts of infected individuals are those most likely to be infected.

Colorado Statistics are available at the CDPHE website:

www.cdphe.state.co.us/dc/CODiseaseStatistics

2) CASE DEFINITION

Clinical Description

A gastrointestinal illness characterized by diarrhea and one or more of the following: diarrhea duration of 72 hours or more, abdominal cramping, vomiting, or anorexia.

Laboratory Criteria for Diagnosis

Confirmed: Evidence of *Cryptosporidium* organisms or DNA in stool, intestinal fluid, tissue samples, biopsy specimens, or other biological samples by certain laboratory methods with a high positive predictive value (PPV), e.g.,

- direct fluorescent antibody [DFA] test,
- polymerase chain reaction [PCR],
- enzyme immunoassay [EIA], or
- light microscopy of stained specimen.

Probable: The detection of *Cryptosporidium* antigen by a screening test method, such as immunochromatographic card/rapid card test; or a laboratory test of unknown method.

Case Classification

Confirmed: A case that is diagnosed with *Cryptosporidium spp.* infection based on laboratory testing using a method listed in the confirmed criteria.

Probable: A case with supportive laboratory test results for *Cryptosporidia spp.* infection using a method listed in the probable laboratory criteria. When the diagnostic test method on a laboratory test result for cryptosporidiosis cannot be determined, the case can only be classified as probable.

OR

A case that meets the clinical criteria and is epidemiologically-linked to a confirmed case.

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3) REPORTING CRITERIA

What to Report to the Colorado Department of Public Health and Environment (CDPHE) or local health agency

- Confirmed or probable cryptosporidiosis cases.
- Cryptosporidiosis cases should be reported within 7 days of diagnosis or a positive laboratory test.
- Cases should be reported using the Colorado Electronic Disease Reporting System (CEDRS), or fax or telephone to CDPHE or local health departments. See below for CDPHE phone and fax numbers.
- Suspected foodborne/enteric disease outbreaks should be reported to CDPHE or local health departments within 24 hours, even if the causative agent is not yet known.

Purpose of Surveillance and Reporting

- To identify cases for investigation and potential outbreaks
- To monitor trends in disease incidence

Important Telephone and Fax numbers

- CDPHE Communicable Disease Epidemiology Program
 - Phone: 303-692-2700 or 800-866-2759
 - Fax: 303-782-0338
 - After hours: 303-370-9395
- CDPHE Microbiology laboratory: 303-692-3480
- Communicable Disease (CD) Manual website:
http://www.cdphe.state.co.us/dc/epidemiology/dc_manual.html

4) STATE LABORATORY SERVICES

Many laboratories test for *Cryptosporidium* using “rapid cartridge” type tests, rather than microscopy. These tests can result in false positive results which have resulted in pseudo outbreaks of cryptosporidiosis being reported. CDPHE strongly recommends laboratories confirm positive tests with microscopy. CDPHE can perform this confirmatory testing for clinical laboratories, however, CDPHE must charge laboratories for this service when requested outside of an ongoing investigation.

Laboratory Testing Services Available

The services listed below are for public health purposes; clinical laboratories are not charged for these services.

- The CDPHE laboratory will test stool specimens for the presence of *Cryptosporidium* in situations where such testing is warranted for public health purposes.
- For more information on *Cryptosporidium* testing, contact the CDPHE Microbiology Laboratory.
- Note: Authorization by the CDPHE Communicable Disease Program is required before submitting stool or implicated food items to the CDPHE Laboratory.
- See Section 6 (E)--Environmental Measures, for more information about water and food testing.

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5) CASE INVESTIGATION

Interview all cases of cryptosporidiosis, as well as symptomatic contacts of confirmed cases and others whose symptoms are suspected to be caused by *Cryptosporidium* to determine:

- Potential source of infection, and implement control measures as appropriate
- If others are ill (i.e. Could this be an outbreak?)
- If the case may be a source of infection for others (e.g. a high-risk worker or a diapered child), and if so, prevent further transmission

Local public health agencies have primary responsibility for interviews of sporadic cases in their jurisdictions. Smaller agencies should consult with regional epidemiologists to establish primary responsibility for interviews of sporadic cases.

