

## Model Aquatic Health Code Network May Webinar

# **“Cryptosporidium in Public Swimming Venues: Recommendations for Reducing Crypto Risk in Swimming Pools”**

**Thank you for your interest and attendance!**

*Please use your computer speakers for the audio portion of this webinar.*

*Due to the number of attendees, please submit questions and comments via  
the Chat box*

**We will begin at 12:00PM Eastern**

**May 24, 2017**

# NACCHO Updates

- Next Webinar: July 2017
- Take a Dive into the Model Aquatic Health Code
  - ✓ Learning lab at 2017 NEHA annual conference
  - ✓ Facilitated discussion on various aspects
- Model Aquatic Health Code Network (MAHC) Webpage
  - ✓ <http://www.naccho.org/programs/environmental-health/hazards/water/model-aquatic-health-code-mahc-network>
  - ✓ Archived webinars & MAHC resources
  - ✓ Join the MAHC Network today!  
[mahcnet@naccho.org](mailto:mahcnet@naccho.org)

# Questions.....



# MAHC NETWORK

May 24, 2017

## CMAHC UPDATES

**Douglas Sackett**

**Executive Director**

**Council for the Model Aquatic Health Code**

# CMAHC UPDATES

- ❑ **180 Change Requests (CR'S) submitted**
  - Available for review at: <https://cmahc.org/view-change-requests.php>
- ❑ **Technical Review Committee (TRC) CR review process underway**
  - TRC CR Review Meeting Schedule available to members on CMAHC website under the “Find 2017 Info On” burgundy button at the top right
  - CMAHC members can join conference call but as “listen only”.

## **CMAHC UPDATES**

- ❑ **Member comment period for influencing TRC reviews and recommendations open until May 31, 2017**
  - The CMAHC encourages members to submit comments by opening the specific Change Request and selecting to add a comment as rapidly as possible to have the greatest chance of influencing the technical reviews.
  - Members may wish to submit a comment form based on/in response to TRC discussions during a TRC CR Review Meeting conference call
- ❑ **On-line *Vote on the Code* Conference Registration opened April 3.**

## Contact Information

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# MAHC

More Information: Search on  
“CDC MAHC” or visit the  
Healthy Swimming MAHC  
Website: [www.cdc.gov/mahc](http://www.cdc.gov/mahc)  
Email: [mahc@cdc.gov](mailto:mahc@cdc.gov)

The screenshot shows the CDC MAHC website homepage. At the top, it features the CDC logo and a search bar. Below the header, there's a navigation menu with 'CDC A-Z INDEX' and 'Find 2017 Info On'. The main content area includes a large image of a child on a water slide, a section titled 'Information For Specific Groups' with a list of roles (Potential MAHC Adopters, Public, Public Health Professionals, Aquatics Staff), and a 'Publications, Data, & Statistics' section with a line graph. A prominent banner states 'The 2016 Model Aquatic Health Code (2nd Edition) is now available!'. Below this, there's a paragraph explaining the MAHC's purpose. The bottom section is organized into a grid of boxes for 'GENERAL INFORMATION', 'RATIONALE BEHIND THE MAHC', 'THE MAHC', 'USING THE MAHC', 'MAHC NETWORK, TOOLS, & FORMS', and 'COUNCIL FOR THE MAHC (CMAHC)'. A 'MAHC Resources' section on the right lists 'Health Promotion Materials', 'Training & Education', and 'Policy & Recommendations'.

# CMAHC

More Information: Search on  
“CMAHC” or visit the CMAHC  
Website: [www.cmahc.org](http://www.cmahc.org)  
Email: [info@cmahc.org](mailto:info@cmahc.org)

The screenshot shows the CMAHC website homepage. It features the CMAHC logo and a search bar. A navigation bar includes 'Find 2017 Info On' and 'Sign In'. The main content area is dominated by a large image of a swimming pool with a 'Countdown to 2017 CMAHC Conference' overlay showing '229 Days'. To the right, there's a 'Reminders and Key Dates' section with a list of upcoming events and deadlines. Below this, there's a 'CMAHC Resources' section with a grid of links for 'Who We Are', 'View or Search the MAHC', 'Vote on the Code Biennial Conference', 'CMAHC Operational Process', 'Administration', 'CMAHC Committees', 'Join, Sponsor, and Get Involved', and 'Tools and Forms'. At the bottom, there's a 'Get Email Updates' section and a 'Founding Sponsors' section with logos for various organizations. The footer contains copyright information and links for 'Site Index', 'Terms & Conditions', and 'Privacy Policy'.





