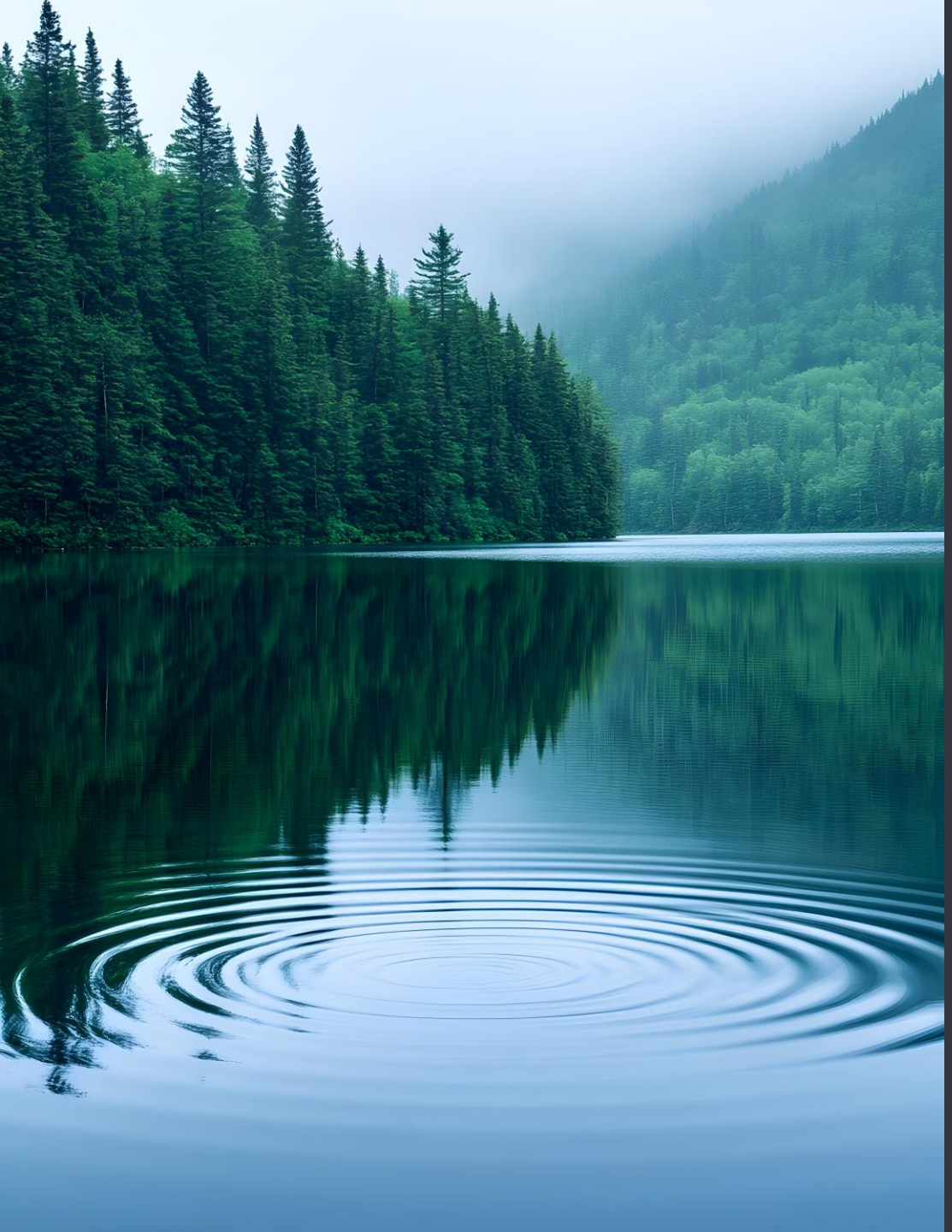

CREATING CLARITY

Lest We Forget: Importance of *Cryptosporidium* and *Giardia*

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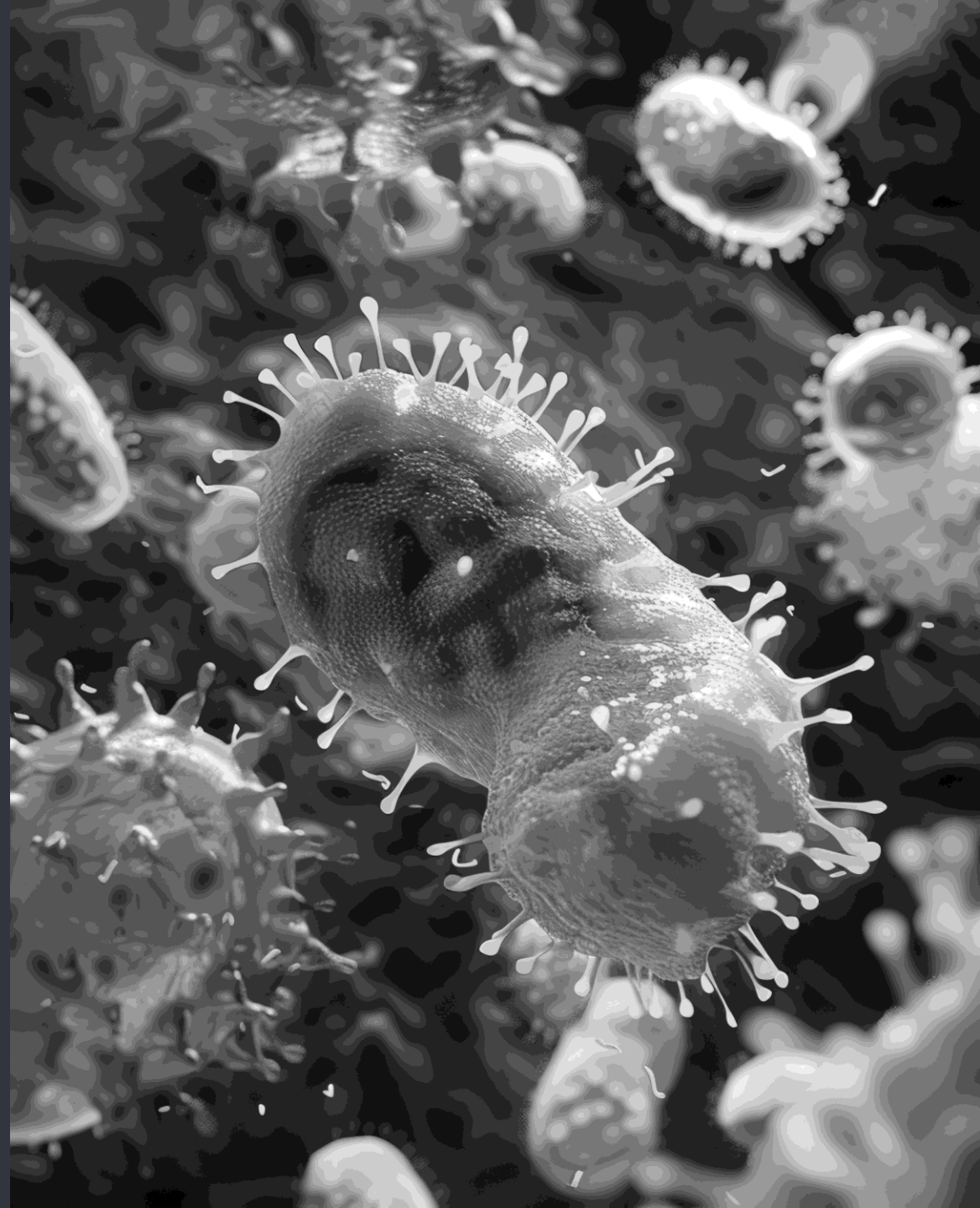
IDEXX Water

Agenda

1. About *Cryptosporidium*/*Giardia* (C/G)
2. EPA response to C/G
3. Where we are today
   + Current outbreaks
4. What utilities and laboratories should do today
5. Q&A

About Cryptosporidium and Giardia:

