Cyclosporiasis

Disease Plan

Quick Links:

Last updated: June 28, 2021, by BreAnne Osborn.

Questions about this disease plan?

Contact the Utah Department of Health Bureau of Epidemiology: 801-538-6191.

✓ CRITICAL CLINICIAN INFORMATION

Clinical Evidence

Signs/Symptoms

- Diarrhea
- Abdominal pain
- Nausea
- Vomiting
- Weight loss

Period of Communicability

- *Cyclospora* is generally not transmissible from person-to-person.

Incubation Period

- Typically 1 week, but can be up to 2 weeks

Mode of Transmission

- Foodborne: ingestion of contaminated food, usually produce or fresh herbs
- Waterborne: ingestion of contaminated water

Laboratory Testing

Type of Lab Test/Timing of Specimen Collection

- Polymerase chain reaction (PCR)
- Modified acid-fast staining, Modified Safranin, Wet Mount

Type of Specimens

- Stool

Treatment Recommendations

Type of Treatment

- Supportive therapy, including hydration, is important; most cases do not require additional treatment.
- When treatment is necessary, Trimethoprim/Sulfamethoxazole (Bactrim) is preferred.
- Ciprofloxacin is not as effective, but is the preferred treatment for cases with a Sulfamethoxazole allergy.

Prophylaxis

- None

Contact Management

Isolation of Case

- None

Quarantine of Contacts

- None

Infection Control Procedures

- Standard and enteric precautions

✓ WHY IS CYCLOSPORIASIS IMPORTANT TO PUBLIC HEALTH?

Cyclospora cayetanensis is a parasite that is widely distributed throughout the world, including in the United States (U.S.). When ingested, this parasite causes the diarrheal illness cyclosporiasis. From 2016 to 2020, Utah had between 2 and 22 cases reported each year. Though, the illness is not common in the U.S., domestically-acquired cases are on the rise, and large outbreaks affecting hundreds can and do occur. Cyclosporiasis can result in severe illness, and treatment may be necessary. Correct diagnosis, early detection of cases, and interview of ill persons is crucial in identifying sources of illness and preventing future cases and outbreaks.

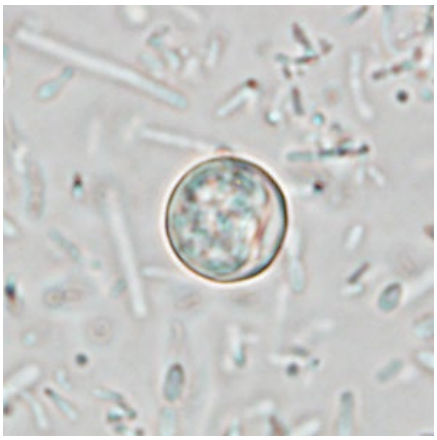
✓ DISEASE AND EPIDEMIOLOGY

Clinical Description

Cyclosporiasis is an infection of the small intestine, and the most common symptom is watery diarrhea. Other symptoms include nausea, vomiting, anorexia, weight loss, abdominal cramps, increased gas, bloating, fatigue, myalgia, and low-grade fever. Symptoms may be continuous, but remittance and relapse episodes can occur. Severe symptoms occur most often among young children and older adults. The illness can be self-limiting, and in untreated immunocompetent people, diarrhea usually lasts for 10 to 24 days. However, in immunocompromised persons, diarrhea can last for months. Guillain-Barré syndrome and Reiter's syndrome are two rare complications that may occur as a result of an infection that is either not treated, or not treated promptly. Biliary tract disease has also been reported. Some persons infected with *Cyclospora* do not develop any symptoms, though this is most commonly documented in settings where cyclosporiasis is endemic.

Causative Agent

Cyclosporiasis is an infection caused by the coccidian protozoan parasite *Cyclospora cayetanensis*. Humans with cyclosporiasis shed the unsporulated oocysts in a noninfectious form that requires several days or weeks to mature before they become infectious. The time for maturation to the infectious form depends on factors such as temperature and moisture, with sporulation occurring at temperatures between 22°C to 32°C. Iodine and chlorine are not effective against *Cyclospora*; however, the organism is easily destroyed by boiling water.



