Cyclospora: Key Scientific and Food Safety Considerations

August 2026

<u>*Pathogen*</u>: *Cyclospora cayetanensis* is a human-specific protozoan parasite that differs fundamentally from bacterial foodborne pathogens such as *Salmonella* and *E. coli*. Humans are the only known hosts, meaning contamination originates from human fecal sources rather than animal reservoirs. This distinction has important implications for risk assessment and outbreak investigations, which should focus on human-source contamination pathways such as sewage intrusion, worker hygiene failures, septic system issues, and contaminated water systems rather than wildlife or livestock reservoirs.

A unique feature of *Cyclospora* is that freshly shed oocysts are not immediately infectious. Following excretion by an infected individual, *Cyclospora cayetanensis* is shed as unsporulated, non-infectious oocysts that require approximately 1–2 weeks of maturation (sporulation) under favorable warm environmental conditions before becoming infectious to a new host. Sporulation is most likely affected by soil chemistry, temperature, humidity and UV light. As a result, environmental persistence becomes a critical component of transmission. Water, soil, equipment, and other environmental reservoirs can serve as vehicles for contamination long after the initial contamination event, making *Cyclospora* fundamentally different from many bacterial foodborne pathogens.

<u>*Routes of Contamination*</u>: Water is considered one of the most important transmission pathways. Contaminated irrigation water, produce wash water, sewage-impacted water, pesticide-mixing water and other environmental water sources are frequently implicated in outbreak hypotheses. Once present in the environment, oocysts can survive long enough to sporulate and subsequently contaminate produce directly or indirectly through water, soil, equipment, or handling activities. Available evidence suggests that robust agricultural water management remains one of the most important preventive controls for reducing *Cyclospora* risk.

<u>*Outbreaks, Investigation, and Surveillance Limits*</u>: *Cyclospora* outbreaks are particularly difficult to investigate because of the parasite's relatively long incubation period, which is commonly several days to two weeks after exposure. This delay complicates epidemiological investigations because ill individuals often struggle to accurately recall foods consumed during the relevant exposure period. The prolonged interval between exposure and symptom onset, combined with complex produce supply chains, creates substantial challenges for traceback and source attribution activities.

The true burden of illness is also likely greater than reported case counts suggest. In fact, the CDC did assign *Cyclospora* an underdiagnosis multiplier of 83.1, that is for every lab-confirmed case, the model assumes roughly 83 people become infected and are never counted. Many infected individuals may not seek medical attention, and routine stool diagnostics do not always test for *Cyclospora*. Consequently, confirmed cases represent only a fraction of actual illnesses occurring in the population, complicating efforts to assess the full magnitude of outbreaks.

Surveillance and source attribution are further hindered by technical limitations in available laboratory methods. Unlike bacterial pathogens, *Cyclospora* cannot be readily cultured in laboratory systems. Detection methods exist but remain challenging, and genetic characterization tools are less mature and less widely deployed than bacterial whole-genome sequencing approaches. Consequently, linking clinical cases, environmental findings, and food sources remains difficult, often delaying outbreak resolution and identification of specific contamination sources.

These analytical limitations also highlight the shortcomings of relying on finished-product testing as a primary control strategy. Because detection remains difficult and contamination may be sporadic and low-level, negative test results should not necessarily be interpreted as evidence that a product or production system is free of risk. The discussion reinforces the importance of preventive controls that address contamination sources rather than dependence on end-product verification.

A key observation is that large seasonal increases in *Cyclospo*ra illnesses may not represent a single outbreak or commodity source. Multiple contamination events, commodities, or growing regions may contribute simultaneously to elevated illness rates, making it difficult to distinguish individual outbreaks and identify common sources. This complexity makes outbreak investigations and public health response challenging.

There remains a need for continued surveillance, research, and improved detection capabilities to better understand environmental transmission pathways and inform risk management strategies.

Pathogen Control: *Cyclospora* should be viewed primarily as a human-sourced environmental contamination hazard. Effective risk management depends on preventing fecal contamination of agricultural water, growing environments, equipment, and produce. Available scientific evidence indicates that *C. cayetanensis* oocysts are relatively resistant to several interventions commonly used to control bacterial foodborne pathogens, particularly routine chemical disinfection and produce washing. In general,

washing produce is recommended as good consumer practice but should not be considered as a validated means of inactivating *Cyclospora* in commercial operations. Similarly, chlorine and other sanitizers commonly used for microbial control appear to have limited efficacy against *Cyclospora* oocysts. AFFI's guidance on processing water basics is available here. Consequently, preventive measures aimed at avoiding contamination are generally more important than post-contamination mitigation strategies.

One notable exception in the frozen sector is blanching; a thermal treatment routinely used in frozen vegetable processing. Because *Cyclospora* is susceptible to heat, blanching is expected to inactivate oocysts and following on-package validated cooking instructions can also ensure safe consumption.

Role of Freezing and Frozen Storage: As noted by health authorities, no *Cyclospora* outbreaks have been linked to commercially frozen produce. Yet, from a frozen food perspective, refrigeration and freezing should not be assumed to eliminate *Cyclospora*. Indeed, historical outbreaks have been associated with commodities entering frozen supply chains, including berries, and available evidence suggests the parasite can survive conditions encountered during refrigerated and frozen storage. Therefore, prevention of contamination before harvest, during harvest, and throughout processing remains the most effective control strategy. At the current time, until more research is conducted, reliance on freezing as a pathogen reduction step is not scientifically supported.

Important Notice: This document provides general information and guidance about the parasitic pathogen *Cyclospora cayatenensis*, but is neither intended as, nor does it constitute legal advice. For questions about this guidance, please contact Savana Everhart Nunn (severhartnunn@affi.com); Sanjay Gummalla (sgummalla@affi.com).

Acknowledgements: This effort was partially supported by the National Institute of Food and Agriculture grant 2024-67017-42441 (*SG*). The contents of this paper are solely the responsibility of the authors and do not necessarily represent the official views of the U.S. Department of Agriculture (USDA AFRI/NIFA: 2024-67017-42441).