What they are, where they live, how they affect public health



Cryptosporidium and Giardia

Cryptosporidium

Ubiquitous protozoan parasites that cause gastrointestinal illness

Typically, self-limiting but can be fatal

Giardia

Where Cryptosporidium are found

RIVERS

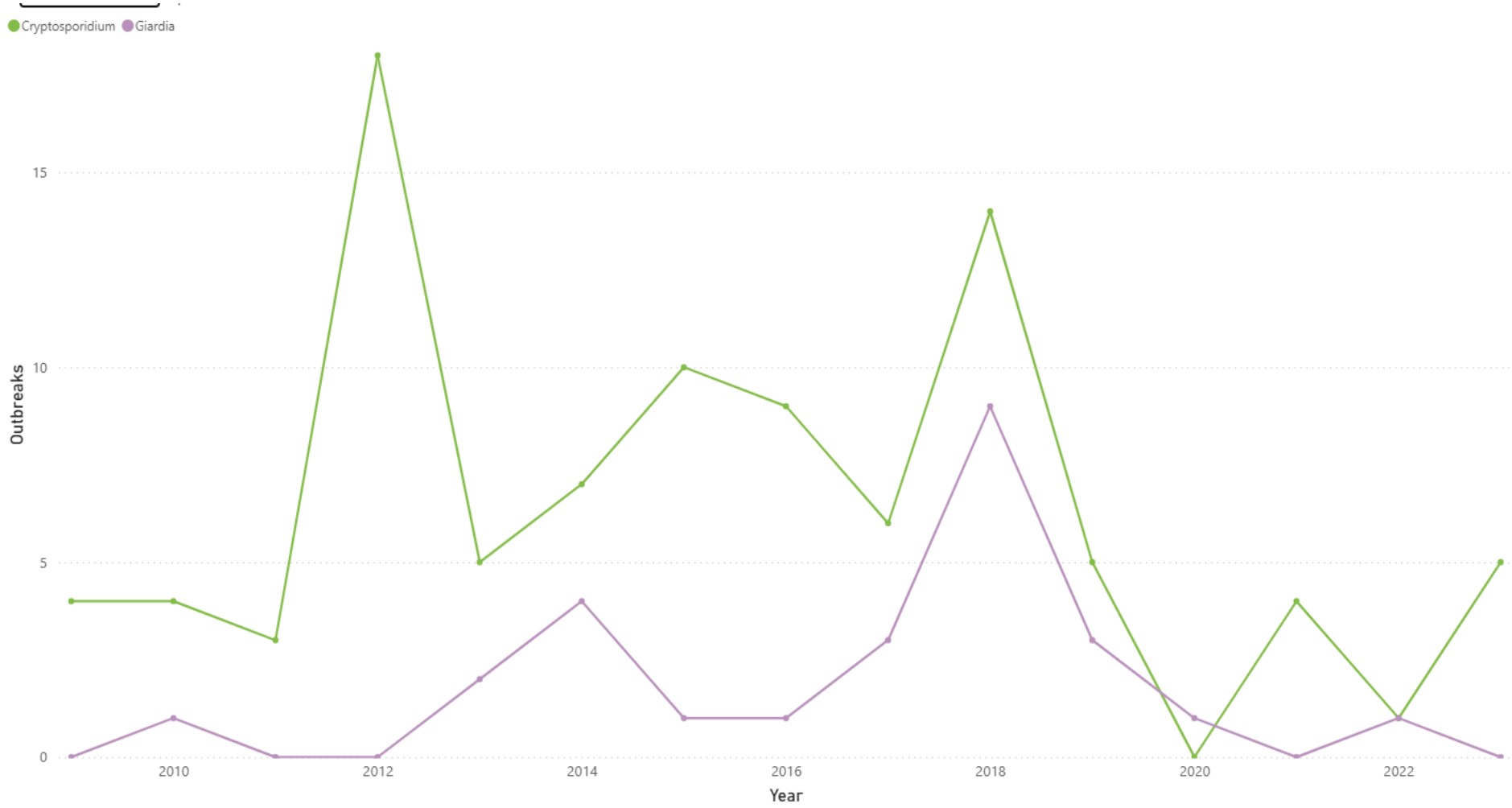
LAKES

DRINKING WATER

THE SEA

POOLS

Cryptosporidium and Giardia outbreaks 2009 -2023



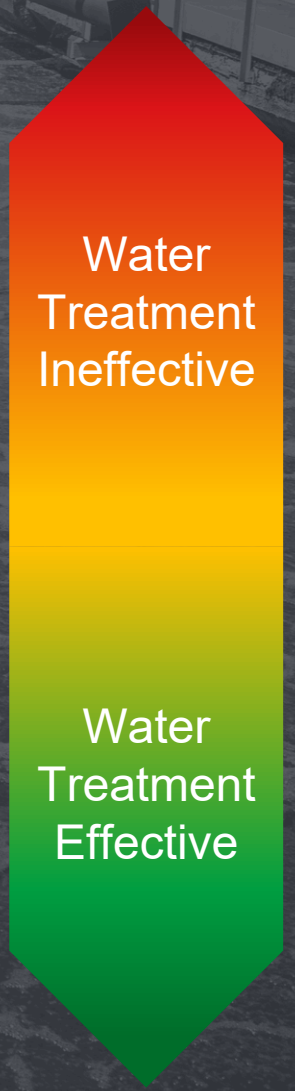
Source: Reported C/G outbreaks [US CDC BEAM/NORS Database]