Cyclospora cayetanensis oocysts in wet mounts (CDC Photo, 2013)

Differential Diagnosis

The differential diagnosis for cyclosporiasis includes other protozoan parasitic disease, such as giardiasis, cryptosporidiosis, and *Cystoisospora belli*. Other diarrheal illnesses such as salmonellosis, shigellosis, campylobacteriosis, *Mycobacterium avium* complex infection, and viral infections (e.g., with cytomegalovirus, rotavirus, norovirus, and adenovirus) may also be included.

Laboratory Identification

Polymerase chain reaction (PCR) tests have recently been developed for the detection of *Cyclospora*, and are currently the most common testing method. Most notably, the BioFire FilmArray® gastrointestinal panel can detect *Cyclospora cayetanensis.* Other multiplex panels may not include *Cyclospora* as a target; therefore, physicians should specifically request testing for this parasite.

Cyclospora can also be identified by modified acid-fast staining, modified safranin, or by wet mount under phase contrast microscopy. Identification of this parasite in stool without the use of PCR tests can require special kinds of laboratory techniques that are not routinely used. Again, physicians should specifically request testing for this parasite.

Because oocysts may be shed at low levels, more than one stool sample may be needed to detect the organism.

Treatment

Cyclosporiasis is often self-limiting and usually does not require any treatment. However, when treatment is necessary, Trimethoprim/sulfamethoxazole (Bactrim) for 7-10 days is the preferred therapy for *Cyclospora* infection. Ciprofloxacin is less effective than TMP/SMX, but is the treatment of choice for patients who have a sulfa allergy. Though cyclosporiasis is generally self-limiting in immunocompetent adults, the illness may last for a month or longer if not treated. Additionally, the patient may experience remitting or relapsing symptoms.

For patients who are immunocompromised, a higher dosage and longer treatment duration may be required. In all patients, fluid and electrolyte balance should be monitored and maintained.

Case Fatality

The case fatality rate is unknown, but is thought to be very low.

Reservoir

Humans are the only known reservoir for *Cyclospora cayetanensis*, although the epidemiology of human cyclosporiasis suggests the existence of animal reservoirs, possibly birds. Several

Cyclospora spp. are known to infect primates, though it is unclear if this is the case for *Cyclospora cayetanensis*.

Transmission

Cyclospora oocysts in freshly excreted stool are not infectious. Direct person-to-person transmission is unlikely, as is transmission via ingestion of newly contaminated food or water because excreted oocysts take days to weeks under favorable environmental conditions to sporulate and become infective. Transmission occurs either through drinking (or swimming in) water, or consuming fresh fruits and vegetables, that have been contaminated with oocysts in the infectious stage.

Both foodborne and waterborne outbreaks have been reported. Most outbreaks in the U.S. have been associated with consumption of imported fresh produce.

The infectious dose is unknown, but trace amounts of oocyst contamination in food products indicates that it is likely to be very low. Oocysts are hardy and resistant to most disinfectants used in food and water processing. These oocysts can remain infective and survive for prolonged periods in cool, moist environments.

Susceptibility

Persons of all ages are at risk for infection. Although travelers to tropical countries may be at increased risk, infection can also be acquired in such countries as the U.S. and Canada. The immunocompromised, particularly those co-infected with HIV and HIV/tuberculosis are more susceptible to infection. The risk may vary by season; most cases in the U.S. occur between May and July. Persons who have previously been infected with *Cyclospora* can become infected again.

Incubation Period

The incubation period for cyclosporiasis is one to two weeks, with an average of one week.

Period of Communicability

People may shed *Cyclospora* oocysts from days to over one month. It is not known how long shedding lasts. While oocysts are not immediately infectious after excretion in stool, they may sporulate and become infectious if left for 7-15 days in a moist, favorable environment. Because oocysts are not immediately infectious, direct person-to-person transmission is rare.

Epidemiology

Cyclosporiasis was first recognized in 1979. The parasite has a broad geographic distribution, but is most frequently reported in Latin America (particularly Guatemala, Peru, and Mexico), the Indian subcontinent, and Southeast Asia. In endemic areas, risk factors for infection include contaminated water, food, or soil, poor sanitation, and low socioeconomic status.

