



CYCLOSPORA EDUCATIONAL SEMINAR

05
MONTH

13
DAY

21
YEAR



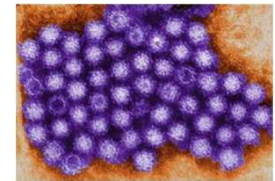


Cyclospora cayetanensis: A Brief Introduction

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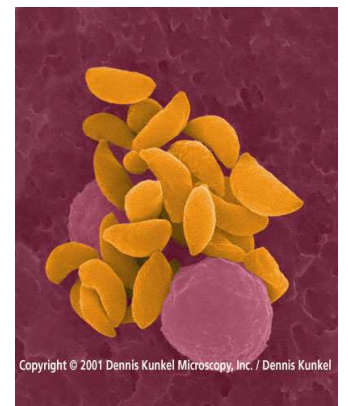
Microorganisms of Concern in Fresh Produce

- Bacteria
 - *Salmonella*, toxigenic *E. coli*,
Shigella, *Listeria monocytogenes*
- Viruses
 - Norovirus, Hepatitis A
- Parasites
 - *Giardia*, *Cryptosporidium*,
Cyclospora, *Toxoplasma*



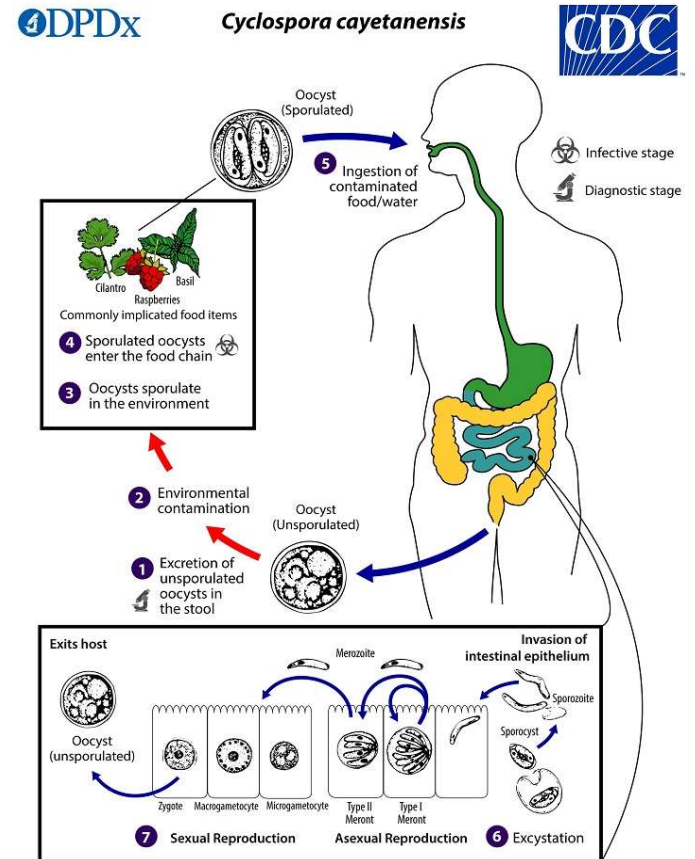
Parasites

- Unicellular
- More highly organized than bacteria
- Do not multiply in foods
- Animal-like in cell composition
- Some are parasitic in nature
 - Need a host (foodborne)
- Food & Water associated parasites
 - *Giardia lamblia*, *Entamoeba histolytica*,
Toxoplasma gondii,
Cryptosporidium parvum,
Cyclospora cayatenensis



Cyclospora cayetanensis

- It is protozoan parasite
- It appears that all human cases are caused by this species; no animal reservoirs for *C. cayetanensis* have been identified
- If *C. cayetanensis* is present, then a human reservoir must be present