Reminder about routine water monitoring

01	Routine monitoring is a verification process
02	It verifies that water treatment is effective
03	We typically test for fecal indicators
04	Fecal Indicators = Pathogen Risk
05	No indicators = effective treatment = low risk

The caveat

Protozoan cysts	***Cryptosporidium* oocysts**
	***Giardia* cysts**
Sporulating bacteria	***Clostridium* spores** ***Bacillus* spores**
Viruses	**Rotavirus, polio etc.**
Bacteria	***E. coli*** ***Salmonella***



Milwaukee Cryptosporidiosis Outbreak 1993

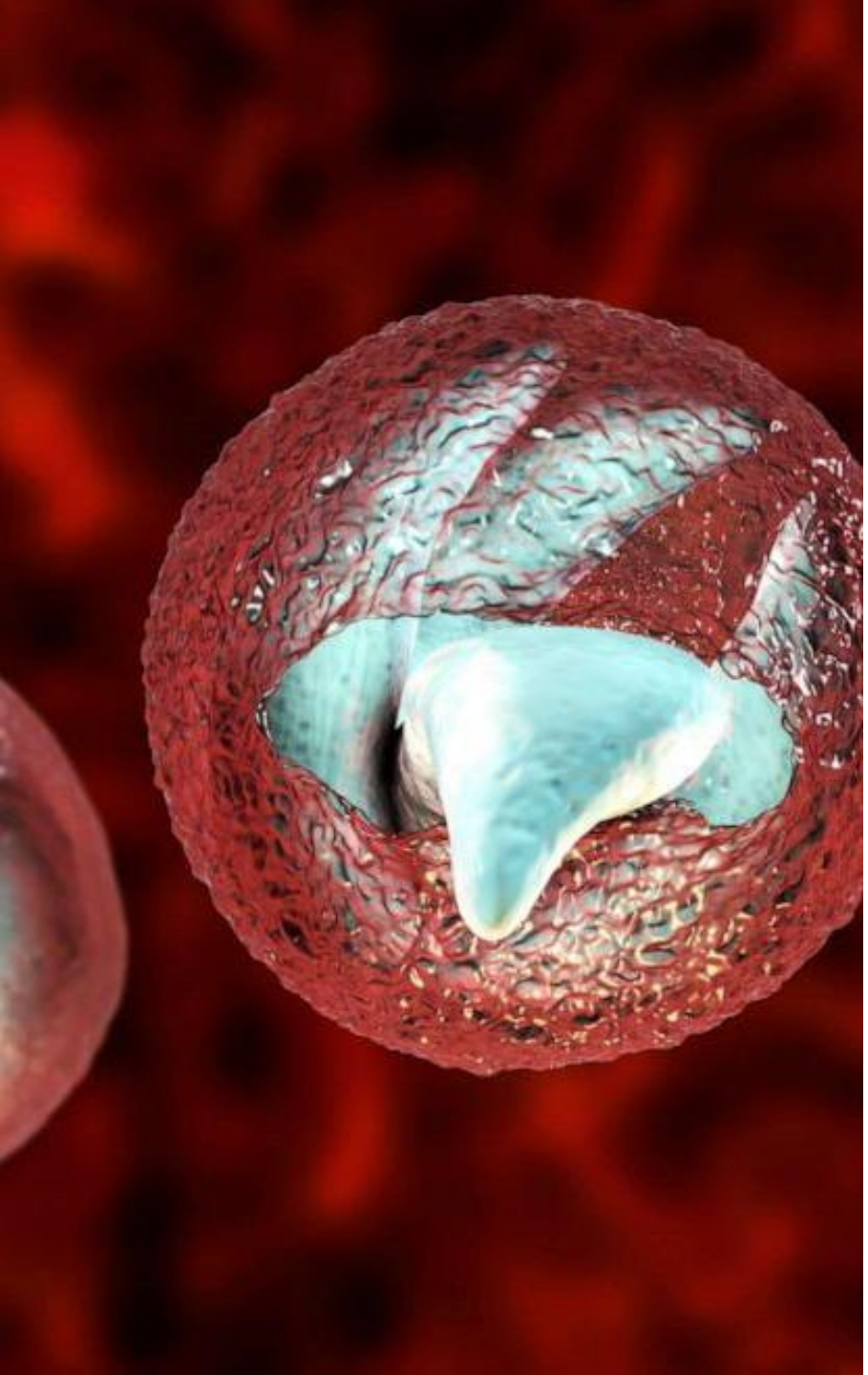

Milwaukee Sentinel

Packer Plus

Boil water, mayor says

Safety of drinking supply probed in wake of mystery epidemic

+ 880,000 people on boil-water notice
+ 403,000 estimated cases of GI illness
+ 69 fatalities
+ $96 million in healthcare costs