In the U.S., cyclosporiasis has historically been associated with international travel, and has frequently been reported as a cause of traveler's diarrhea. However, most cyclosporiasis cases in the U.S. today have no history of international travel. Between 2011-2015, there were 1,988 confirmed and 2,109 probable cyclosporiasis cases reported to CDC. Approximately 19% of those cases reported traveling internationally during their exposure period compared to 63% who reported no travel (19% had an unknown travel history). Most cases occur between March and July.

Waterborne and foodborne outbreaks have occurred in the U.S. and have been linked to various types of fresh produce, often imported from developing countries, including raspberries, basil, snow peas, and lettuce. An outbreak in 2014 that included 304 ill persons from 19 states with confirmed *Cyclospora* infection was likely related to contaminated fresh cilantro imported from Mexico.

The number of cyclosporiasis cases has been rising in recent years. This is likely due in part to the development of better detection methods. From 2016 to 2020, Utah has had between 2 and 22 cases reported each year. Foreign travel is a commonly reported risk factor, however, domestically-acquired *Cyclospora* infections are even more common, and in 2018, domestically-grown produce was implicated in a *Cyclospora* outbreak for the first time.

✓ PUBLIC HEALTH CONTROL MEASURES

Public Health Responsibility

- Investigate all cases of disease and fill out and submit appropriate disease investigation forms.
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention.
- Identify cases and sources to prevent further transmission.
- Identify clusters or outbreaks of this disease and determine the source.

Prevention

Personal Preventive Measures/Education
To avoid exposure and transmission, individuals should:

- Avoid swallowing recreational water.
- Avoid swallowing pool or bath water; chlorination may not eliminate the parasite.
- Avoid drinking unboiled or untreated water when hiking, traveling in developing countries, or visiting areas where water quality is unknown. Iodine is not effective against *Cyclospora*, but bringing water to a full, rolling boil is sufficient to kill it.
- Avoid swimming while ill with diarrhea and for at least two weeks after diarrhea resolves.
- Thoroughly wash all fresh fruits and vegetables prior to consumption.

Chemoprophylaxis

None.

Vaccine

None.

Isolation and Quarantine Requirements

Isolation: Exclude food handlers with cyclosporiasis from work until diarrhea has resolved. Persons diagnosed with cyclosporiasis should not use recreational waters for at least two weeks after symptoms resolve.

NOTE: A food handler is any person preparing/handling food or medications, or providing direct patient contact. This can include a patient care or childcare provider.

Hospital: Standard and Contact precautions.

Quarantine: Contacts with diarrhea who are food handlers shall be considered the same as a case, and should be handled in the same manner. No restrictions otherwise.

NOTE: In certain circumstances, cases, ill contacts, and/or asymptomatic contacts who are food handlers may be required to have negative stool samples prior to returning to work. The local health department will decide which cases and/or contacts will need negative stool samples prior to returning to work, and whether one or two negative samples is necessary. If a case or contact has been treated with an antimicrobial agent, the stool specimen should not be collected until at least 48 hours after cessation of therapy. If two negative stool samples are determined to be necessary, collect the specimens at least 24 hours apart.

✓ CASE INVESTIGATION

Reporting

Report any illness to public health authorities that meets any of the following criteria:

1. A symptomatic person with laboratory evidence of cyclosporiasis, which is defined as the detection of *Cyclospora* organisms or DNA in stool, intestinal fluid/aspirate, or intestinal biopsy specimens,
2. A symptomatic person with epidemiologic linkage to a confirmed case of cyclosporiasis,
3. A person whose healthcare record contains a diagnosis of cyclosporiasis.

Other recommended reporting procedures:

- Report all cases of cyclosporiasis to public health.
- Reporting should be ongoing and routine.
- Frequency of reporting should follow the Utah Department of Health's routine schedule (in Utah, within three working days of identification).

Table 1: Criteria to determine whether a case should be reported to public health authorities

Criterion	Reporting		
Clinical Evidence			
Diarrhea	O	O	
Fever	O	O	
Anorexia	O	O	
Abdominal bloating	O	O	
Abdominal cramping	O	O	
Weight loss	O	O	
Nausea	O	O	
Fatigue	O	O	
Vomiting	O	O	
Myalgia or other body aches	O	O	
Healthcare record contains a diagnosis of cyclosporiasis			S
Laboratory Evidence			
Cyclospora organisms or DNA in stool	O		
Cyclospora organisms or DNA in intestinal fluid/aspirate or intestinal biopsy specimens	O		
Epidemiologic Evidence			
Epidemiologic linkage to a confirmed case of cyclosporiasis		O	
Member of a risk group defined by public health authorities during an outbreak		O	

Notes:
S = This criterion alone is Sufficient to identify a case for reporting
O = At least one of these "O" (Optional) criteria in each category (i.e., clinical evidence and laboratory evidence) in the same column is required to identify a case for reporting. (These optional criteria are alternatives, which means that a single column will have either no O criteria or multiple O criteria; no column should have only on O.)