# Healthy and Safe Swimming Week 2017 Communication Tools

**Michele Hlavsa, RN, MPH**  
**Epidemiologist/Chief, Healthy Swimming**  
**Waterborne Disease Prevention Branch**

**MAHC Network Webinar**  
**May 24, 2017**

National Center for Emerging and Zoonotic Infectious Diseases  
Division of Foodborne, Waterborne, and Environmental Diseases





## Healthy and Safe Swimming Week 2017



# Diarrhea and Swimming Don't Mix!

May 22–28, 2017

### ❑ Objective

- Increase awareness of recreational water–associated diarrhea outbreaks and steps to take to prevent them

### ❑ Call to Action

- Don't swallow the water you swim in
- Don't swim or let your kid swim if sick with diarrhea
- Hyperchlorinate public aquatic venues

[www.cdc.gov/healthywater/swimming/aquatics-professionals/fecalresponse.html](http://www.cdc.gov/healthywater/swimming/aquatics-professionals/fecalresponse.html)

### ❑ Target Audiences

- Swimmers, parents of young swimmers, aquatics staff, and public health

# Healthy and Safe Swimming Week Communications Toolkit

- ❑ Community outreach suggestions
- ❑ List of resources/URLs
- ❑ Sample press release
- ❑ Sample op-ed
- ❑ Sample proclamation
- ❑ Social media message bank



[www.cdc.gov/healthywater/observances/hss-week/response-tools-public-health.html](http://www.cdc.gov/healthywater/observances/hss-week/response-tools-public-health.html)

# Outreach: Website, Social Media, Oh My

- MMWR report on recent crypto outbreaks linked to aquatic venues

[www.cdc.gov/mmwr/volumes/66/wr/mm6619a2.htm?s\\_cid=mm6619a2\\_w](http://www.cdc.gov/mmwr/volumes/66/wr/mm6619a2.htm?s_cid=mm6619a2_w)

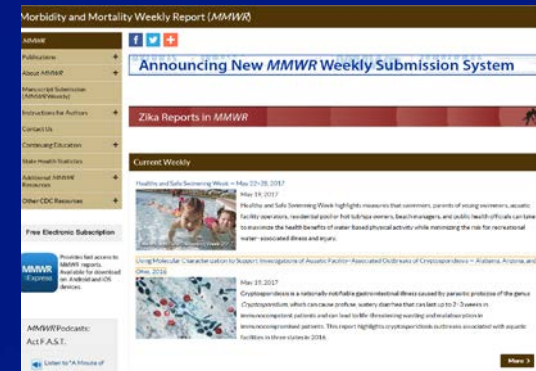
- Updates to CDC website

[www.cdc.gov/healthyswimming](http://www.cdc.gov/healthyswimming)

- Twitter chat – May 22

- MAHC Network webinar – May 24

- Radio Media Tour – May 25



# Outreach: Website, Social Media, Oh My

- ❑ GovDelivery announcements
- ❑ *Did You Know?* and *Have You Heard?* emails
- ❑ Healthy Swimming Promotion Materials  
[www.cdc.gov/healthywater/swimming/materials/index.html](http://www.cdc.gov/healthywater/swimming/materials/index.html)
  - HSSW buttons/badges
  - New posters
- ❑ Web content syndication  
<https://tools.cdc.gov/syndication/>



# Printed Healthy Swimming Promotion Materials

- **Brochure**  
(English & Spanish)