<https://www.cdc.gov/parasites/cyclosporiasis/biology.html>



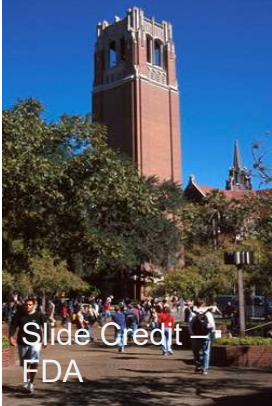
Unique Outbreak Characteristics

- No real-time genetic subtyping methods to link illnesses, food or environmental samples during outbreaks
- Number of cases typically rise during the spring and summer, usually in May, June and July in the U.S.
- Cannot grow in a laboratory, which makes research, such as on strategies for elimination, more challenging



Recent Outbreaks in the US

	2018	2019	2020
Total Laboratory Confirmed Illnesses (not associated with international travel)	2,299	2,408	1, 241
Associated with Produce	511 (fresh salad mix) 250 (fresh-cut vegetable tray)	241 (fresh basil)	701 (Bagged salad mix)



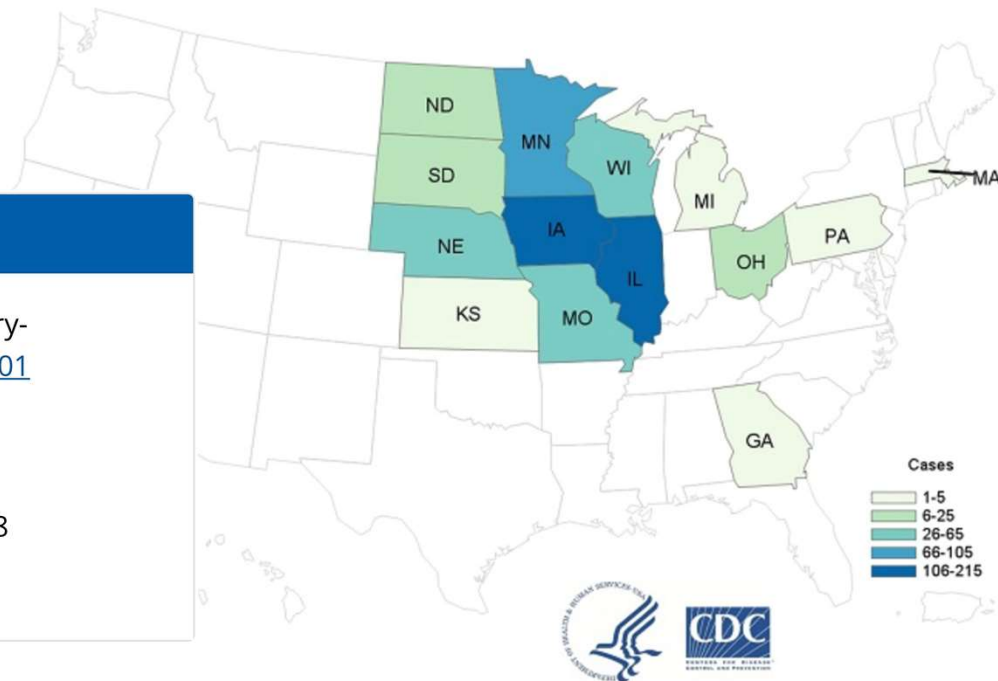
Slide Credit —
FDA

2020 Outbreak of *Cyclospora* Infections Linked to Bagged Salad Mix

State of residence for people with *Cyclospora* infections included in the outbreak investigation, as of September 23, 2020 (n=701)*

At a Glance

- Reported laboratory-confirmed cases: [701](#)
- States: [14](#)
- Deaths: 0
- Hospitalizations: 38
- Recall: [Yes](#) 



*Data are current as of September 23, 2020. The ill person from Georgia purchased and ate a bagged salad product while traveling in Missouri.

