

## CYCLOSPORIASIS

### REPORTING INFORMATION

- **Class B:** Report by the close of the next business day after the case or suspected case presents and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report to the local public health department in which the reporting health care provider or laboratory is located.
- Reporting Form(s) and/or Mechanism:
  - The Ohio Disease Reporting System (ODRS) should be used to report lab findings to the Ohio Department of Health (ODH). For healthcare providers without access to ODRS, you may use the [Ohio Confidential Reportable Disease form](#) (HEA 3334).
  - The [Ohio Enteric Case Investigation Form](#) may be useful in the local health department follow-up of cases. Do not send this form to the Ohio Department of Health (ODH); information collected from the form may be entered into ODRS where fields are available and the form may be uploaded in Administration section of ODRS.
- The [Cyclosporiasis National Hypothesis-Generating Questionnaire](#) must be used for follow-up of cases. Please upload completed form into ODRS for submission to CDC, or fax completed forms to ODH at (614) 564-2456.
- Key fields for ODRS reporting include: sensitive occupation or attendee of daycare, symptoms of and number ill in the household and travel.

### AGENT

*Cyclospora cayetanensis*, a single-cell coccidian parasite. The species designation *Cyclospora cayetanensis* was given in 1994 to Peruvian isolates of human-associated *Cyclospora*. It appears that all human cases are caused by this species.

### Infectious Dose

The infectious dose may be very small.

### CASE DEFINITION

#### 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

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

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

#### Comments

Symptomatic and asymptomatic cases are reportable.

Direct person-to-person transmission is unlikely because *Cyclospora* oocysts are not infectious at the time of excretion.

## **SIGNS AND SYMPTOMS**

Common symptoms of cyclosporiasis may include watery diarrhea (most common), loss of appetite, weight loss, cramping, bloating, increased gas, nausea and fatigue. Other symptoms that may occur but are less common include vomiting and low-grade fever.

If a person that is ill with cyclosporiasis is not treated, symptoms can persist for several weeks to a month or more. Some symptoms, such as diarrhea, can return, and some symptoms, such as muscle aches and fatigue, may continue after the gastrointestinal symptoms have gone away. Infection is not usually life-threatening. Reported complications from *Cyclospora* infection are rare, but have included malabsorption and cholecystitis. Some people with *Cyclospora* infection experience no symptoms at all, particularly persons living in areas where the disease is endemic.

## **DIAGNOSIS**

Cyclosporiasis is diagnosed by means of the "ova and parasite" examination of stools. This test must be specifically requested; it is not usually included as part of the standard parasite stool examination.

Because *Cyclospora* may be shed intermittently, three stool samples on different days are recommended. It is estimated that >90% of infections are detected when three stools are examined. The three stool specimens should be obtained within a 10-day period and spaced at least 48 hours apart (e.g. Monday, Wednesday, and Friday).

Because trichrome stain is the routine staining technique for stool specimens in most laboratories, laboratorians should be familiar with the appearance of *Cyclospora* stained with trichrome in order to detect oocysts during routine examinations. However, this staining method is inadequate for definitive diagnosis because all oocysts will appear unstained. Staining techniques, such as modified acid-fast staining and Safranin stain, are often used to make *Cyclospora* oocysts more visible under the microscope. In addition, *Cyclospora* oocysts auto fluoresce, meaning that when stool containing oocysts is viewed under an ultraviolet (UV) microscope the oocysts fluoresce blue or green against a black background. Molecular diagnostic methods, such as the polymerase chain reaction (PCR), may be used to look for the parasite's DNA in the stool. The increase in culture-independent diagnostic testing (CIDT) methods has led to an increase in testing for this organism.

## **EPIDEMIOLOGY**

### **Source**

Humans. The existence of animal reservoirs is still under investigation.

### **Occurrence**

Worldwide. Cases have been reported in residents of or travelers from Asia, Nepal, Latin America, Caribbean Islands, Australia and East Europe. There have been several large foodborne outbreaks in the U.S. and Canada since 1995. In the summer of 2017, there were multiple outbreaks across the United States. Unfortunately, the sources were not identified.

### **Mode of Transmission**

By ingestion of food or water contaminated with oocysts. Infected persons excrete the oocyst stage of *Cyclospora* in their feces. *Cyclospora cayetanensis* oocysts are

excreted unsporulated (non-infective); they usually require at least 1 week under laboratory conditions to sporulate (become infective); therefore, direct person-to-person transmission of *Cyclospora* is unlikely to occur.