**SHARE THE FUN... not the germs**

**Remember, we share it with everyone**

**Why is this so important?**  
If you get into the water when you have diarrhea, you could make others sick. Most outbreaks linked to the water we swim, relax, and play in are outbreaks of diarrhea. These outbreaks are caused by germs like Cryptosporidium (or "Crypto" for short), norovirus, and E. coli. These germs—sometimes millions of a time—can spread when someone who is sick has diarrhea in the water. Other people can get sick if they swallow the germ's water—even just a mouthful. Even when it's treated properly with chemicals, the water can still have germs. Pool chemicals, like chlorine or bromine, are added to the water to kill germs, but they don't work right away. If used properly, they can kill most germs within a few minutes. However, some germs, like Crypto, can live in properly treated pool water for several days. Let the chemicals use their power on germs—not on your pee, poop, sweat, or dirt. The job of pool chemicals is to kill germs. But when pee, poop, sweat, and dirt mix all our bodies and into the pool water, the chemicals break down these other things instead of killing germs. This uses up the chemicals' power, which means there's less to kill germs. That's why it's important to follow the 4 easy steps.

**Let the chemicals use their power on germs—not on your pee, poop, sweat, or dirt.**

**Follow these 4 easy steps to help keep germs out of the water and stay healthy:**

- 1 Stay out of the water if you have diarrhea.
- 2 Shower before you get in the water.
- 3 Don't pee or poop in the water.
- 4 Don't swallow the water.

**Did you know that germs in the water can cause skin, ear, and eye infections?**

U.S. Department of Health and Human Services  
 Centers for Disease Control and Prevention

- **2 Pool Chemical Safety Posters**

- **Use**  
■ **Storage**



(laminated posters in English & Spanish)

**POOL CHEMICAL SAFETY: USE BEFORE YOU USE POOL CHEMICALS**

**BEFORE YOU USE POOL CHEMICALS**

- Get trained in your chemical safety (for example, during operator training classes)
- Ask for help if you are NOT trained for specific tasks
- Read and follow product label or Material Safety Data Sheet (MSDS) before using
- Learn your local Emergency Chemical Spill Response Plan and practice steps (if available, available)

**USING POOL CHEMICALS SAFELY**

- Do not enter the pool by swimming, wading, or playing (for example, water skiing, tubing, and more)
- Read chemical product label before each use
- Handle in a well-ventilated area
- Open and add product to a clean area before opening another
- Measure, mix, and dilute
- Measure carefully
- Never mix
  - Chlorine products with acid. This could create both gases
  - Different pool chemicals for example, different types of chlorine products with each other or with the other substances
- Only use dedicated pool chemicals when directed by product label
- If product label directs pre-rinsing and your chemical is water, NEVER add water to pool chemical because instead (potentially) equipment, bacteria can form

Always read and follow chemical safety instructions. Follow your local Emergency Chemical Spill Response Plan, and be sure to contact the proper authorities and management.

Pool Address and Phone Number:  
 Emergency Response Phone Number:  
 Local Health Department Phone Number:

www.waterworks.gov | www.epa.gov | www.cdc.gov | www.dhs.gov

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
 CENTERS FOR DISEASE CONTROL AND PREVENTION

# Questions

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**The findings and conclusions in this report are  
those of the authors and do not necessarily  
represent the official position of the  
Centers for Disease Control and Prevention.**

# Recommendations for reducing *Cryptosporidium* infection risk at swimming pools

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Assistant Professor

University of Wisconsin – Eau Claire

Environmental Public Health Program

Model Aquatic Health Code Network Webinar

May 24, 2017



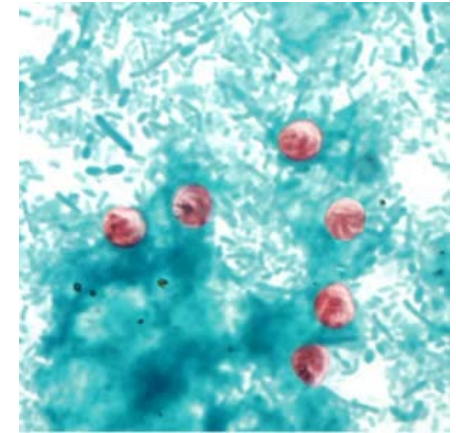
# Objectives

- Understand why there is risk of *Cryptosporidium* infection at swimming pools
- Explore methods for reducing *Cryptosporidium* infection risk at swimming pools
- Discuss the most feasible methods for Environmental Health Specialists to reduce *Cryptosporidium* infection risk at swimming pools

Why is there risk of *Cryptosporidium* infection  
at swimming pools?