<https://www.cdc.gov/parasites/cyclosporiasis/outbreaks/2020/index.html>



Cyclospora cayetanensis Update

Food and Drug Administration

May 2021



Polling Question #1

1. *Cyclospora cayetanensis* is...
 - a. Bacterial foodborne pathogen
 - b. A viral foodborne pathogen
 - c. A parasitic protozoan foodborne pathogen
 - d. None of the above



Misconceptions around *C. cayetanensis* Sources/Routes

- ~~Infective immediately after shed in feces~~ **Not True!**
- ~~Infection is always self-limiting , and not a public health priority~~
- ~~Just a childhood illness~~ **Not True!** **Not True!**
- ~~Spread through meat~~ **Not True!**
- ~~Only imported produce is at risk of contamination~~ **Not True!**
- ~~Animals are a reservoir/source of contamination~~ **Not True!**
- ~~Only harvesters or packing employees can contaminate their environment~~ **Not True!**
- ~~Direct/immediate contact by an ill worker is what leads to illness with cyclosporiasis~~ **Not True!**



Misconceptions around *C. cayetanensis* Control

- ~~Antimicrobials can help control *C. cayetanensis* in water sources~~ Not supported!
- ~~Antimicrobials in water will disinfect produce from *C. cayetanensis* contamination~~ Not True!
- ~~Sanitizer in latrines will control/eliminate *C. cayetanensis*~~ Not True!
- ~~Carbon filters may be an effective control against *C. cayetanensis*~~ Not supported!
- ~~*C. cayetanensis* can be eliminated from surfaces & environment using routine cleaning/sanitizing methods~~ Not True!
- ~~Thorough washing fruits and vegetable could eliminate the risk of *C. cayetanensis* transmission~~ Not True!



Polling Question #2

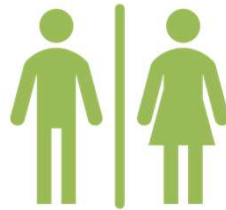
What are the known hosts for *Cyclospora cayetanensis*?

- a. Cats
- b. Reptiles
- c. Rats
- d. People

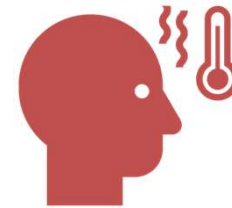
Potential Sources of Contamination



Portable toilets



Other sources
of sewage



(Feces of) Ill
workers



Potential Routes of Contamination

- Agricultural Water Sources & Distribution Systems
 - Irrigation water
 - Water used for pesticide sprays
 - Used during harvest
 - Post-harvest water (e.g., packing, washing)
- Worker hands and clothing (such as boots, smocks, and gloves)
- Tools & Equipment (e.g., harvest tools, equipment)
- Consider potential for cross-contamination between produce/food



Polling Question #3

- How does cyclosporiasis spread?
 - a. Direct contact with infected person
 - b. Through contact with infected animals
 - c. By ingesting contaminated food or water
 - d. Unknown

Canal adjacent to crops



Photo: shared with permission from University of Florida

Aerial of citrus farm and canals



Photo: shared with permission from University of Florida

Irrigation pump



Photo: shared with permission from University of Florida

Canal with pump, filling spray rig



Photo: shared with permission from University of Florida



Polling Question #4

- When assessing risks for *C. cayetanensis*, I should concentrate on:
 - a. Workers; toilets/handwashing facilities; workers' boots, clothing and gloves; tools and equipment; sewage systems and agricultural water sources and distribution systems.
 - b. The weather
 - c. Animals
 - d. The day of the week I am harvesting



What questions would you ask when assessing for risk of *C. cayetanensis* from...

- Agricultural Water Sources & Distribution Systems
 - Is there potential for human waste to contaminate agricultural water sources/distribution systems ***on-farm***?
 - e.g., sewage or discharge from latrines
 - Is there potential for human waste to contaminate agricultural water sources/distribution systems ***off-farm***?
 - e.g., sewage or discharge from latrines
 - Are systems that convey water adequately protected from being contaminated with sewage?



What questions would you ask when assessing for risk of *C. cayetanensis* from...

- Sewage Systems?
 - Are sewage systems well maintained? Recently modified?
 - Are you aware of any spills or leaks of human waste/sewage systems near your operation or water systems?
 - Are any spills or leaks in human waste managed in a way to prevent contamination?
 - Are septic systems evaluated after any significant event (such as hurricanes) to ensure systems are still functional?
 - Is there a waste/sewage treatment facility in close proximity to the farm and/or water sources?