A. Case Investigation / Forms

For single cases, complete the CDPHE Cryptosporidiosis Case Investigation Form that can be found on the CD manual website or a similar local health agency form. Local health departments are encouraged to use the standard CDPHE investigation form. Following patient interviews, complete the CEDRS record for all cases. If an outbreak is suspected, outbreak-specific interview forms should be used. Please contact CDPHE for assistance.

For agencies that choose to use their own case investigation forms, the following information should be collected:

- *Demographics (including address, date of birth, gender, ethnicity and race)*
- *Occupation (**High risk occupations include: food service, child care, and health care**)*
- *Childcare or School Attendance*
- *Symptoms and Onset Date*
- *Laboratory (date of specimen collection)*
- *Hospitalization and Medical Treatment Received*
- *Travel History (locations and dates)*
- *Drinking Water Source/Recreational water exposures*
- *Farm or Animal Exposure*
- *Restaurant History (include food items and date consumed)*
- *Recent Group Activities*
- *Contacts with Persons with Gastrointestinal Illness*

B. Identify and Evaluate Contacts

1. Symptomatic Contacts

- Contacts of a confirmed case who have diarrhea should be treated the same as confirmed cases for disease control purposes. See Section 6--Disease Control Measures.
- Refer symptomatic individuals who have not previously been tested (especially if they are high-risk workers) to their health care providers for stool testing. **Because *Cryptosporidium* is not part of routine panels, these individuals must be counseled to inform their health care providers to test specifically for *Cryptosporidium*.** If testing will be performed by CDPHE, refer to the Food and Stool Specimen Collection Instructions on the CD manual website.

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- CDPHE recommends that people who are experiencing symptoms submit stool specimens through their health care provider rather than to the state laboratory for several reasons:
 - The patient will receive appropriate medical care for the illness
 - Results will be known more quickly if stool is tested by a commercial laboratory than if tested at the state laboratory
- If a common source of infection is suspected, please notify CDPHE.

2. Asymptomatic Contacts

- Ask about sensitive occupations such as food handling, childcare, and/or school.
- Provide information about symptoms and preventive measures. See Section 6 (C)-- Education.
- Counsel asymptomatic high-risk workers (e.g., food handlers). Stress importance of good handwashing, personal hygiene, and removing themselves from working and notifying their supervisor whenever they have a diarrheal illness.
- If an asymptomatic contact who is a high-risk worker develops diarrhea, exclude her/him from work, obtain a stool sample, and notify the worker's supervisor.

C. Reported Incidence Is Higher than Usual/Outbreak Suspected

If the number of reported cases of cryptosporidiosis in your jurisdiction is higher than usual, or if an outbreak is suspected, investigate to determine the source of infection and mode of transmission. Consult with a CDPHE Communicable Disease Epidemiologist. CDPHE staff can assist local public health agencies to investigate outbreaks and determine a course of action to prevent further cases, and can coordinate surveillance of cases that cross county lines.

6) DISEASE CONTROL MEASURES

A [Cryptosporidium Fact Sheet](#) is available on the CD manual website.

A. Treatment

There is no specific treatment that is effective for cryptosporidiosis. In immunocompetent persons, symptoms usually resolve in 1-2 weeks. In people with immunodeficiencies, the illness may be prolonged and may lead to death.

B. Prophylaxis

No prophylactic treatment of close contacts is recommended.

C. Education

All cases should be counseled not to swim for 2 weeks after resolution of diarrhea. This is due to the low infectious dose and hearty nature of *Cryptosporidium* oocysts, which are resistant to chlorine. Exclusion for other specific situations is addressed below.

