



Preventing Foodborne Illness: *Cyclospora cayetanensis*¹

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What is *Cyclospora cayetanensis*?

Cyclospora cayetanensis is a microscopic, intestinal protozoan parasite first reported in 1979 that has been known as cyanobacterium-like, coccidia-like, and as cyclospora-like bodies (CLB). It wasn't until 1993 that it was officially characterized as *Cyclospora cayetanensis*. Much is still unknown about *C. cayetanensis*, but it is a known cause of a gastrointestinal infection (cyclosporiasis), with increasing worldwide incidence including cases in the United States and Canada.

How does *Cyclospora cayetanensis* spread?

The full host range of *C. cayetanensis* is currently unknown. At this time, humans are the only known host, with chimpanzees and other primates thought to be potential reservoirs.

Infection with *C. cayetanensis* begins when ingested particles invade the epithelial cells of the small intestine. *C. cayetanensis* will then replicate and continue to spread to nearby cells. It is this

self-limiting (short-lived) stage that causes most of the symptoms associated with this parasite.

During infection, some of the parasitic cells undergo a sexual reproductive stage, where survival structures, called "oocysts," are produced. These are the structures that eventually pass in the host's fecal matter and spread infection. After about one to two weeks, shed oocysts become "activated" (i.e., infectious), and if consumed through contaminated food or water, the disease will spread to the new host. Due to this lag time in infectivity, direct person-to-person contamination is unlikely. The full disease cycle of the parasite can be seen at the following Centers for Disease Control (CDC) Web site:

<http://www.dpd.cdc.gov/dpdx/HTML/Cyclosporiasis.htm>

Environmental factors have an effect on the time required for shed oocysts to become pathogenic. Specifically, the moderate temperatures of late spring and early summer, 68° to 70°F (20° to 21°C), especially when combined with periods of high rainfall, are ideal for oocysts to become infectious.

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Such conditions are also often conducive to fruit and vegetable production, both domestically and abroad. They tend to occur at different times in different regions of the world and that means when fruit and vegetable production is out of season in the U.S., it is often in season in another country. This results in the importation of produce to fill domestic consumer demand. If a producing country does not adhere to adequate sanitary practices; if crops are irrigated with untreated water, or if employees are not required to adhere to hygienic and sanitary practices, the risk of infestation with *C. cayetanensis* oocysts increases. This has led to multiple domestic outbreaks of gastroenteritis linked to imported goods contaminated with *Cyclospora*.

What are the symptoms associated with *Cyclospora cayetanensis*?

Usually, symptoms begin about 1 week after ingestion of contaminated food or water. Such symptoms may include:

- frequent and watery diarrhea (~6 stools/day, possibly explosive),
- substantial weight loss,
- fatigue,
- abdominal pain,
- vomiting,
- nausea, and/or
- low-grade fever.

Some cases are asymptomatic (without symptoms). The disease is usually self-limiting (symptoms go away after a few days) and is typically not fatal, although there can be a relapse (symptoms return). In severe cases, symptoms can last more than a month if left untreated.

What are the risk groups of *Cyclospora cayetanensis*?

Persons of all ages are at risk for infection. Young children under 12 years of age tend to exhibit symptoms more frequently due to their immature

immune systems. The immuno-compromised and the elderly may exhibit more severe symptoms, while travelers touring in developing countries can be at higher risk of infection. The risk tends to vary with the season, and moderate and rainy climates are the most conducive to infection spread.

Foods associated with cyclosporiasis

Several types of fresh produce from various countries have been implicated as vehicles of transmission. For example, fresh raspberries, snow peas, and mesclun lettuce imported from Guatemala have all been implicated in U.S. outbreaks. The U.S. Food and Drug Administration (FDA) and the Centers for Disease Control and Prevention (CDC) are working with Guatemalan officials to determine the possible modes of contamination. The implication of three different vehicles of infection during 1997 highlights the need for prevention and control measures to ensure the safety of produce that is eaten raw, and the need for an improved understanding of the epidemiology of *Cyclospora*.