What questions would you ask when assessing for risk of *C. cayetanensis* from...

- Adjacent and nearby land use?
 - Consider proximity of the following to (directly or indirectly) contaminate your operation or water sources (eg., runoff)
 - Improperly maintained septic systems or portable toilets
 - Notice of sewage spills in the area
 - Land application practices
 - e.g., wastewater, gray water
 - Wastewater treatment facilities
 - Recreational activities
 - e.g., RVs, boats, campsites, swimming
 - Landfills
 - Encampments
 - e.g., homeless, refugees



What questions would you ask when assessing for risk of *C. cayetanensis* from...

- Toilets/Handwashing Facilities?
 - Are toilets/handwashing facilities readily available to workers?
 - Are toilets/handwashing facilities cleaned and adequately maintained?
 - Do toilets/handwashing facilities provide for sanitary disposal of waste and toilet paper?
 - Are handwashing facilities stocked with soap, running water, and drying devices?
 - Is waste being disposed of into an adequate sewage system or other adequate means?



What questions would you ask when assessing for risk of *C. cayetanensis* from...

- Workers?
 - Are workers (and visitors) properly using toilet facilities, including proper disposal of toilet paper?
 - Are workers (and visitors) consistently and properly washing their hands after using the toilet?
 - Are ill workers being excluded from working in the operation?
 - Are ill visitors excluded from the operation?
 - Are workers notifying supervisors if ill?
 - Did ill workers receive treatment?



What questions would you ask when assessing for risk of *C. cayetanensis* from...

- Workers' Boots, Clothing & Gloves?
 - Is there potential for workers' boots, clothing, or gloves to be contaminated with human feces directly?
 - On-farm, or off-farm?

 - Is there potential for workers' boots, clothing, or gloves to be indirectly contaminated with human feces?
 - On-farm, or off-farm?

 - Are workers properly using or re-using gloves?



What questions would you ask when assessing for risk of *C. cayetanensis* from...

- Tools and Equipment?
 - Is there potential for tools and/or equipment to be contaminated with human feces directly?
 - Is there potential for tools and/or equipment to be indirectly contaminated with human feces?
 - For example, by contaminated water during washing





Tomato flume



Photo: shared with permission from University of Florida



What can the farmer do?

- Evaluate operations for potential sources and routes of contamination with *Cyclospora* during:
 - Pre-harvest
 - Harvest
 - Post-harvest
- Continue to implement GAPs:
 - Assess your water systems and lands adjacent to water systems for potential contamination sources (e.g., landfills, sewage or septic systems, and land applications of wastewater), including the likelihood of runoff
 - Monitor microbial water quality



What can the farmer do?

- If *Cyclospora cayetanensis* has been detected in your water source, a farmer could consider:
 - Implement root cause analysis
 - work with relevant partners to:
 - determine the potential source(s) and route(s) of contamination
 - implement appropriate prevention and verification measures for risk management purposes
 - Consider using an alternate water source, such as ground water when possible. Acknowledge this may not be feasible option for all farms.
 - Assess whether the water is used in a way that is intended to or directly contacts the harvestable portion of the crop or food contact surfaces during growing, harvesting or post-harvest activities
 - If the answer is “yes”...



What can the farmer do?

- If *Cyclospora cayetanensis* has been detected in your water source:
 - If the water contacted the harvestable portion of the covered produce, that product is considered adulterated.
 - If you continue to use that water source, consider changing the water application method to one that minimizes contact with the harvestable portion of the crop
 - Consider use of protective barriers or staking keep the harvestable portion of produce from contacting water or the ground
 - Do not use potentially contaminated water to wash hands, or clean equipment or tools
 - To evaluate level of risk and determine if preventive measures for *Cyclospora cayetanensis* are effective, consider the use of testing for the presence of *Cyclospora cayetanensis* rather than merely relying on visual observations



What can the farmer do?