### **Period of Communicability**

The oocyst is shed during the acute illness and possibly longer; however, it is not directly communicable person-to-person. When untreated, illness may be protracted with relapses.

### **Incubation Period**

Symptoms of cyclosporiasis begin an average of 7 days (range, 2 days to > 2 weeks) after ingestion of sporulated oocysts (the infective form of the parasite).

## **PUBLIC HEALTH MANAGEMENT**

### **Case**

#### Investigation

All cases reported to the local health department should initially be followed up with a telephone call to obtain demographic and epidemiologic data. Ascertain if the case has been outside the U.S. in the three weeks prior to onset. If the case has not traveled, determine if any household or other close contacts have traveled outside the U.S. recently. If there is no history of travel, contact the ODH Bureau of Infectious Diseases Outbreak Response and BT Investigation Team (ORBIT) at 614-995-5599. If the case is in a sensitive occupation refer to "Isolation and Follow-up Specimens" below.

#### Treatment

Cyclosporiasis is treated with a 7-day course of the antibiotic trimethoprim-sulfamethoxazole (TMP/SMX). No highly effective alternative antibiotics regimen has been identified yet for patients who do not respond to the standard treatment or have a sulfa allergy. Most people with healthy immune systems will recover without treatment.

#### Isolation and Follow-up Specimens

Ohio Administrative Code (OAC) 3701-3-13 (G) states:

"Cyclosporiasis: a person with cyclosporiasis who attends a child care center or works in a sensitive occupation shall be excluded from the child care center or work in the sensitive occupation and may return after diarrhea has ceased and effective antimicrobial therapy has begun."

The Centers for Disease Control and Prevention (CDC) recommends persons who have had diarrhea do not swim for two weeks after diarrhea ceases in order to prevent spread of disease.

### **Contacts**

If the case or any household member is employed in a sensitive occupation or is a child care center attendee, **all** household members with diarrhea should submit 3 specimens for *Cyclospora* testing and be treated if positive.

### **Prevention and Control**

Avoid food or water that may be contaminated with stool. Wash fruits and vegetables thoroughly with clean, running water.

### Food Handlers

Symptomatic persons should be excluded from work. As detailed in Isolation, above, food handlers may only return to work after diarrhea has ceased, and appropriate antimicrobial therapy has begun.

Please note also, that the Food Service Operation rules pertain. Cyclosporiasis is a disease which can be transmitted through food. Persons infected with a disease that is communicable by food are not permitted to work as a food handler. For additional information, refer to Ohio Administrative Code (OAC) Chapter 3717-1 (Ohio Uniform Food Safety Code) Section 02.1, Management and Personnel: Employee Health.

CDC has also issued guidance for food service workers. It may be viewed at: [http://www.cdc.gov/parasites/cyclosporiasis/resources/pdf/cyclosporiasis\\_food\\_handlers.pdf](http://www.cdc.gov/parasites/cyclosporiasis/resources/pdf/cyclosporiasis_food_handlers.pdf).

Healthcare Workers, Child Care Workers and Children who Attend Child Care Centers  
Symptomatic persons should be excluded from work. As detailed in Isolation, above, children who attend child care centers and persons who work in sensitive occupations may return when diarrhea has ceased and appropriate antimicrobial therapy has begun.

### **Special Information**

Persons with diarrhea of infectious or unknown cause (e.g. confirmed or suspected cases of cyclosporiasis) are not permitted to work in sensitive occupations, according to OAC 3701-3-13 (H), which states: "Diarrhea, infectious or of unknown cause: a person with diarrhea, of infectious or unknown cause, who attends a child care center or works in a sensitive occupation shall be excluded from the child care center or work in the sensitive occupation and may return only after diarrhea has ceased. A person with infectious diarrhea of known cause shall be isolated in accordance with the provisions of the rule set forth for the specified disease." " 'Sensitive occupation' means direct food handling, direct patient care, the handling of food or provision of direct care to children in a child care center or any other occupation which provides significant opportunity for an infected individual to transmit infectious disease agents" per OAC 3701-3-01 (Y).

Outbreaks traced to raspberries imported from Guatemala have been reported in the U.S. and Canada.. Although many outbreaks were linked to imported raspberries, other vehicles including fresh basil, cilantro and mesclun lettuce (a mixture of various types of baby leaves of lettuce) have also been implicated in *Cyclospora* outbreaks.