Cryptosporidium

Parasite that causes severe diarrhea in humans

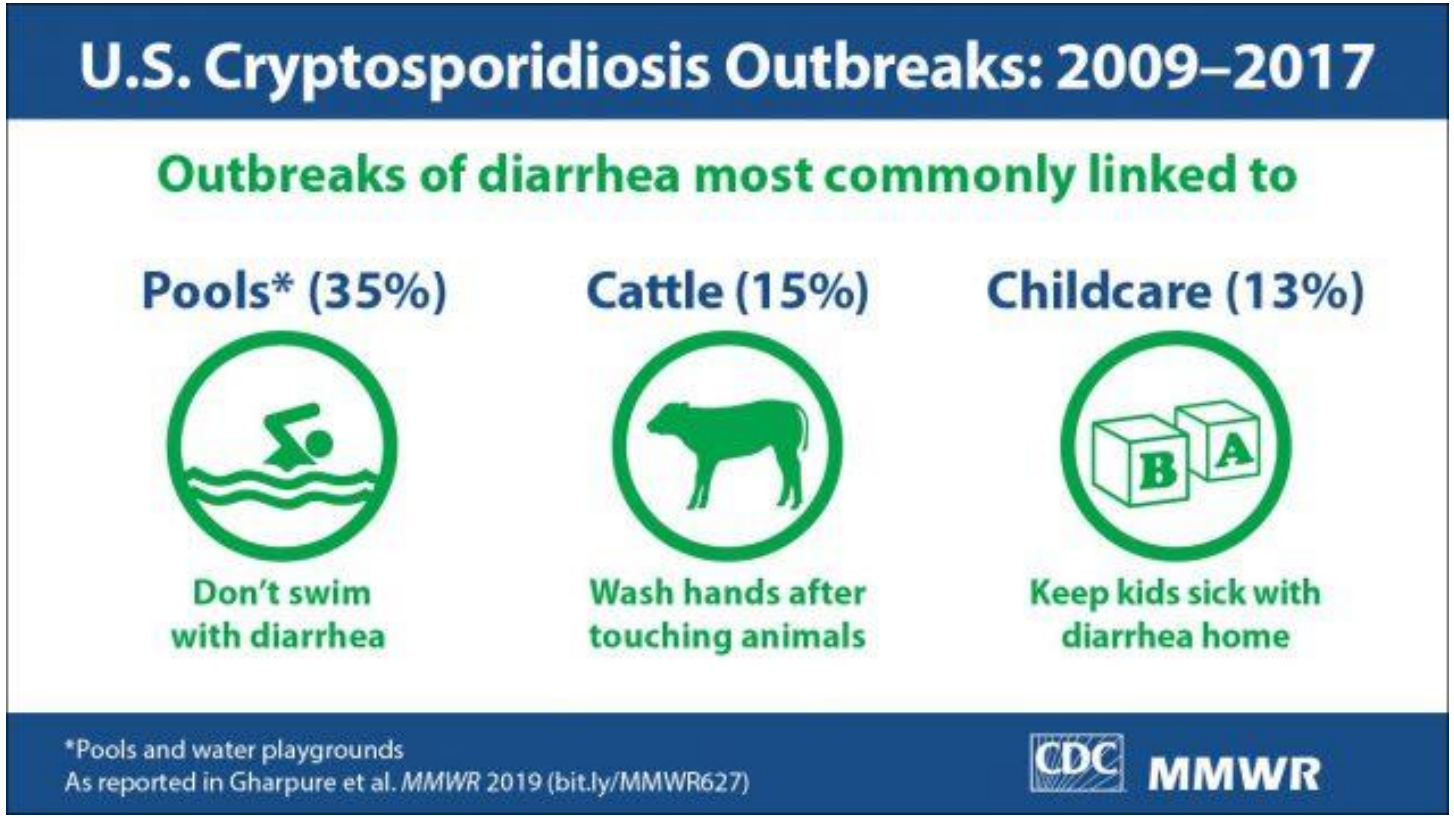
- Disease state is called cryptosporidiosis.
- 26+ types of the parasite exist, including ones that infect humans, cats, dogs, mice etc.
- Cryptosporidium parvum: Is a zoonotic species, transmitted from animal to human.
- Cryptosporidium is the leading cause of waterborne disease among people in the United States.

