

Long Term 2 Enhanced Surface Water Treatment Rule (LT2) *Cryptosporidium* Monitoring

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THE WATERWORKS FLU

A tiny parasite gets the blame for making thousands of Milwaukeeans miserable

By J. MADELEINE NASH CHICAGO

ONLY THE MICROBIOLOGISTS WERE happy last week as Milwaukee turned into a bio-laboratory for anyone

first outbreak of cryptosporidiosis in this country, nor is it likely to be the last. Indeed, Walter Jakubowski, a parasitology expert for the Environmental Protection Agency, believes that most surface water is now contaminated with the "It's so widespread," you just can't

located about three miles away from the river's mouth. Possibly a problem, except for filtration

**MILWAUKEE
409,000 PEOPLE INFECTED
Cryptosporidium**

any cryptosporidiosis parasite versions of this pesky protozoan can be removed only through filtration. Unlike bacteria, they are not readily killed by chlorine. Furthermore, the tests that water-purification plants routinely rely on to



Municipal water was fabled, so city residents lined up to fill jugs with clean well water



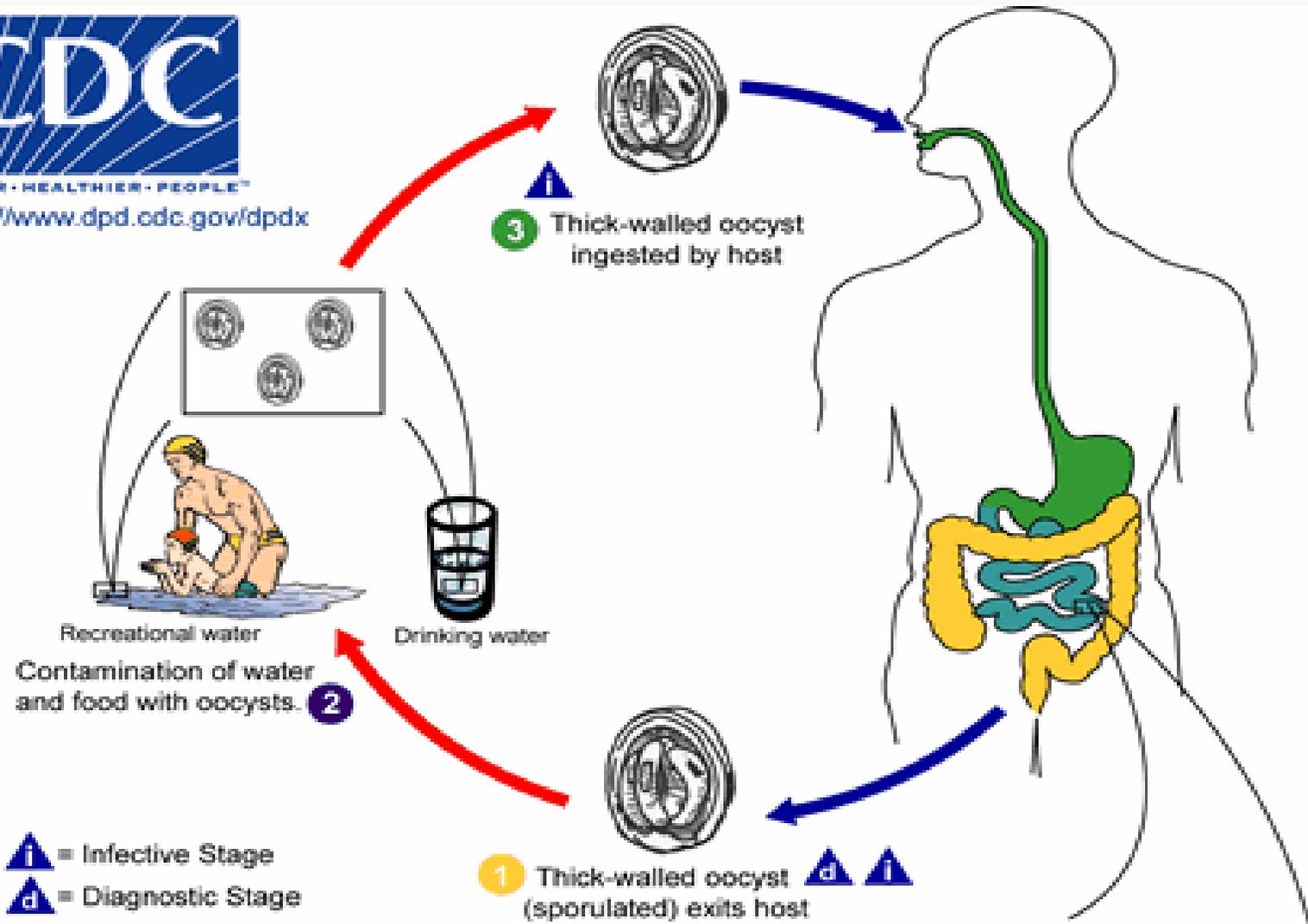
Massive Outbreak of *Cryptosporidium* Infection