# What do we know about *Cryptosporidium*?

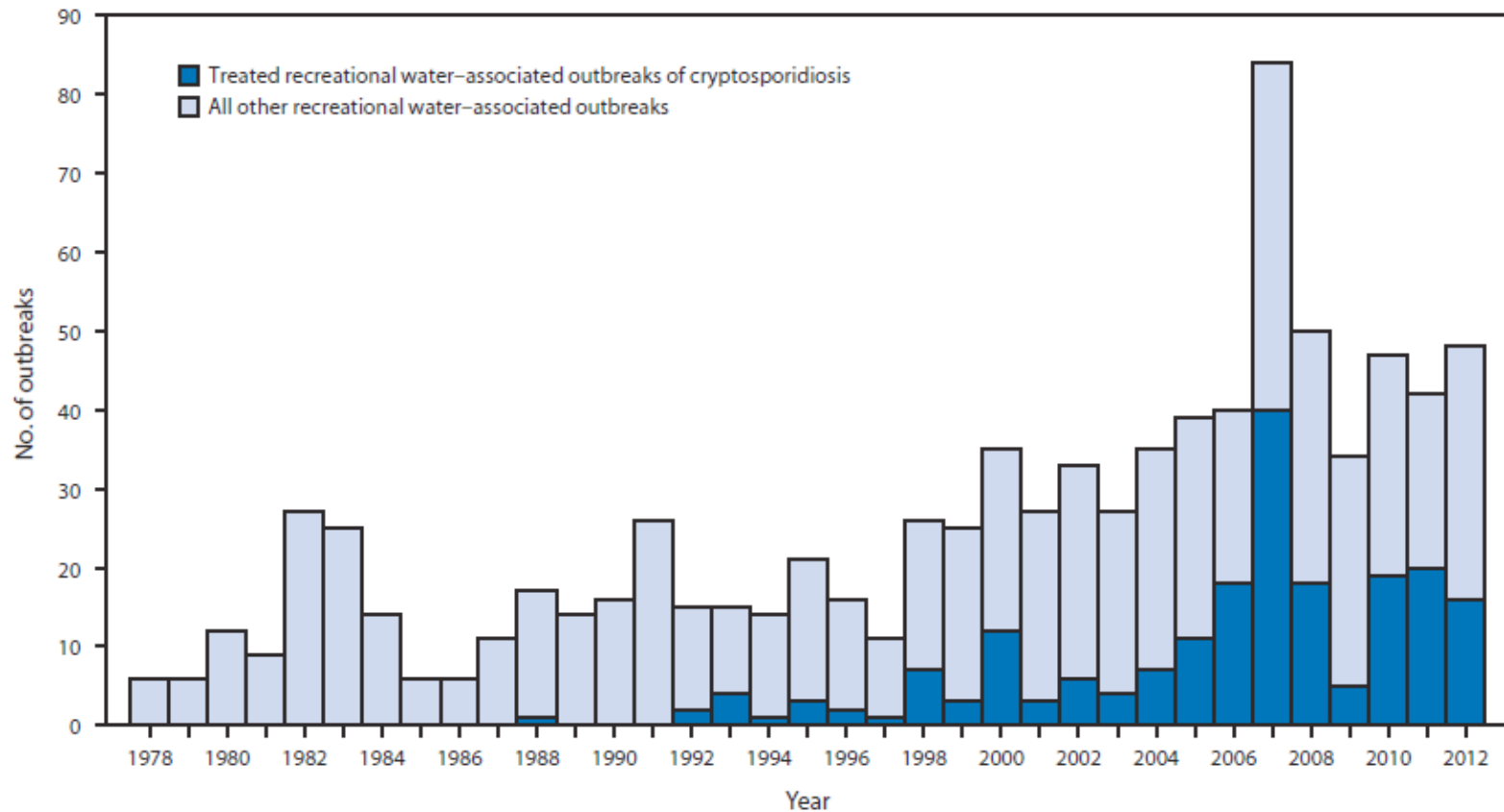
- Cryptosporidiosis
  - Vomiting, diarrhea, nausea, death
  - Immunocompromised
    - 20% of U.S. population
    - Including children
- *Cryptosporidium* caused 50% of treated recreational water-associated outbreaks between 2011-2012
- Treated recreational water venues are ideal for *Cryptosporidium* outbreaks:
  - Oocysts highly resistant to chlorine (inactivation: 20 ppm for 12.75 hr)
  - Swimming = “community bathing”
  - Bathers can excrete up to  $10^9$  oocysts/fecal release
  - *Cryptosporidium* has low infectious dose
  - Oocyst release up to 50 days post-diarrhea cessation
  - Swimmers perceive pool water is sterile
  - Swimming pool water is recirculated



