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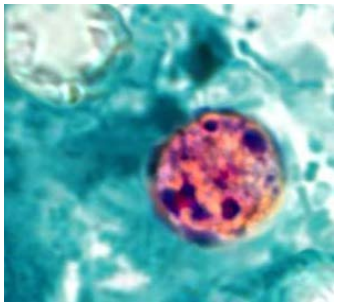
Cyclosporiasis Outbreaks

Cyclosporiasis is likely an under-diagnosed condition in the United States. A recent outbreak of cyclosporiasis associated with fresh produce is a reminder that cyclosporiasis should be considered in persons with a prolonged diarrheal illness. A few cases of cyclosporiasis may indicate an outbreak due to a widely distributed product.

The Agent



Cyclospora cayetanensis
www.cdc.gov

The causative coccidian protozoan was first reported in 1979 from Papua New Guinea but not given its current name until 1994 based on research done at Cayetano Heredia University in Peru. The genus *Cyclospora* has around 20 species but all illnesses in humans have been associated with *C. cayetanensis*.

The infectious dose of *Cyclospora* is likely small. The incubation period is usually about one week, ranging from one to 14 days. *Cyclospora* infects the small intestine. Usual symptoms are watery diarrhea, bloating, abdominal cramps, anorexia, weight loss, nausea, and fatigue. Duration of illness is a few days to a month or longer with remissions and relapses. Some infections are asymptomatic. Treatment is with trimethoprim-sulfamethoxazole or less effectively with ciprofloxacin. Treatment is more difficult for persons with AIDS. Routine ova and parasite (O&P) testing will generally not identify the organism, so providers suspecting it should specifically request testing for *Cyclospora*.

Humans are the only known reservoir host for *C. cayetanensis* but epidemiologic evidence suggests non-human reservoirs exist. Other *Cyclospora* species have been found in various animals such as millipedes, snakes, moles, and Old World monkeys. Like many parasites *Cyclospora* has a somewhat complex lifecycle (Figure below). Mature *Cyclospora* oocysts shed in human feces are not infective, unlike for *Cryptosporidium*, another coccicdian parasite. After days or weeks in a favorable environment, sporulation occurs to produce the infectious form.

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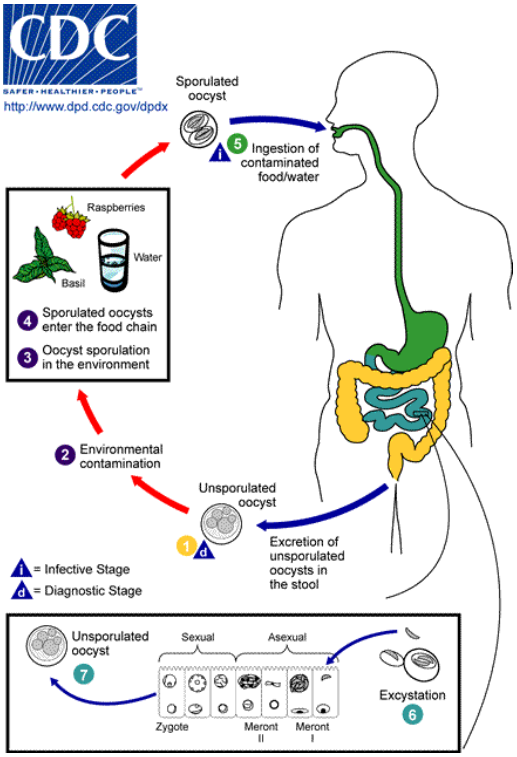
Sporulated oocysts ingested in contaminated food or water then excyst in the gastrointestinal tract and begin a new reproductive cycle.

Figure: *Cyclospora* Lifecycle



When freshly passed in stools, the oocyst is not infective 1. 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 5. The oocysts excyst in the gastrointestinal tract, freeing the sporozoites which invade 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.
www.cdc.gov

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Cyclosporiasis is endemic in many tropical and subtropical regions, including Africa, South and Central Americas, Asia, and the Middle East. Within those areas there is no definite temperature or rainfall pattern that might explain the maturation rate.

Epidemiology of Cyclosporiasis

Due to the required environmental maturation period there is no direct person-to-person transmission of the organism. Cases reported in the United States have been foodborne and have also occurred in persons who traveled to *Cyclospora*-endemic areas. While most routine

prevention measures such as avoiding risk foods and water during travel will reduce the risk of developing cyclosporiasis, chlorine or iodine treatment of water may not reliably eliminate resistant *Cyclospora* oocysts.

