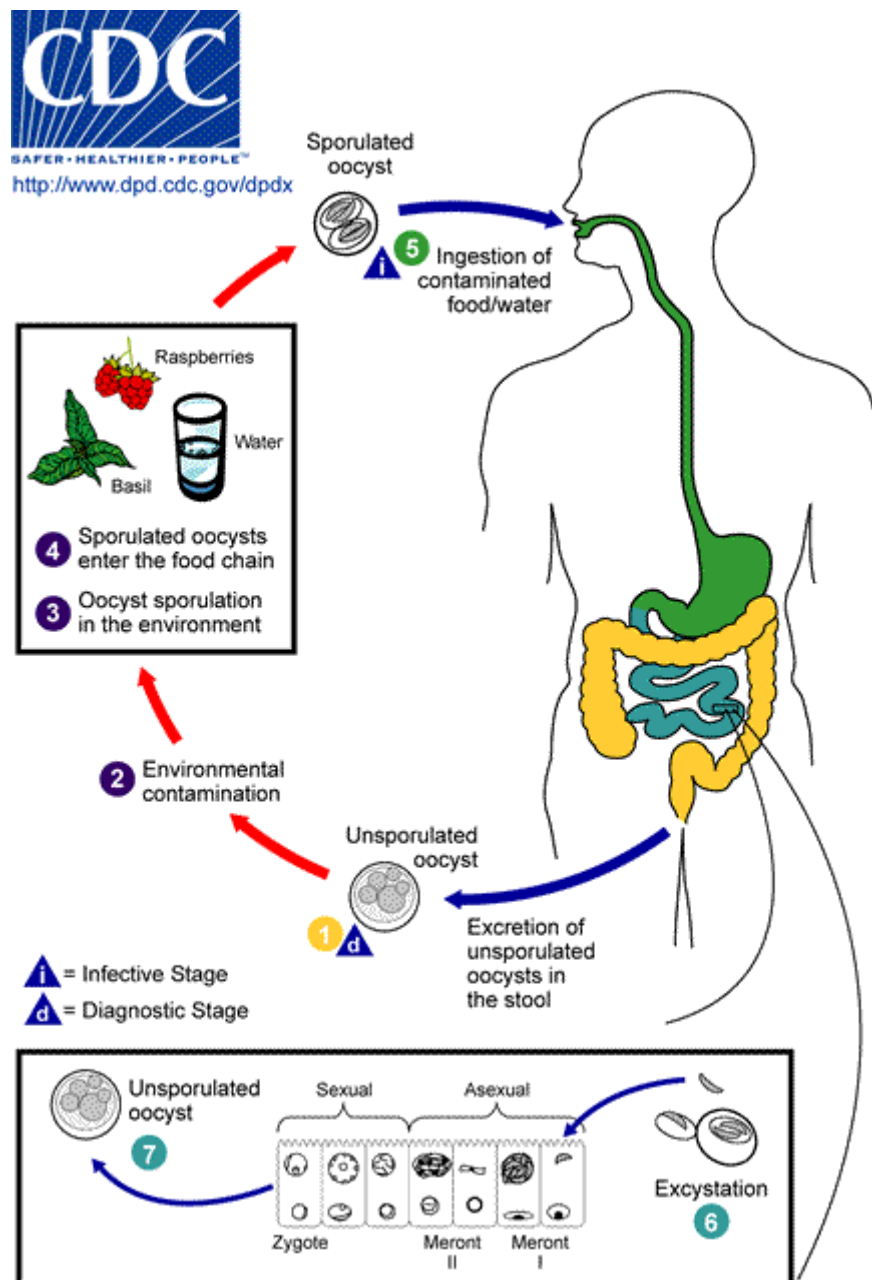


Cyclosporiasis

Causal Agent:

The causal agent has been only recently identified as a unicellular coccidian parasite. The species designation *Cyclospora cayentanensis* was given in 1994 to Peruvian isolates of human-associated *Cyclospora*. It appears that all human cases are caused by this species.