- Largest waterborne disease outbreak in documented United States history
- Over 400,000 people were sickened, and approximately 100 people died
- Total cost of outbreak-associated illness was \$96 million in medical costs and productivity losses
- Standards and testing for *Cryptosporidium* were not adequate to detect this outbreak

Lifecycle of *Cryptosporidium*



<http://www.dpd.cdc.gov/dpdx>





Hosts

- Humans
- More than 150 animals including
 - Dogs
 - Cats
 - Birds
 - Deer
 - Cattle
 - Horses
 - Mice, Rats
 - Snakes
 - Rabbits, skunks, chipmunks
 - Etc, etc, etc

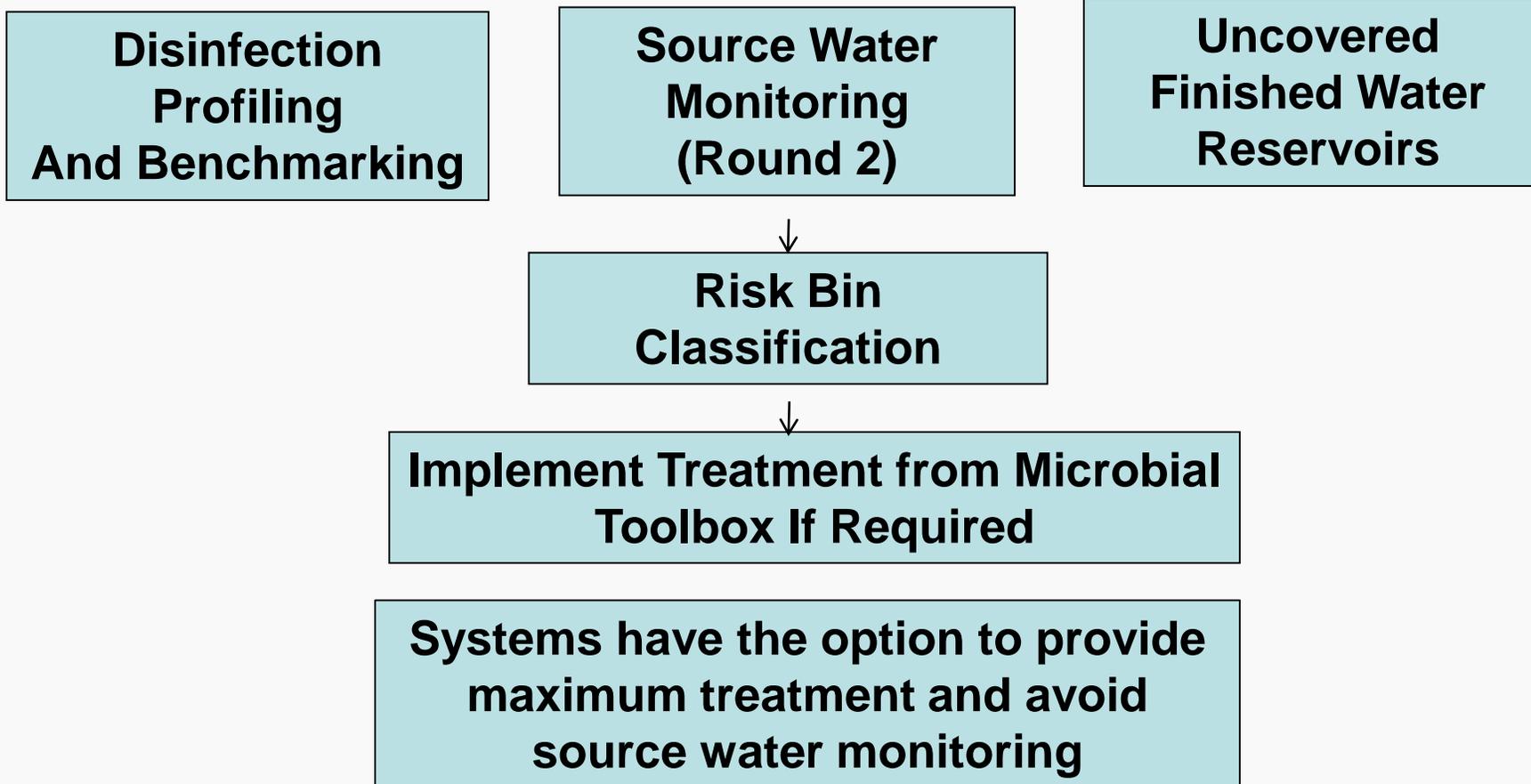


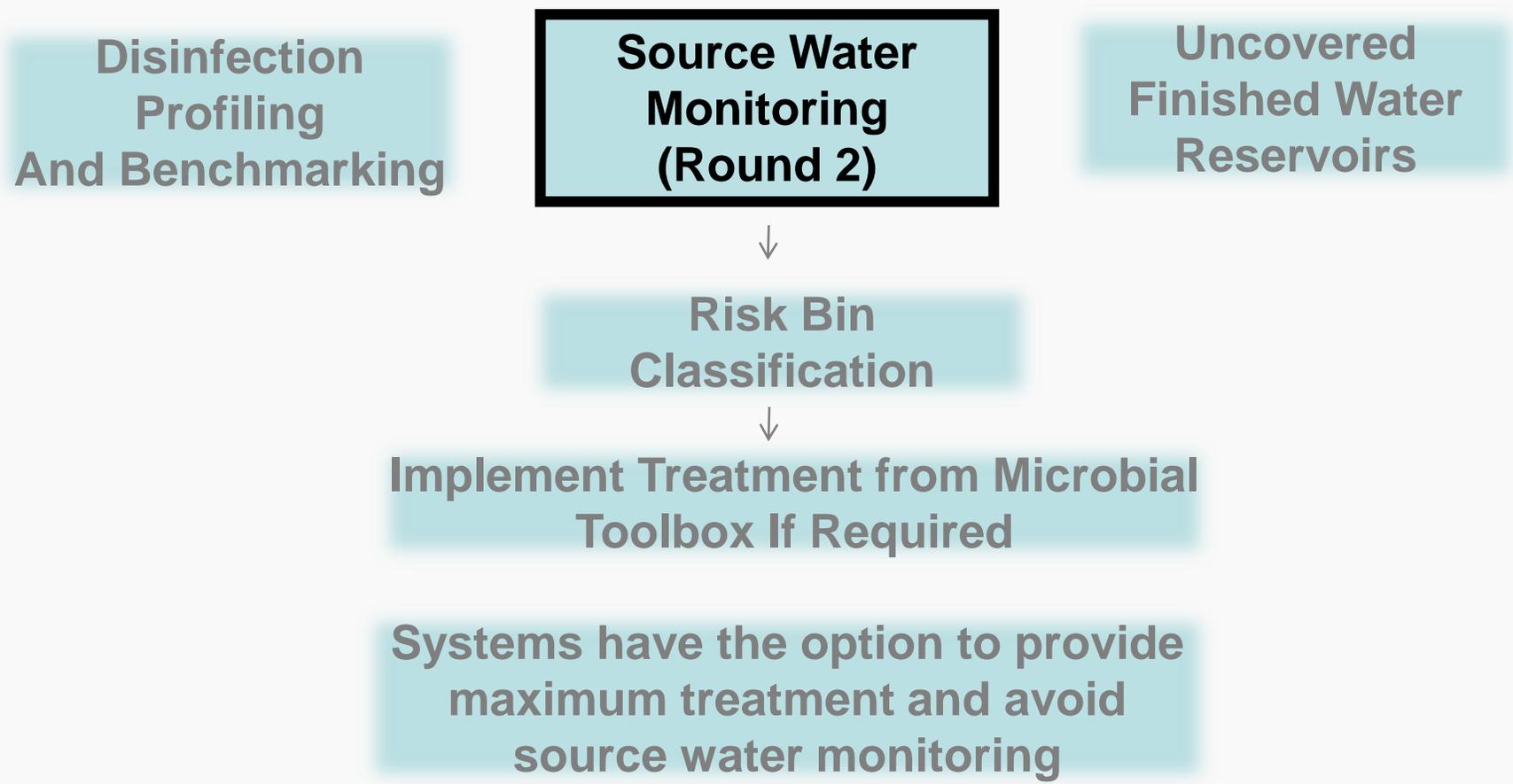
Health Effects

- Diarrhea, cramps, loss of appetite, low-grade fever, nausea and vomiting
- Can be prolonged, invasive and life-threatening in immunocompromised persons
- Possible links to reactive arthritis and irritable bowel syndrome
- Suggested relapse in inflammatory bowel disease e.g. Crohn's
- Developing countries:
 - children exhibit poor growth, depressed cognitive function