To avoid exposure, recommend that individuals:

- Always wash their hands thoroughly with soap and water before handling food or eating, after using the toilet or changing diapers, and after contact with animals, especially cattle.
- After changing diapers, wash the child's hands as well as their own.

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- Dispose of feces in a sanitary manner, especially in childcare centers or other institutional settings.
- Avoid drinking raw milk, other unpasteurized dairy products, or unpasteurized apple cider.
- Avoid drinking water from streams or lakes. Avoid drinking unboiled water while traveling in developing countries or whenever else the water quality is unknown. (Bringing water to a full, rolling boil is sufficient to kill *Cryptosporidium* or use filters capable of removing particles 0.1 – 1.0 micrometers in diameter).
- Adhere to local advisories to boil water.
- Avoid swallowing water when swimming. Lakes, streams (and other surface waters) and swimming pools may be contaminated with *Cryptosporidium* and chlorination is not effective in eliminating the parasite.

The likelihood that *Cryptosporidium* could cause illness in regulated, public drinking water is low. Immunocompromised individuals, however, may want to consider the following recommendations:

- Boil tap water before drinking or making ice cubes.
- Consider the use of a home water filtering system with a very fine filter (absolute pore size of 1 micron or smaller). Such filters include: reverse-osmosis filters; filters labeled as “absolute” 1 micron filters; and those labeled as meeting National Sanitation Foundation (NSF) standard #53 for cyst removal.
- Avoid fecal contact.
- Avoid sexual practices that may involve direct contact with feces. Latex barrier protection should be emphasized as a way to prevent the spread of *Cryptosporidium* to case’s sexual partners as well as being a way to prevent the exposure to and transmission of other pathogens.

D. Managing Special Situations

1. Food Handlers

- Food handlers should be excluded from work until at least 24 hours after diarrhea has resolved and adequate hygiene can be maintained, ideally as verified by environmental health.
- While individual circumstances may vary, cases are generally not required to provide two negative stools to return to work.
- If a case has questionable hygienic practices or there are other concerns, a food handler should be excluded from work until two negative stool tests have been obtained at least 24 hours apart.
- In an outbreak situation, negative stool tests may be required to return to food handling.

2. Childcare/ Preschool

Refer childcare providers to the CDPHE **Infectious Disease in Child Care Settings: Guidelines for Child Care Providers** (www.cdphe.state.co.us/dc/epidemiology/dc_guide.html) for additional *Cryptosporidium* information.

- Children and staff members with cryptosporidiosis who have diarrhea should be excluded until at least 24 hours after diarrhea has resolved. Parents of cases should be counseled not to take their children to another childcare center during this period of exclusion.

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- Reinforce the importance of meticulous handwashing with childcare center staff after diaper changes and toileting children. If possible, this should be verified by environmental health.
- Since most child care center staff are considered food handlers, see Section 6 (D1)--Food Handlers above.
- If there are concerns about hygienic practices at the child care center, consider obtaining two negative stool tests obtained at least 24 hours apart before a case returns to class.
- When a case of cryptosporidiosis is identified in a child attending childcare, determine whether additional children have or have recently had diarrhea. Other children with diarrhea should be excluded, should be seen by their physician, and should submit stool for testing. If other cases in the center are identified, consider sending a letter home to parents.
- If the case is the only child in the classroom or center who has been ill, no further action is indicated for other children in that classroom or center.
- Reinforce the importance of meticulous handwashing with childcare center staff.
- Parents and staff should be reminded that cases should not swim or wade in pools for 2 weeks after resolution of diarrhea.

3. School

Refer school personnel to the CDPHE **Infectious Disease Guidelines for School Personnel** (www.cdphe.state.co.us/dc/epidemiology/dc_guide.html) for additional *Cryptosporidium* information.