Case Investigation Process

All suspect, probable, and confirmed cases should be interviewed with the cyclosporiasis case report form and the *Cyclospora* national hypothesis generating questionnaire (CNHGQ). Restrict food handlers from work until diarrhea has resolved. Negative stool specimens may be required.

CSTE Case Definition
Cyclosporiasis 2009

Clinical description
An illness of variable severity caused by the protozoan parasite *Cyclospora cayetanensis*. The most common symptom is watery diarrhea. Other common symptoms include loss of appetite, weight loss, abdominal cramps/bloating, nausea, body aches, and fatigue. Vomiting and low-grade fever also may be noted.

Laboratory criteria for diagnosis
Laboratory-confirmed cyclosporiasis shall be defined as the detection of Cyclospora organisms or DNA in stool, intestinal fluid/aspirate, or intestinal biopsy specimens.

Case classification
Confirmed: a case that meets the clinical description and at least one of the criteria for laboratory confirmation as described above.

Probable: a case that meets the clinical description and that is epidemiologically linked to a confirmed case.

Table 2: Criteria for defining a case of cyclosporiasis

Criterion	Confirmed	Probable
Clinical Evidence		
Diarrhea	O	O
Low grade fever	O	O
Anorexia	O	O
Abdominal bloating	O	O
Abdominal cramping	O	O
Weight loss	O	O
Nausea	O	O
Fatigue	O	O

Vomiting	O	O
Myalgia or other body aches	O	O
Laboratory Evidence		
Cyclospora organisms or DNA in stool	O	
Cyclospora organisms or DNA in intestinal fluid/aspirate or intestinal biopsy specimens	O	
Epidemiologic Evidence		
Epidemiologic linkage to a confirmed case of cyclosporiasis		O
Member of a risk group defined by public health authorities during an outbreak		O

Notes:
N = All "N" criteria in the same column are Necessary to classify a case.
O = At least one of these "O" (Optional) criteria in each category (e.g., clinical evidence and laboratory evidence) in the same column—in conjunction with all "N" (Necessary) criteria in the same column— is required to classify a case.

Outbreaks

CDC defines a foodborne outbreak as, "an incident in which two or more persons experience a similar illness resulting from the ingestion of a common food." An outbreak of cyclosporiasis is confirmed by the demonstration of the organism in the stool or intestinal fluid or biopsy of two or more ill persons. *Cyclospora* is chlorine-resistant; therefore, swimming in chlorinated pools may not protect against transmission.

Identify Case Contacts

Contacts of cyclosporiasis cases may include household contacts, childcare and school attendees and workers, and food handlers. These contacts may be identified through interview of the case-patient or physician notes. More information about management of case contacts are listed in the "Case Contact Management" section below.

Case Contact Management

Childcare and School

Transmission of cyclosporiasis from person-to-person is unlikely. After being shed in stool, the parasite must undergo developmental changes (taking days to weeks) before becoming infectious. Humans become infected by consuming food or water that has been contaminated with feces containing infective *Cyclospora* oocysts. Therefore, non-food handling students, teachers, and childcare attendees can continue to attend their programs as long as they feel well enough to do so. However, since most staff in childcare programs are considered to be food handlers, those with *Cyclospora* in their stool can remain onsite, but must not prepare food or feed children until their diarrhea has resolved. Negative stool specimens may be required at the discretion of the local health department.

✓ ACKNOWLEDGEMENTS

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✓ REFERENCES

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✓ VERSION CONTROL

Updated Dec 2014 – CSTE reporting criteria, case definition, and case classification swim lanes included.