For fresh produce that cannot be scrubbed (e.g. berries, lettuce), rinsing with clean, running water, using a colander, is recommended to minimize the risk of foodborne pathogens. *Cyclospora* oocysts should be inactivated by cooking or freezing; however, the minimum time and temperature needed to inactivate oocysts has not yet been determined.

**What is *Cyclospora*?**

*Cyclospora cayetanensis* is a parasite composed of one cell, too small to be seen without a microscope. The parasite causes an intestinal infection called cyclosporiasis.

**How is *Cyclospora* spread?**

*Cyclospora* is spread by people ingesting something, such as water or food, which was contaminated with infected stool. For example, outbreaks of cyclosporiasis have been linked to various types of fresh produce. *Cyclospora* needs time (days or weeks) after being passed in a bowel movement to become infectious for another person. Therefore, it is unlikely that *Cyclospora* is passed directly from one person to another.

**Who is at risk for infection?**

People of all ages are at risk for infection. Persons living or traveling in tropical or subtropical regions may be at increased risk because cyclosporiasis is endemic (found) in some developing countries. Foodborne outbreaks of cyclosporiasis in the United States and Canada have been linked to various types of imported fresh produce.

**What are the symptoms of infection?**

*Cyclospora* infects the small intestine (bowel) and usually causes watery diarrhea, with frequent, sometimes explosive, bowel movements. Other symptoms can include loss of appetite, substantial loss of weight, bloating, increased gas, stomach cramps, nausea, vomiting, muscle aches, low-grade fever and fatigue. Some people who are infected with *Cyclospora* do not have any symptoms.

**How soon after infection will symptoms begin?**

The time between becoming infected and becoming sick is usually about one week.

**How long will symptoms last?**

If not treated, the illness may last from a few days to a month or longer. Symptoms may seem to go away and then return one or more times (relapse).

**What should I do if I think I may be infected?**

See your health care provider.

**How is *Cyclospora* infection diagnosed?**

Your healthcare provider will ask you to submit stool specimens to see if you are infected. Because identification of *Cyclospora* infection can be difficult, you may be asked to submit several stool specimens over several days. Identification of this parasite in stool requires special laboratory tests that are not routinely done. Therefore, your health care provider should specifically request testing for *Cyclospora*. Your health care provider may have your stool checked for other organisms that can cause similar symptoms.

**How is infection treated?**

The recommended treatment for infection with *Cyclospora* is a combination of two antibiotics, trimethoprim-sulfamethoxazole, also known as Bactrim\*, Septra\*, or Cotrim\*. People who have diarrhea should rest and drink plenty of fluids.

**I am allergic to sulfa drugs; is there another drug I can take?**

No alternative drugs have been identified yet for people who are unable to take sulfa drugs. See your healthcare provider to discuss potential options.

**How is infection prevented?**

Avoiding water or food that may be contaminated with stool may help prevent *Cyclospora* infection. People who have previously been infected with *Cyclospora* can become infected again.

\*Use of trade names is for identification only and does not imply endorsement by the Centers for Disease Control and Prevention (CDC) or the Ohio Department of Health (ODH).

Information adapted from:

[http://www.cdc.gov/parasites/cyclosporiasis/gen\\_info/faqs.html](http://www.cdc.gov/parasites/cyclosporiasis/gen_info/faqs.html)

**What is *Cyclospora*?**

*Cyclospora cayetanensis* is a unicellular parasite previously known as cyanobacterium-like or coccidia-like body (CLB). The first known human cases of illness caused by *Cyclospora* infection (i.e., cyclosporiasis) were reported in the medical literature in 1979. Cases have been reported with increased frequency from various countries since the mid-1980s, in part because of the availability of better techniques for detecting the parasite in stool specimens.

**How is *Cyclospora* transmitted?**

Infected persons excrete the oocyst stage of *Cyclospora* in their feces. When excreted, oocysts are not infectious and may require from days to weeks to become infectious (i.e. to sporulate). Therefore, transmission of *Cyclospora* directly from an infected person to someone else is unlikely. However, indirect transmission can occur if an infected person contaminates the environment and oocysts have sufficient time, under appropriate conditions, to become infectious. For example, *Cyclospora* may be transmitted by ingestion of water or food contaminated with oocysts. Outbreaks linked to contaminated water, as well as outbreaks linked to various types of fresh produce, have been reported in recent years. It is not yet known how common the various modes of transmission and sources of infection are, nor whether animals can be infected and serve as sources of infection for humans.