- Students or staff with cryptosporidiosis who have diarrhea should be excluded until at least 24 hours after diarrhea has resolved.
- In general, students or staff with cryptosporidiosis who do not have diarrhea and are not otherwise sick may remain in school.
- If there are concerns about the case's hygiene (e.g. the case has developmental disabilities and wears diapers) consider obtaining two negative stool tests at least 24 hours apart before a case returns to class.
- Students or staff who handle food and have cryptosporidiosis must not prepare food until their diarrhea has resolved. See Section 6 (D1)--Food Handlers.
- Parents and school staff should be reminded that cases should not swim or wade in pools for 2 weeks after resolution of diarrhea.

4. Community Residential Programs (facilities serving the developmentally disabled)

Actions taken in response to a case of cryptosporidiosis in a community residential program will depend on the type of program and the level of functioning of the residents. In general:

- Residents with cryptosporidiosis should be placed on contact precautions until at least 24 hours after their symptoms subside.
- If the resident has questionable hygiene, is incontinent, or there are other concerns, the resident should remain on contact precautions until he/she has submitted two negative stool tests obtained at least 24 hours apart.
- Residents with cryptosporidiosis must be excluded from handling or preparing food for other residents until their diarrhea has resolved.

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- Staff members who provide direct patient care (e.g., feed patients, give mouth or denture care, or give medications) are considered foodhandlers and are subject to foodhandler restrictions. See section 6 (D1)--Food Handlers.
- Staff members with cryptosporidiosis should be excluded from work until their diarrhea has resolved.
- In an outbreak situation, negative stools may be required to return to work.

5. Patients and Staff in Health Care Facilities (Hospitals and Long Term Care Facilities)

Hospitals and long term care facilities generally have written infection control policies and procedures for handling cases of communicable disease among patients and staff members. If a facility does not have such policies in place, provide the following recommendations:

- Patients with cryptosporidiosis should be placed on contact precautions until 24 hours after their symptoms subside.
- If the patient has questionable hygiene, is incontinent, or there are other concerns, the patient should remain on contact precautions until two negative stool tests are obtained.
- Healthcare workers should be excluded from work until diarrhea has resolved.
- While individual circumstances may vary, in general, healthcare workers are not required to provide two negative stools to return to work.
- In an outbreak situation, negative stool tests may be required to return to work.

E. Environmental Measures

- If a private drinking water source is implicated, CDPHE recommends that the owner test for *Cryptosporidium* and can direct the owner to appropriate commercial laboratories to perform this testing.
- If a municipal drinking water source or other public supply is implicated, CDPHE will work with the Water Quality Control Division to ensure appropriate testing and follow up.
- If a food item is implicated, it must be removed from the environment.
- A decision about testing suspect/implicated food items must be made in consultation with CDPHE Communicable Disease Program.
- If a commercial product is suspected, CDPHE Communicable Disease Program will coordinate follow-up with the CDPHE Consumer Protection Division and relevant outside agencies.
- The general policy of the CDPHE Laboratory and the Communicable Disease Program is only to test food samples associated with outbreaks, not in single cases.
- For single cases, CDPHE or local health agencies may suggest that the holders of food locate a private laboratory that will test food, or that they store the food in their freezer for a period of time in case additional reports are received.
- The CDPHE laboratory can test food samples associated with isolated cases of illness on a fee for service basis. For more information, contact the CDPHE Microbiology Laboratory.

REFERENCES

American Academy of Pediatrics. *2009 Red Book: Report of the Committee on Infectious Diseases, 28th Edition*. Illinois, Academy of Pediatrics, 2009.

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Case Definitions for Infectious Conditions Under Public Health Surveillance:

www.cdc.gov/osels/ph_surveillance/nndss/casedef/case_definitions.htm

CDC Website: www.cdc.gov → click on “Diseases and Conditions”.

Heymann DL, ed. *Control of Communicable Diseases Manual, 19th Edition*. Washington, DC, American Public Health Association, 2008.

Juranek, D. Cryptosporidiosis: Sources of Infection and Guidelines for Prevention. *Clinical Infectious Diseases* 1995; 21(supp 1) S57-61.