*Cryptosporidium* oocysts  
([CDC, 2013](#))

# What do we know about *Cryptosporidium*?

Number of outbreaks associated with recreational water, by year - United States, 1978 - 2012



# What do we know about *Cryptosporidium*?

## Per-swim and Annual Risk of *Cryptosporidium* Infection from Swimming in Treated Recreational Water

**Table 3**

Average, standard deviation, and 95th/99th percentile per-swim and annual *Cryptosporidium* infection risks from swimming in treated recreational water among sub-populations.

	Infection Risk Per-swim Event			Annual Infection Risk		
	Mean	SD	95th Percentile	Mean	SD	95th Percentile
All swimmers	$2.6 \times 10^{-4}$	$3.9 \times 10^{-3}$	$<4.5 \times 10^{-3a}$	$2.5 \times 10^{-2}$	$6.1 \times 10^{-2}$	$1.2 \times 10^{-1}$
Adults	$2.5 \times 10^{-4}$	$6.8 \times 10^{-3}$	$<2.3 \times 10^{-3a}$	$2.2 \times 10^{-2}$	$6.6 \times 10^{-2}$	$1.1 \times 10^{-1}$
Children	$3.5 \times 10^{-4}$	$5.4 \times 10^{-3}$	$5.2 \times 10^{-4}$	$2.9 \times 10^{-2}$	$6.1 \times 10^{-2}$	$1.3 \times 10^{-1}$

<sup>a</sup> 99th percentile risk value.

- Risk of *Cryptosporidium* infection in one year of swimming pool visits:
  - 29 infections per 1,000 child swimmers ( $\leq 18$ )
  - 22 infections per 1,000 adult swimmers

# Methods for reducing *Cryptosporidium* infection risk

# How can we reduce *Cryptosporidium* infection risk at swimming pools?

- Treated water venues are ideal for *Cryptosporidium* outbreaks:

- Oocysts highly resistant to chlorine (inactivation: 20 ppm for 12.75 hr)

→ ■ Use alternative disinfectants

- Swimming = "community bathing"

- Bathers can excrete up to  $10^9$  oocysts/fecal release

- *Cryptosporidium* has low infectious dose

→ ■ Stop introduction of oocysts

- Oocyst release up to 50 days post-diarrrhea cessation

- Swimmers perceive pool water is sterile

- Swimming pool water is recirculated

→ ■ Use more effective filtration techniques

# Use alternative disinfectants

- Current free chlorine levels recommended in the Model Aquatic Health Code (MAHC) will not inactivate *Cryptosporidium* in a timeframe that reduces swimmer risk
  - *Cryptosporidium* Ct = 15,300: It would take 10 days to achieve a 3 log reduction in oocysts at 1 ppm chlorine
- Higher levels of chlorine will inactivate *Cryptosporidium* faster
  - Hyperchlorination is recommended following a diarrheal fecal incident to inactivate *Cryptosporidium*



# Use alternative disinfectants

- Problems with using hyperchlorination as a method to inactivate *Cryptosporidium*:
  - Must use *a lot* of chlorine
    - Added expense
      - Chlorine product
      - Closure time (CDC guidelines: 20 ppm chlorine for 12.75 h)
  - Must maintain 20 ppm the entire 12.75 h
    - Employee overtime
    - Test kit capability and reliability
    - Operator error
  - Must know if and when fecal incident occurred
  - Hyperchlorination does not work well in pools with high cyanuric acid concentrations

# Use alternative disinfectants

- ▣ Hyperchlorination and cyanuric acid:

**ENVIRONMENTAL**  
Science & Technology

Article

[pubs.acs.org/est](https://pubs.acs.org/est)