**Who is at risk for infection?**

Persons of all ages are at risk for infection. Persons living or traveling in developing countries may be at increased risk; but infection may be acquired worldwide, including in the United States. In some countries of the world, infection appears to be seasonal.

**What are the symptoms of infection?**

The incubation period between acquisition of infection and onset of symptoms averages one week. *Cyclospora* infects the small intestine and typically causes watery diarrhea, with frequent, sometimes explosive, stools. Other symptoms can include loss of appetite, substantial loss of weight, bloating, increased flatus, stomach cramps, nausea, vomiting, muscle aches, low-grade fever and fatigue. If untreated, illness may last for a few days to a month or longer, and may follow a remitting-relapsing course. Some infected persons are asymptomatic.

**How is infection diagnosed?**

Identification of this parasite in stool requires special laboratory tests that are not routinely done (see section on laboratory diagnosis). A single negative stool specimen does not rule out the diagnosis; three or more specimens may be required. Stool specimens should also be checked for other microbes that may cause a similar illness.

**How is infection treated?**

Trimethoprim/sulfamethoxazole (TMP-SMX, Bactrim\* Septra\* or Cotrim\*), is the treatment of choice. The typical regimen for immunocompetent adults is TMP 160 mg plus SMX 800 mg (one double-strength tablet) orally twice a day for 7 days. Children should receive TMP 5 mg/kg plus SMX 25 mg/kg twice a day for 7-10 days. HIV-infected patients may need longer courses of treatment.

No alternative antibiotic regimen has been identified yet for patients who do not respond

to or are intolerant of TMP-SMX. Approaches to consider for treatment of such patients include observation and symptomatic treatment, use of an antibiotic whose effectiveness against *Cyclospora* is unknown or is based on limited data, or desensitization to TMP-SMX. The latter approach should be considered only for selected patients who require treatment, have been evaluated by an allergist and do not have a life-threatening allergy. Anecdotal or unpublished data suggest that the following drugs are ineffective: albendazole, trimethoprim, azithromycin, nalidixic acid, tinidazole, metronidazole, quinacrine, tetracycline, doxycycline and diloxanide furoate.

### **How is infection prevented?**

Based on currently available information, avoiding food or water that may be contaminated with stool is the best way to prevent infection. Reinfection can occur.

### **Key points for the laboratory diagnosis of *Cyclospora*:**

1. To maximize recovery of *Cyclospora* oocysts, first concentrate the stool specimen by the formalin-ethyl acetate technique (centrifuge for 10 minutes at 500 x g) and then examine a wet mount and/or a stained slide of the sediment.
2. *Cyclospora* oocysts are 8-10 microns in diameter (in contrast, *Cryptosporidium parvum* oocysts are 4-6 microns in diameter).
3. Ultraviolet epifluorescence microscopy is a sensitive technique for rapidly examining stool sediments for *Cyclospora* oocysts, which autofluoresce (*Cryptosporidium parvum* oocysts do not). If suspect oocysts are found, bright-field microscopy can then be used to confirm that the structures have the characteristic morphologic features of *Cyclospora* oocysts (i.e. are nonrefractile spheres that contain undifferentiated cytoplasm or refractile globules).
4. On a modified acid fast-stained slide of stool (the technique used by most laboratorians), *Cyclospora* oocysts are variably acid fast (i.e., in the same field, oocysts may be unstained or stain from light pink to deep red). Unstained oocysts may have a wrinkled appearance; it is important to distinguish oocysts from artifacts that may be acid fast but do not have the all-important wrinkled morphology of the oocyst wall.
5. Using a modified safranin technique, oocysts uniformly stain a brilliant reddish orange if fecal smears are heated in a microwave oven during staining. If epifluorescence microscopy is available, the stained slide can first be examined with this technique and suspect oocysts reexamined with bright-field microscopy.
6. Although not recommended as an optimal technique for detection of *Cyclospora*, on a trichrome-stained slide of stool, the oocysts appear as clear, round, and somewhat wrinkled spheres, either 8-10 microns in diameter or slightly smaller because of shrinkage during the staining process.

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Laboratory information is adapted from:

[http://www.dpd.cdc.gov/dpdx/HTML/PDF\\_Files/cyclospora\\_benchaid.pdf](http://www.dpd.cdc.gov/dpdx/HTML/PDF_Files/cyclospora_benchaid.pdf)