Updated May 2015 – "Why is Cyclosporiasis Important to Public Health" section added. Symptoms and illness duration updated in "Clinical Description" section. More information added to "Causative Agent" section. "Laboratory Identification," "Treatment", "Reservoir," "Transmission", and "Susceptibility" sections updated. "Identify Case Contacts" section updated and separated from "Case Contact Management." "Acknowledgements," "Version Control," and "Minimum Data Set" sections added.

Updated December 2017—Minimum Data Set.

Updated June 2021—Updated statistics throughout the document. Updated "Laboratory Identification" and "Epidemiology" sections. Added ELR rules.

✓ UT-NEDSS (EPITRAX) MINIMUM/REQUIRED FIELDS BY TAB

Demographic

- First Name
- Last Name
- Street Number
- Street Name
- City
- State
- County
- Zip Code
- Date of Birth
- Area Code
- Phone Number
- Birth Gender
- Ethnicity
- Race

Clinical

- Disease
- Onset Date
- Visit Type
- (if inpatient) Did cyclosporiasis cause hospitalization?
- Died
  - (if yes) Date of Death
  - (if yes) Did cyclosporiasis cause death?
- Symptoms

Laboratory

- Lab Name
- Lab Test Date
- Collection Date
- Specimen Source
- Test Type
- Organism
- Test Result
- Accession Number

Contacts

- Any contacts ill with similar symptoms during exposure period?

Epidemiological

- Food Handler
  - Name of facility where patient handled food
  - Location
  - Did the patient work while ill?
  - Important information including dates
- Healthcare Worker
  - Name of healthcare facility
  - Location
  - Did the patient work while ill?
  - Important information, including dates
- Group Living
  - Name of the facility
  - Location
  - Did the patient work/attend while ill?
  - Important information, including dates
- Childcare Association
  - Name of the childcare
  - Location
  - Did the patient work/attend while ill?
  - Important information, including dates
- Occupation
- Risk Factors
- Risk Factor Notes

Investigation

- Date 14 days before disease onset:
- Date 1 day before disease onset:
- Did the patient travel outside the U.S. during the exposure period?
    - (if yes) Describe travel (location, dates, mode, if others were ill, etc.)
- Did the patient travel outside Utah, but inside the U.S., during the exposure period?
    - (if yes) Describe travel (location, dates, mode, if others were ill, etc.)
- Did the patient eat leafy greens during the exposure period?
- Did the patient eat fresh herbs during the exposure period?
- Did the patient eat berries during the exposure period?

Reporting

- Date first reported to public health

Administrative

- State Case Status (completed by UDOH)
- Outbreak Associated
- Outbreak Name

✓ ELECTRONIC LABORATORY PROCESSING RULES

Cyclosporiasis Rules for Entering Laboratory Test Results

The following rules describe how laboratory results reported to public health should be added to new or existing events in UT-NEDSS. These rules have been developed for the automated processing of electronic laboratory reports, although they apply to manual data entry, as well.

Test-Specific Rules

Test specific rules describe what test type and test result combinations are allowed to create new morbidity events in UT-NEDSS, and what test type and test result combinations are allowed to update existing events (morbidity or contact) in UT-NEDSS.

Test Type	Test Result	Create a New Event	Update an Existing Event
PCR/amplification	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	No	Yes
	Other	No	Yes

Whitelist Rules

Whitelist rules describe how long an existing event can have new laboratory data appended to it. If a laboratory result falls outside the whitelist rules for an existing event, it should not be added to that event, and should be evaluated to determine if a new event (CMR) should be created.

Cyclosporiasis Morbidity Whitelist Rule: If the specimen collection date of the laboratory result is 60 days or less after the last positive lab, the laboratory result should be added to the morbidity event.

Cyclosporiasis Contact Whitelist Rule: If the specimen collection date of the laboratory result is 60 days or less after the date of the contact event, the laboratory result should be added to the contact event.

Graylist Rule

We often receive laboratory results through ELR that cannot create cases, but can be useful if a case is created in the future. These laboratory results go to the graylist. The graylist rule describes how long an existing event can have an old laboratory result appended to it.

Cyclosporiasis Graylist Rule: If the specimen collection date of the laboratory result is 30 days before to 7 days after the event date of the morbidity event, the laboratory result should be added to the morbidity event.

Other Electronic Laboratory Processing Rules

If an existing event has a state case status of “not a case,” ELR will never add additional test results to that case. New labs will be evaluated to determine if a new CMR should be created.