Key LT2 Rule Requirements







Source Water Monitoring

- Large systems ($\geq 10,000$) monitor for *Cryptosporidium*, *E. coli* and turbidity for 24 months (or provide 5.5 log *Cryptosporidium* treatment).
- Small systems ($< 10,000$) may monitor for *E. coli* for 12 months and, *if their E. coli level is above a trigger*, they monitor for *Cryptosporidium*.
 - EPA guidance includes a trigger of 100cfu/100mL
 - States may approve an alternate trigger level and/or alternate indicator level

Cryptosporidium Monitoring Start Dates Round 2- Large Systems

Frequency /Duration	Systems serving	Begin Monitoring no later than
Monthly 24 Months	At least 100,000	April 1, 2015
	50,00-99,999	October 1, 2015
	10,000-49,000	October 1, 2016



Start Dates for Systems serving less than 10,000

Monitor for	Frequency /Duration	Begin Monitoring no later than
<i>E. coli</i>	Once every two weeks/ 12 Months	October 1, 2017
<i>If triggered by source water E. coli monitoring</i>		
<i>Cryptosporidium</i>	Semi-monthly for 12 Months or monthly for 24 months	April 1, 2019



Monitoring Responsibilities for Public Water Systems

- Follow State Requirements
- Procure Certified Laboratory Services or Establish In-house Capability & Certification
- Review Laboratory Reports



§ 40 CFR 141.705 Approved laboratories

State Certification must be Equivalent to EPA's
Cryptosporidium Laboratory QA Program

- Pass OGWDW's crypto cert course
- Use the checklists in Supplement 2 to the Manual for the Certification of Laboratories Analyzing Drinking Water

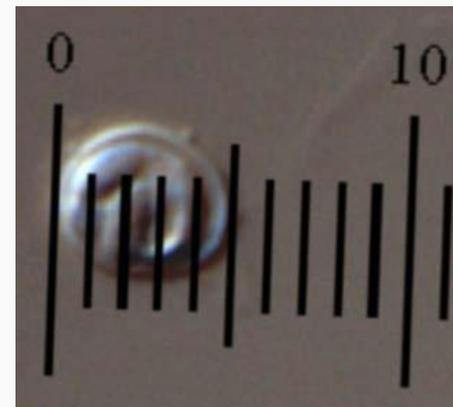
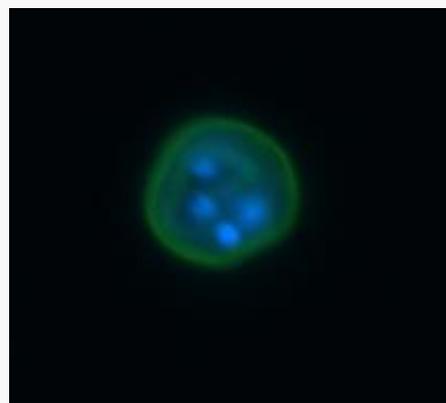


§ 40 CFR 141.704 Analytical Methods

The required Methods use similar processes

- Method 1623.1: *Cryptosporidium* & *Giardia* (June 2012)
- Method 1623: *Cryptosporidium* & *Giardia* (Dec 2005)
- Method 1622: *Cryptosporidium* only (Dec 2005)