Source: ABC News: https://abcnews.go.com/Health/summertime-parasite-outbreaks-increasing-year-2009-cdc/story?id=64062638

Cryptosporidium

- Spread through fecal-oral transmission, typically ingesting contaminated recreational water, drinking water, or food, or through contact with infected persons or animals.
- As of 2017, the annual number of reported cryptosporidiosis outbreaks overall increased an average of approximately 13% per year over time.

Common sources of Cryptosporidium oocysts among 444 outbreaks, 2009-2017



Giardia

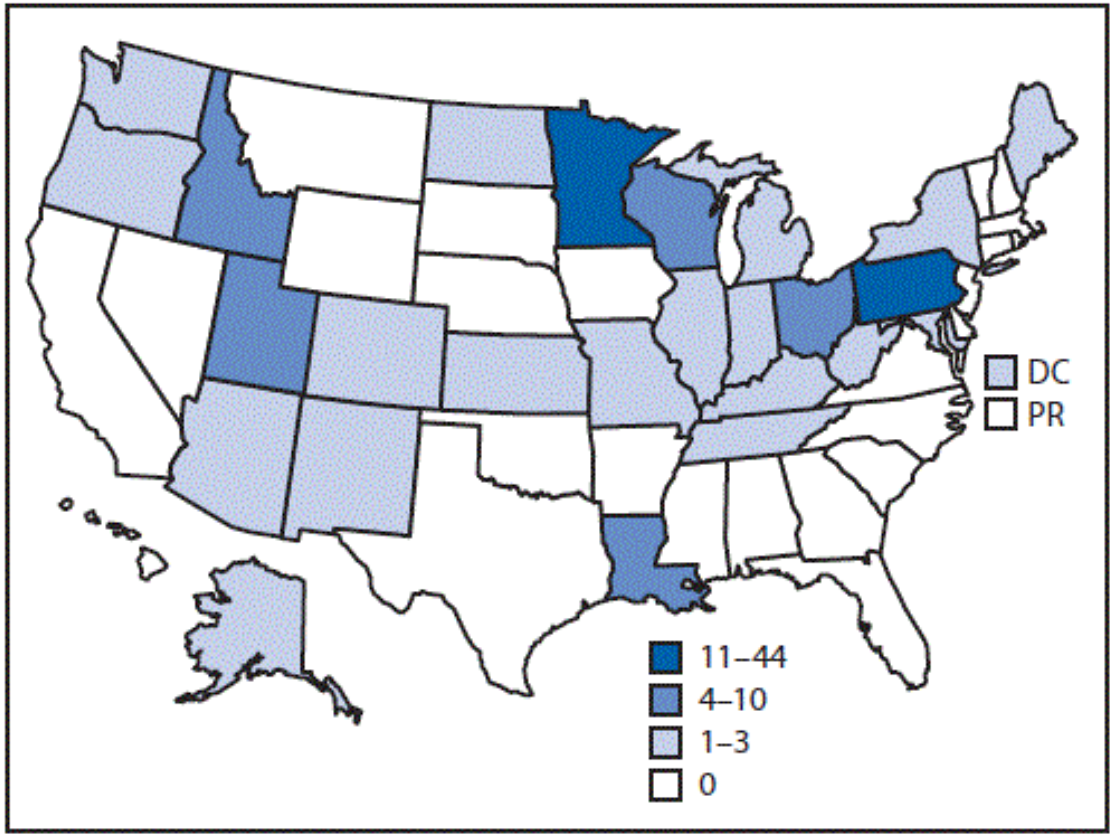
Parasite that causes severe diarrhea in humans

- Disease state is called giardiasis.
- 6 species of the parasite exist, including ones that infect humans, amphibians, rodents and birds.
- Giardia duodenalis: Is the species that infects a wide range of mammals, including humans, and is further divided into assemblages A-H.
- Cysts are transmitted between hosts through the fecal-oral route, contaminated water and/or food.

Giardia

- Giardia cysts are transmitted by fecal-oral route from cysts.
- Giardiasis can result from ingesting from soil (think unwashed food), food, water, surfaces contaminated with feces or from an infected person or animal
- Giardia cysts are very hardy and can survive outside the body for extended periods, making contamination of water, food, surfaces, and objects a significant facto
- Individuals are contagious for as long as they are shedding the parasite in their stool, which can be for weeks or even months

Reported giardiasis outbreaks (N = 111), by state US CDC 2012–2017



Source: US CDC
https://www.cdc.gov/mmwr/volumes/70/wr/mm7009a2.htm#F1_down

Regulation of Cryptosporidium and Giardia – U.S.