- For worker health and hygiene, provide training to workers on:
 - Hygienic practices during pre-harvest, harvest and post-harvest
 - Signs and symptoms of cyclosporiasis, and potential for asymptomatic carriers
 - Importance of seeking diagnosis and treatment



What can the farmer do?

- For waste management:
 - Management of portable toilets and septic systems on farm to ensure they do not serve as a source of contamination for the farm or water systems
 - Identify steps to address any sewage spills or leaks and contact your local public health or waste management authorities for assistance



What are the knowledge gaps related to *Cyclospora cayetanensis*?

- Control measures to eliminate *Cyclospora* once present in environment/produce are not available
- Do not have a genetic method to help link cases or sample positives
- Do not know if oocysts when detected are infective
- Do not know prevalence in the US as many people may not seek care
- Cannot explain the seasonality of infection
- Do not know how prevalent *Cyclospora cayetanensis* is in the food/water/environment



Resources

- FDA Fast Facts for Farmers (Fact Sheet)
<https://www.fda.gov/media/123995/download>
- FDA Cyclospora:
<https://www.fda.gov/Food/FoodborneIllnessContaminants/Pathogens/ucm610936.htm>
- CDC Cyclosporiasis:
<https://www.cdc.gov/parasites/cyclosporiasis/index.html>
- FDA Blog Posting on Cyclospora: <https://www.fda.gov/news-events/fda-voices-perspectives-fda-leadership-and-experts/fda-cdc-develop-robust-strategy-prevent-illnesses-caused-cyclospora>
- Microbiological Surveillance Sampling Update FY18-F19 Fresh Herbs <https://www.fda.gov/food/sampling-protect-food-supply/microbiological-surveillance-sampling-fy18-19-fresh-herbs-cilantro-basil-parsley-and-processed>
- Produce Safety Rule



CPS CYCLOSPORA RESEARCH- \$1.4M (5 YEARS)

The prevalence of Cyclospora in water and produce. PI. Y. Ortega, U. of Georgia. 2020-2021

Cyclospora Prevalence in Irrigation Water in Fresh Produce Growing Regions in Arizona. PI G. Lopez, U. of Arizona. 2019

Cyclospora: Potential Reservoirs and Occurrence in Irrigation Waters. PI G. Lopez, U. of Arizona. 2017-2018

Determination of parasites in bagged salads. Wuertz, U. of Arizona. 2016

CPS CYCLOSPORA RESEARCH- \$1.4M (5 YEARS)

Determination of Physical and Chemical Mechanisms to Prevent Cyclospora Infection. PI S. Lenaghan, U. of Tennessee. 2021-2022

Analysis of the presence of Cyclospora in waters of the Mid-Atlantic states and evaluation of removal and inactivation by filtration. PI K.Kneil, U. of Delaware – 2020

Sources and prevalence of Cyclospora cayetanensis in Southeastern US irrigation water sources and growing environments. PI M. Mattioli, CDC. 2020 – 2021

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Two more projects to be announced

**Fund the science, find solutions and
fuel the change!**

**CYCLOSPORA: RESEARCH FORUM
JUNE 15, 2021**

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AGENDA: [HTTPS://FILES.CONSTANTCONTACT.COM/B2346D4E001/A5BD6AA7-7C8B-4C57-9141-5291439870AF.PDF](https://files.constantcontact.com/B2346D4E001/A5BD6AA7-7C8B-4C57-9141-5291439870AF.PDF)

June 15, 2021 | Special Session

A Forum on *Cyclospora cayetanensis*: What we know, what we don't know and identifying challenges that lie ahead

This forum will provide an update on the science and current thinking on *Cyclospora* and offer practical information on mitigation strategies for growers. It brings together a wide variety of stakeholders, including growers, academics, government agencies, trade associations, and others interested in learning more about this important parasite and in seeking practical solutions to prevent *Cyclospora* contamination and illnesses attributed to produce. This gathering provides a forum for a diverse audience of stakeholders to think together and discuss areas of concern about this important issue in the produce industry.



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QUESTIONS?