Life Cycle:



Some of the elements in this figure were created based on an illustration by Ortega et al. *Cyclospora cayetanensis*. In: Advances in Parasitology: opportunistic protozoa in humans. San Diego: Academic Press; 1998. p. 399-418.

When freshly passed in stools, the oocyst is not infective ¹ (thus, direct fecal-oral transmission cannot occur; this differentiates *Cyclospora* from another important coccidian parasite, *Cryptosporidium*). In the environment ², sporulation occurs after days or weeks at temperatures between 22°C to 32°C, resulting in division of the sporont into two sporocysts, each containing two elongate sporozoites ³. Fresh produce and water can serve as vehicles for transmission ⁴ and the sporulated oocysts are ingested (in contaminated food or water) ⁵. The oocysts excyst in the gastrointestinal tract, freeing the sporozoites which invade the epithelial cells of the small intestine ⁶. Inside the cells they undergo asexual multiplication and sexual development to mature into oocysts, which will be shed in stools ⁷. The potential mechanisms of contamination of food and water are still under investigation.

Geographic Distribution:

Cyclosporiasis has been reported in many countries, but is most common in tropical and subtropical areas. Since 1990, at least 11 food-borne outbreaks of cyclosporiasis, affecting approximately 3600 persons, have been documented in the United States and Canada.

Clinical Features:

After an average incubation period of 1 week, symptomatic infections typically manifest as watery diarrhea, which can be severe. Other symptoms include anorexia, weight loss, abdominal pain, nausea and vomiting, myalgias, low-grade fever, and fatigue. Untreated infections typically last for 10-12 weeks and may follow a relapsing course. Infections, especially in disease-endemic settings can be asymptomatic.

Laboratory Diagnosis:

Currently, the most practical diagnostic method consists of the identification of oocysts in stool specimens by light microscopy. Other methods are also available or under investigation.

Specimen processing:

Specimens should be refrigerated and sent to the diagnostic laboratory as rapidly as possible. If it is not possible to send the specimen to the laboratory promptly, it should be preserved. Ideally, because a range of tests might be desired, each of which has different requirements of the specimen, the latter should be split in portions which should be respectively:

- fixed in 10% formalin (for direct microscopy, concentration procedures, and preparation of stained smears);
- fixed in 2.5% potassium dichromate (for sporulation assays and molecular diagnosis); and
- frozen without fixation (for molecular diagnosis).

(Note: specimens fixed in sodium acetate-acetic acid formalin can be handled in the same manner as specimens fixed in formalin; however, specimens fixed in polyvinyl alcohol (PVA) are of limited value because they are not usable for concentration procedures.)

Cyclospora oocysts can be excreted intermittently and in small numbers. Thus:

- a single negative stool specimen does not rule out the diagnosis; three or more specimens at 2- or 3-day intervals may be required
- concentration procedures should be used to maximize recovery of oocysts. The method most familiar to laboratorians is the formalin-ethyl acetate sedimentation technique

(centrifuge for 10 minutes at $500 \times g$). Other methods can also be used (such as the Sheather's flotation procedure).

Microscopic examination:

The sediment can be examined microscopically with different techniques:

- wet mounts (by conventional light microscopy, which can be enhanced by UV fluorescence microscopy or differential interference contrast (DIC, Nomarsky))
- stained smears (using modified acid-fast stain or a modified safranin stain)

Diagnostic findings

- Microscopy
- Sporulation assay
- Molecular methods
- Bench aids for *Cyclospora*

Treatment:

The recommended treatment for cyclosporiasis is a combination of two antibiotics, trimethoprim-sulfamethoxazole*, also known as Bactrim, Septra, or Cotrim. Supportive measures include management of fluid and electrolyte balance, and rest.

* This drug is approved by the FDA, but considered investigational for this purpose.