January 5, 2006: EPA announced revisions to the Surface Water Treatment Rules that came into effect March 6, 2006 and the Long Term 2 Enhanced Surface Water Treatment Rule (LT2) was established to protect the public from Cryptosporidium and other microbial pathogens.

Rule included:

Source water monitoring for Crypto, *E. coli* for small systems	Treatment by filtered systems with the high Crypto levels	Inactivation of Cryptosporidium by **all unfiltered** systems	Criteria for the use of Crypto treatment and control processes	Covering or treating uncovered water storage facilities

Regulation of Cryptosporidium and Giardia – U.S.

EPA LT2 rule required all unfiltered PWSs to provide at least 2-log (i.e., 99%) inactivation of certain organisms, including Cryptosporidium

EPA established 4 Bins for all systems, based on source water test levels of Cryptosporidium

Bin 1: Cryptosporidium concentration < 0.075 oocysts/L

Bin 2: Cryptosporidium concentration 0.075 to < 1.0 oocysts/L

Bin 3: Cryptosporidium concentration 1.0 to < 3.0 oocysts/L

Bin 4: Cryptosporidium concentration > 3.0 oocysts/L

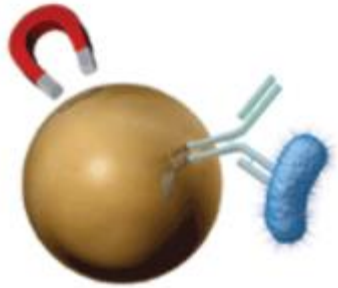
Methodology is Complex

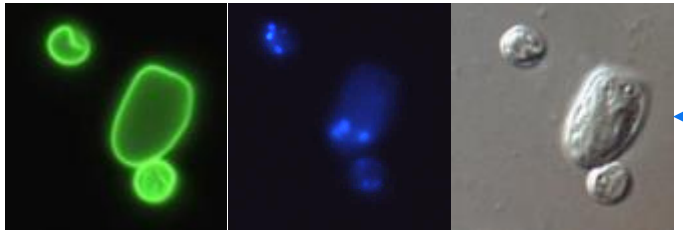
Collection

Elution

Concentration

Purification





Visualisation

Enumeration

Outcome of Cryptosporidium and Giardia Regulatory Actions

- **Reduced incidence of cryptosporidiosis:** The EPA estimates that full compliance with the rule could prevent 89,000 to 1,459,000 cases of cryptosporidiosis per year, leading to a reduction of 20 to 314 premature deaths.

