CASE REPORT

A 26-year-old man from Mexico City had clinical manifestations of illness after a five-day stay in Lima, Peru. Six months later in Mexico, he was given a diagnosis of infection with *Cyclospora cayetanensis* by using coproparasitoscopic serial tests. He was treated twice with nitazoxadine successfully.

**DISCUSSION**

*Cyclospora cayetanensis* is an emerging protozoan pathogen that causes an acute or chronic diarrheal disease known as cyclosporiasis, which can affect immunocompetent and immunocompromised (infected with human immunodeficiency virus) humans. Cyclosporiasis was firstly described and related to a coccidian in feces of patients with diarrhea in 1979 by Ashford.

After the studies of Ortega and others, the taxonomic classification of *C. cayetanensis* was determined. These investigators induced sporulation of so-called cyanobacterium-like bodies by using potassium dichromate solution. It was observed that these microorganisms contained two sporocytes per oocyst; inside of each sporocyte were two sporozoites. Consequently, the new species was systematically classified within the phylum Apicomplexa, placing the parasite in the coccidian genus *Cyclospora*. The species designation *C. cayetanensis* was proposed because the research studies were first performed at University of Lima, Peru (Cayetano Heredia University).

This cosmopolitan apicomplexan parasite is endemic to countries such as Nepal, Haiti, Guatemala, and Peru. However, it can also be found as an enteropathogen that causes traveler’s diarrhea. This condition has been associated with intake of fruits, such as strawberries or raspberries, and...
with different types of green vegetables such as lettuce contaminated with *C. cayetanensis* sporulated oocysts.\(^5\) *C. cayetanensis* is an obligate intracellular protozoan that has an enteropapillary and direct life cycle, combined with asexual (merogony or schizogony) and sexual reproduction (gametogony), respectively.\(^5\)

The asexual cycle is initiated by ingesting sporulated oocysts from contaminated water, fresh vegetables, or food. In the duodenum, oocyst excystation occurs and results in formation of four invasive sporozoites that adhere and penetrate the enterocyte membrane of the small intestine. These sporozoites undergo an initial (first) merogony inside a parasitophorous vacuole located in the luminal pole of infected host cells\(^6,7\) and give rise to type I meronts containing 8–12 merozoites. Merozoites then rupture infected host cells and are released. At this stage, they can infect other enterocytes, initiating the second merogony.\(^5\)–\(^7\)

Type II meronts develop into four merozoites. After they are released from enterocytes, these merozoites begin so-called sexual reproduction. Each daughter merozoite differentiates into a male microgamont or female macrogamont. Male microgamonts produce many microgametes, each of which is capable of fertilizing a mature macrogamont. After syngamy, newly formed oocysts will be formed and shed with the feces.\(^5\)\(^,\)\(^6\)

Newly released oocysts are unsporulated. At this stage, they are unable to cause human infections because an internal sporoblast, instead of sporozoites with sporozoites, is found in freshly passed oocysts and because sporulation occurs only under specific environmental conditions (high temperature and humidity). In general, the mode of transmission is through ingestion of sporulated oocysts present in contaminated food or water.\(^7\)

The prepatent period of *C. cayetanensis* is variable and short (average = 7 days). Sometimes, especially in disease-endemic areas, cyclosporiasis does not have any symptoms (in healthy carriers).\(^8\) When clinical manifestations are present, prodromes begin with 1 or 2 days of malaise and fever. Subsequent symptoms include abrupt watery diarrheal episodes, with 4–10 bowel movements per day that are abundant and contain mucus. Initially, there is no blood in the feces. Blood appears in lower quantities subsequently after onset of initial symptoms. Similarly, asthenia, as well as abdominal pain, nausea, vomiting, anorexia and flatulence, are reported frequently.\(^7\)

Episodes of signs and symptoms are inconsistent (range = 3 to more than 100 days). Abrupt reduction of symptoms is generally associated with disappearance of oocysts from feces.

Diagnosis of cyclosporiasis by laboratory studies is direct when microscopy is used. Unsporulated oocysts in concentration and flotation CPS tests are observed as hyaline spherules 8–10 μm in diameter, which have a morula or mulberry-like structure composed of 6–9 refractile globules. Modified Ziehl-Neelsen staining identifies oocysts as intense red spherical structures 8–10 μm in diameter.\(^5\)\(^,\)\(^8\)–\(^10\)

Trimethoprim/sulfamethoxazole (160 mg/800 mg), twice a day for seven days, has been prescribed in many studies. If symptoms persist, another treatment for seven days with this drug combination is highly recommended. If oocysts are still found in feces, especially in immunosuppressed patients, who have the most severe symptoms, a 3–7 day treatment should be administered for 3–4 months.\(^11\)

This case report draws attention to all health professionals to consider *C. cayetanensis* as potential etiologic cause of persistent human enteritis. Although it was described more than a decade ago, cyclosporiasis is still rarely reported in private or public health laboratories. Unawareness of this disease might often lead to misdiagnosis and incorrect treatments. The possible explanation for this problem is lack of information among clinicians and laboratory workers about this protozoan parasite and its impact on public health.

In addition, in many cases clinical manifestations are self-limited and diagnosis can be delayed when patients seek medical attention while they are in a relapse state or have a chronic disease. The medical practice of erroneously administered antibiotics for any diarrheal symptoms should also be considered. Moreover, the unhealthy habit of self-medication or seeking of empiric therapy will exacerbate this condition.

Furthermore, we emphasize that TMP/SMX was not an effective treatment compared with nitazoxanide. Therefore, we suggest nitazoxanide as an alternative treatment for patients with low or null response to TMP/SMX therapy, or if the patient is allergic to TMP/SMX.\(^12\)

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**Figure 1.** Oocyst of *Cyclospora cayetanensis* in an unstained wet mount of stool (A) and in a modified Ziehl–Neelsen-stained fecal smear (B) (Bar = 10 μm).
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