Meet the Bugs

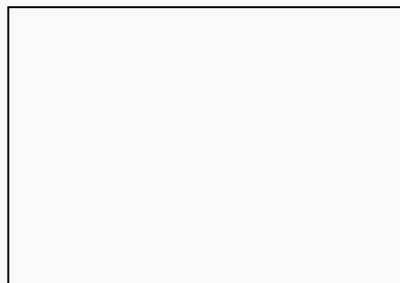




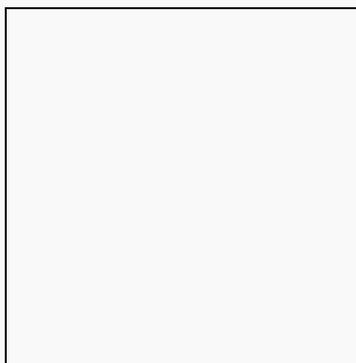
Sample



Filter



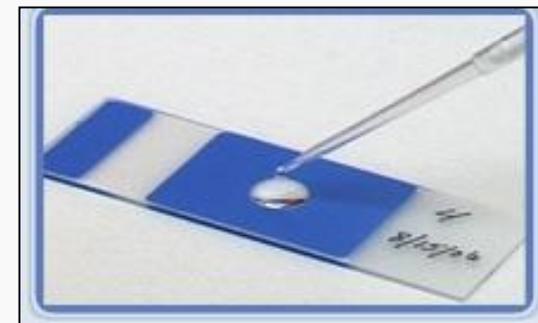
Centrifuge Tubes



Magnetic Purification



100 μ l



Microscope Slide

Method Overview

10 L







7/30/2015

U.S. Environmental Protection Agency

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§ 40 CFR 141.704 Quality Control Requirement

- Matrix spike (MS) samples are required
 - 2nd sample spiked with pre-determined number of *Cryptosporidium* oocysts
 - Typically two matrix spikes for each source



Reviewing Lab Reports

- Positive Results documented by Lab as “Total FA Count”
- Written descriptions with each individual count
 - Size measurement
 - Cell shape and features
 - Stain characteristics

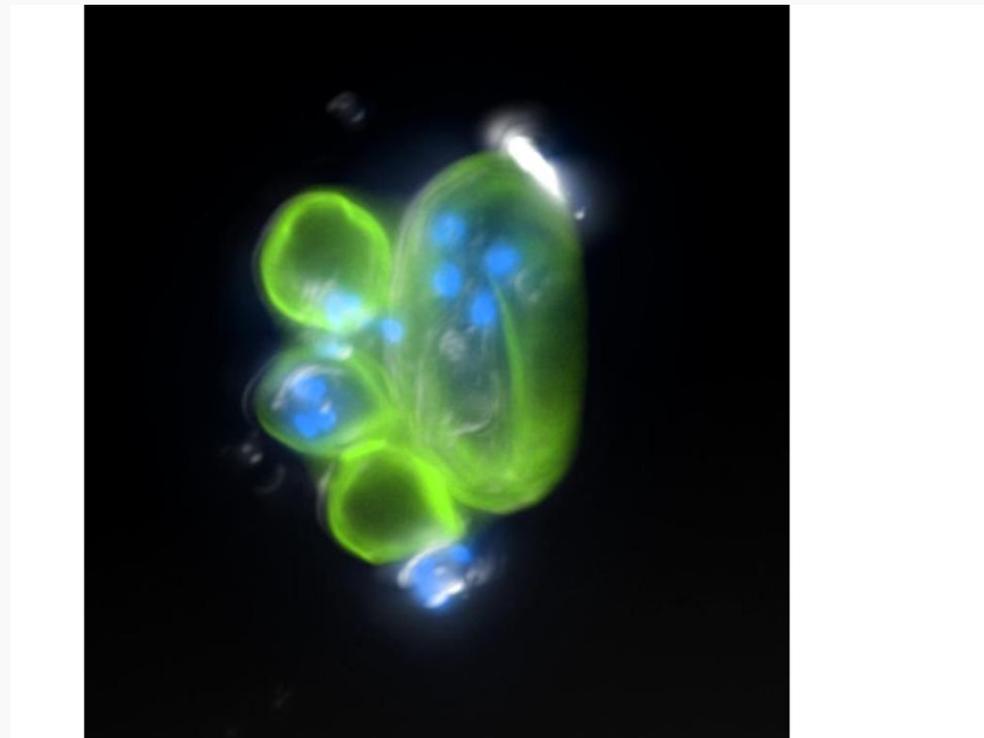


Review Sample Holding Times

- 4 days collection to process
- 1 day process
- 3 days process to stain
- 7 days for microscopy

EPA's Technical Support Center Assistance

- Train Certification Officers
- Provide written guidance
- Tech Support for States and labs
- Maintain list of certified labs on EPA's website