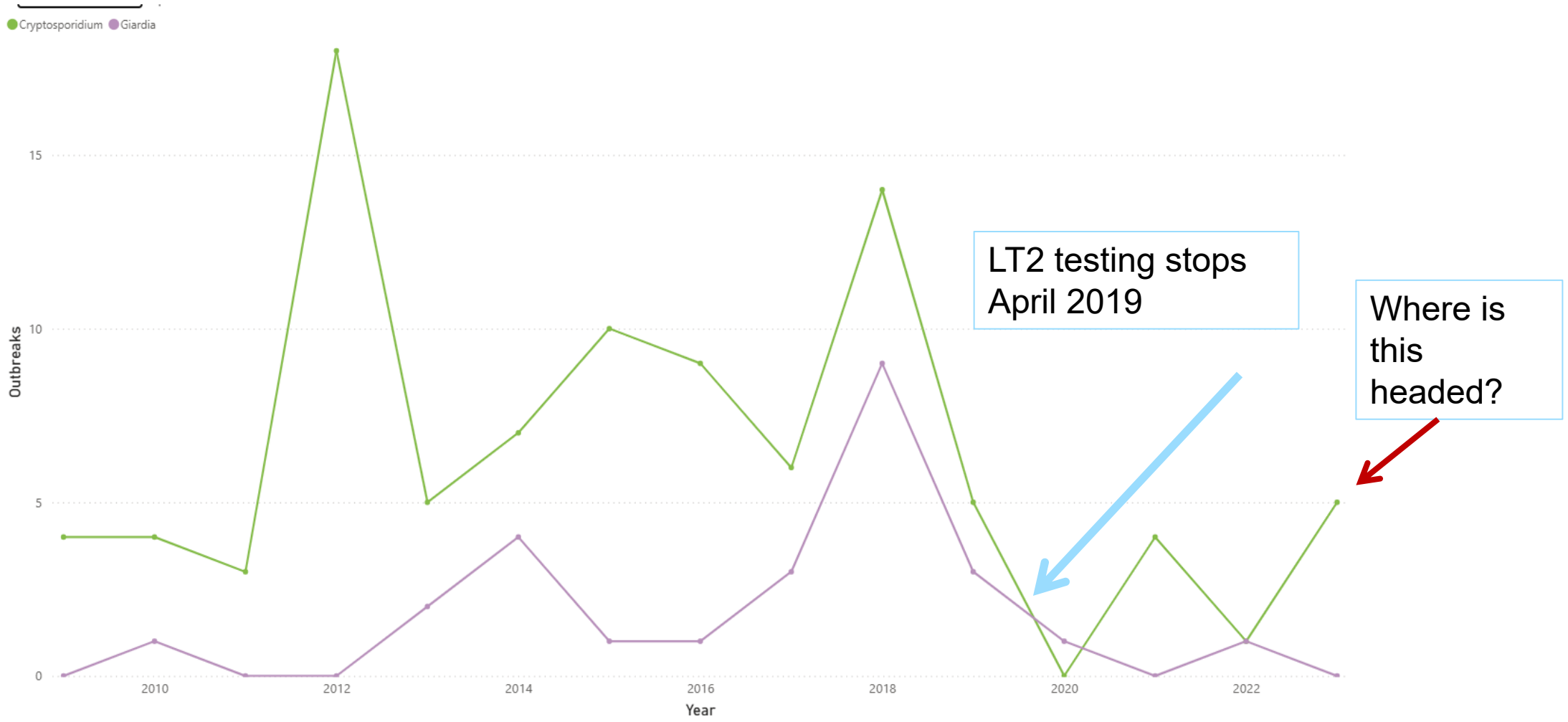
- **Targeted treatment for Cryptosporidium:** The rule requires surface water systems to monitor source water for Cryptosporidium and implement additional treatment, if necessary, based on monitoring results.

- **Protection from other pathogens:** LT2 emphasis on Cryptosporidium treatment **also helps reduce exposure to other harmful microbes like Giardia**.

Outcome of Cryptosporidium and Giardia Regulatory Actions

- **Improved disinfection practices:** The rule includes provisions for improving disinfection practices and for managing risks associated with uncovered finished water reservoirs.
- **Risk-based approach:** The rule required systems to monitor their source water and classify themselves into risk categories (bins) based on Cryptosporidium levels, with higher risk systems needing additional treatment.
- **"Microbial Toolbox" options:** Systems in higher risk categories (Bins 2, 3, and 4) can choose from various treatment and management strategies (microbial toolbox options) to meet the required Cryptosporidium reduction goals.
- **Maintained microbial protection:** The rule ensures that systems maintain microbial protection while taking steps to reduce disinfection byproducts, addressing potential risk-risk trade-offs.

Cryptosporidium and Giardia outbreaks 2009 -2023



Source: Reported C/G outbreaks [US CDC BEAM/NORS Database]

Cases of Cryptosporidiosis

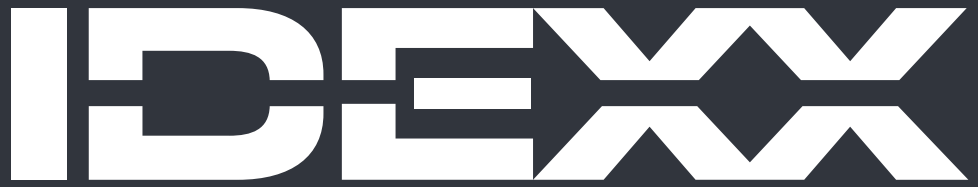
- Cases decreased until 2018, but then started to rise again
- Drinking water systems have risk-reduction processes in place, but not required to test

QUESTION: Should we be encouraging drinking water systems to periodically test as validation of their processes?

Lest we forget

- **April 2024:** Georgia Water Park; 119 cases
- **August 2024:** Yellowstone County, Montana, at least 71 confirmed
- **Spain** has seen a substantial rise in cryptosporidiosis cases since 2023, with an incidence six times higher than the median of previous years
- **The UK:** experienced a significant rise in cryptosporidiosis cases since August 2023
- **Wales:** A Cryptosporidium outbreak in 2024 linked to a petting farm in Wales has sickened over 70 people
- **Australia:** NSW recorded nearly 500 cases of cryptosporidiosis in 2024, a 500% increase compared to the previous five-year average

Questions & Discussion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