Sources of contamination

Little information is available regarding animal hosts and environmental survival time. Oocysts, however, tend to be resistant to adverse conditions and have been known to survive for long periods of time if kept moist. Oocysts must be consumed for the development of cyclosporiasis and are only shed in the fecal matter of an infected host. Thus, fecal contamination of food or water, or any substance that someone may have oral contact with, is the only method of contamination.

Prevention of cyclosporiasis

Individuals should be aware that the only way to prevent disease is to avoid oral contact with contaminated products—there is no vaccination for cyclosporiasis. Food and water should be from treated, reliable sources. The best way to avoid exposure to *Cyclospora* is to avoid food from unsafe sources. Any foods to be eaten raw, such as produce, should be thoroughly washed with potable water before use or consumption, which will decrease, **but will not eliminate** the risk of *Cyclospora*.

transmission. Travelers to resource-poor countries or other areas with sub-standard effluent treatment facilities should be advised to follow precautions as found in the CDCs “Yellow Book,” Health Information for International Travel.

The risk of transmitting *C. cayetanensis* from a market or production facility can be considerably decreased by strictly following sanitation and hygiene guidelines set forth by the Food and Drug Administration. These guidelines include the FDA Food Code, current Good Manufacturing Practices (cGMPs) and Sanitation Standard Operating Procedures (SSOPs) for food handling and storage. More information can also be obtained from the Florida statutes for retail food establishments, which can be found at <http://www.leg.state.fl.us/statutes>, Title 29: Chapter 381, and Title 33: Chapter 509.

Personal hygiene

Proper hand washing is of utmost importance in avoiding transmission of any true foodborne disease and as a good general sanitary practice, both personal and professional. **The major cause of foodborne illness in retail establishments comes from poor personal hygiene, particularly the lack of proper hand washing.**

Good personal hygiene and sanitation practices are THE most important factors in preventing foodborne illness!

Dirty hands contaminate food. Although hands may look clean, the microorganisms that cause illness are too small to be seen. Therefore, whenever preparing food, contact with items that are not a part of the assembly process should prompt immediate hand (re)washing. The same is true even when wearing gloves.

There is NO Five-Second Rule When it Comes To Food Safety!

When you should wash your hands

Millions of germs can be transferred on contact. Here is a list of times when you should wash your hands, even when wearing gloves:

- Before handling, preparing, or serving food
- Before handling clean utensils or dishware
- After using the restroom;
- After touching your face, cuts, or sores;
- After smoking, eating, or drinking;
- After handling raw meat—especially poultry;
- After touching unclean equipment, working surfaces, soiled clothing, soiled wiping cloths, etc.; and
- After collecting and taking out the garbage.

What is the proper procedure for hand washing?

1. Wet your hands with warm water.
2. Apply soap and wash your hands for 20 seconds.
 - Pay attention to hard-to-reach areas like knuckle creases, between fingers and under finger nails
 - Include the forearm past the wrist as you wash
3. Rinse and then dry with a single-use paper towel.

Other ways to minimize risk

- Use and drink purified water (municipal water, bottled water, etc.), especially when visiting developing countries or where water supplies are under less rigorous sanitary programs. Water can be purified by boiling, if necessary.
- Peel, cook, or wash fruits and vegetables, even prepackaged salads, before serving or processing.
- For processing, only use potable water from treated municipal water supplies.
- Do not use untreated manure as a fertilizer for fruits and vegetables. USDA National Organic Program specifies regulations regarding time

table associated with composted manure under section 205, subsection 203.

- Sewage sludge application for agriculture purposes is also regulated by the Code of Federal Regulations, section 503.15.
- Irradiation may be of value in eliminating parasites like *Cyclospora* from fresh produce; consider this as a possible step in production.

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