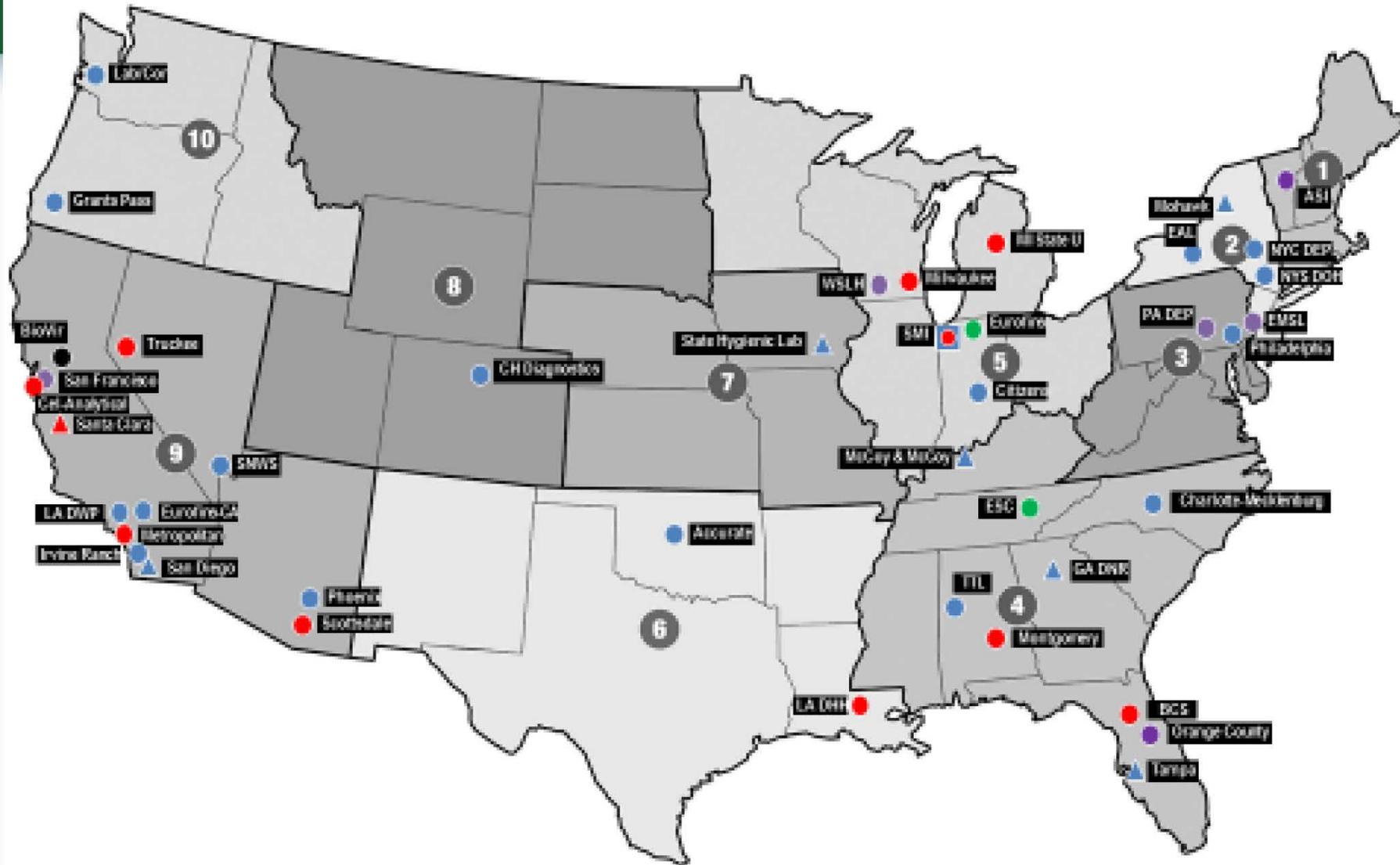




Region 6

- 4 certification officers that have passed TSC's crypto course
- 2 laboratories
 - Louisiana State Office of Public Health Laboratory in Baton Rouge
 - Accurate Environmental in Oklahoma City
- Another state lab and a municipal lab are gearing up
- At least one state has been monitoring since before federal involvement

43 Certified *Cryptosporidium* Laboratories



Naegleria fowleri



cyst trophozoite biflagellate

- Causes primary amebic meningoencephalitis (PAM)
- Primarily in Southern states in US
- Oral consumption of contaminated water has not been implicated
- Infections traced to contaminated water entering the nasal cavity