In Washington State, 30 cyclosporiasis cases were reported from 2002 through 2012 with typically 0 to five cases annually. Of 13 cases reported during 2005–2012, nine had traveled out of the country (seven to Central or South America, one to Italy, and one to China). No cyclosporiasis outbreaks have been detected in Washington.

Since the mid-1990s, foodborne outbreaks of cyclosporiasis in this country have been linked to various types of imported fresh produce. Implicated products include raspberries, basil, snow peas, and mesclun lettuce; no commercially frozen or canned produce has been implicated. Many implicated produce items have been identified only due to outbreaks from shared meals at events, restaurants or residential facilities (Table).

Table: Recent Cyclosporiasis Outbreaks in the United States and Canada

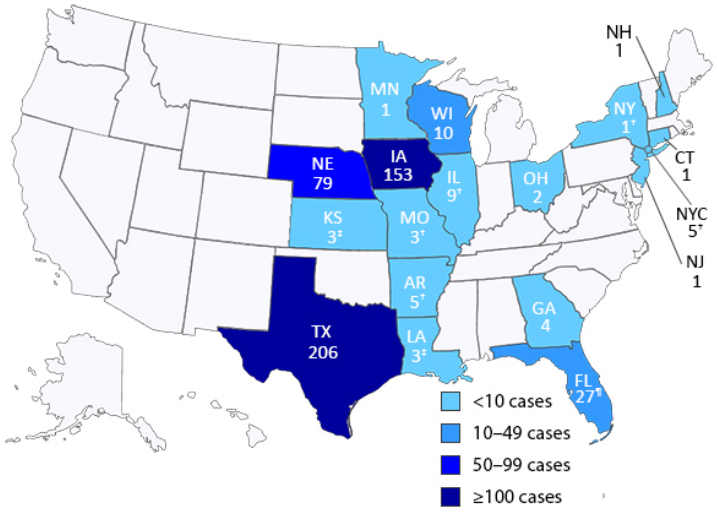
Year	Location	Cases	Product	Details
2007	British Columbia	29	Imported basil (Mexico)	Retrospective recognition, outbreak over 3 months
2005	Florida	365 confirmed, 552 total	Imported basil (Peru)	
2004	Pennsylvania	40 confirmed, 96 total	Imported snow peas (Guatemala)	45% attack rate for events at residential facility
2001	British Columbia	17	Imported basil (Thailand)	
2000	Pennsylvania	54	Imported raspberries (Mexico, Guatemala)	68% attack rate for wedding reception
1999	Missouri	62	Basil (Mexico, United States)	Two events
1998	Ontario	46 confirmed, 192 total	Imported raspberries (Guatemala)	13 clusters, overall attack rate for events 89%
1997	East Coast	25 clusters with at least one confirmed case	Imported basil	Attack rate for one event 89% One case exposed only through using a utensil
1997	Florida	29 cases	Domestic and imported mesclun lettuce	Restaurant cohort

Of note, high attack rates during outbreaks in identifiable groups suggest ingestion of a low dose of organisms can result in infection. During an outbreak in 1997, one case reportedly did not eat the implicated basil but did use a serving utensil from the basil salad to serve another dish, additional supporting evidence for a low infectious dose. However, it is probable that cyclosporiasis is underreported due to limited detection. When cases occur sporadically (i.e.,

apart from a recognized group or event), it is likely the diagnosis is not considered and the risk product is not identified.

Cyclospora Outbreak, 2013

The current multi-state outbreak of cyclosporiasis has affected a large number of persons. It was first recognized by two cases without international travel during the exposure period. The case count as of August 8th was 514 cases from 17 states from the East Coast through the Great Plains, although not all cases are confirmed to share the implicated exposure. At least 30 cases required hospitalization.



Investigation of an Outbreak of Cyclospora, August 8, 2013
www.cdc.gov

Epidemiologic investigation implicated a pre-packaged salad mix which had been used by at least two restaurant chains where cases reported eating. FDA trace back identified a single source of the lettuce, a farm in Mexico. To date, there is no evidence to support contamination of packages of salad mix such as those sold in grocery stores. For the latest update on the outbreak see: http://www.cdc.gov/parasites/cyclosporiasis/outbreaks/investigation-2013.html

Cyclosporiasis cases are rarely reported to notifiable conditions surveillance systems. The disease is likely under-diagnosed and cases are most likely to be recognized when multiple illnesses occur simultaneously in a defined group. Detailed investigation of each case of cyclosporiasis is important to detect and remove potential sources of exposure.