## Effect of Cyanuric Acid on the Inactivation of *Cryptosporidium parvum* under Hyperchlorination Conditions

Jennifer L. Murphy,<sup>\*,†</sup> Michael J. Arrowood,<sup>†</sup> Xin Lu,<sup>†</sup> Michele C. Hlavsa,<sup>†</sup> Michael J. Beach,<sup>†</sup> and Vincent R. Hill<sup>†</sup>

<sup>†</sup>Waterborne Disease Prevention Branch, Division of Foodborne, Waterborne, and Environmental Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia 30333, United States

# Use alternative disinfectants

Inactivation of *Cryptosporidium* in chlorinated pool water

	No cyanuric acid	8 ppm cyanuric acid	50 ppm cyanuric acid	100 ppm cyanuric acid (MAHC limit is 90 ppm)
Chlorine (ppm)	20	20	20	20
pH	7.5	7.5	7.5	7.5
Temperature (°F)	77	77	77	77
<b>Time (h)</b>	<b>8</b>	<b>14</b>	<b>62 (2.5 days)</b>	<b>72 (3 days)</b>
Log reduction	3	3	1	0.8

# Use alternative disinfectants

## 2016 CDC fecal incident response guidelines

	No cyanuric acid	1 - 15 ppm cyanuric acid	15 + ppm cyanuric acid: <b>drain pool to <math>\leq 15</math> ppm CYA</b>
Chlorine (ppm)	20	20	20
pH	$\leq 7.5$	$\leq 7.5$	$\leq 7.5$
Temperature ( $^{\circ}$ F)	$\geq 77$	$\geq 77$	$\geq 77$
Time (h)	12.75	28	28

# Use alternative disinfectants

## Approved alternative disinfectants to chlorine in MAHC

	<b>Pro</b>	<b>Con</b>
Bromine	Leaves a residual	No published Ct values for <i>Cryptosporidium</i> inactivation
UV light	Inactivates <i>Cryptosporidium</i> quickly	No residual
Ozone	Inactivates <i>Cryptosporidium</i> quickly	No residual
Copper/silver ions	Leaves a residual	No published Ct values for <i>Cryptosporidium</i> inactivation
Chlorine dioxide	Inactivates <i>Cryptosporidium</i> quickly  Leaves a residual	Only for water quality remediation when swimmers are absent, produces carcinogens, dangerous to handle

# Stop introduction of oocysts

- Is *stopping* introduction possible? Probably not, but we can *reduce* contamination by controlling sources
  - Some controls are better than others
    - Environmental Health Hierarchy of Controls:
      - Elimination
      - Substitution
      - Administrative
      - Engineering
      - Personal Protective Equipment

# Stop introduction of oocysts

- Swimming = “community bathing”
  - Separate children and adults
  - Expose the truth about swim diapers
- Bathers can excrete up to  $10^9$  oocysts/fecal release
  - Do not allow ill swimmers into the pool
  - Make better swim diapers
  - Improve fecal incident observation and reporting by swimmers, parents of swimmers and pool staff
  - Enforce bathroom breaks
- *Cryptosporidium* has low infectious dose
  - Educate swimmers on the importance of avoiding pool water ingestion
    - Do parents allow kids to drink bathtub water?
- Oocyst release up to 50 days post-diarrhea cessation
  - Do not allow previously-ill swimmers into the pool
  - Enforce pre-swim showering
- Swimmers perceive pool water is sterile
  - Educate swimmers on pool water hazards
  - Educate swimmers on test kit use

# Stop introduction of oocysts

- Elimination
- Substitution
- Administrative
- Engineering
- Personal Protective Equipment

## ■ Elimination controls

- Do not allow ill swimmers into the pool
- Do not allow previously-ill swimmers into the pool
  - Signage – do not swim if you have diarrhea
  - Group education on recreational water illness – swim teams, water aerobics, swim classes
  - Waivers – open swim, fitness facility users, swim classes, swim teams, water aerobics



# Stop introduction of oocysts

- Administrative controls
  - Expose the truth about swim diapers
    - Signage – swim diapers are the same as a bathing suit
    - Group education on recreational water illness – swim teams, water aerobics, swim classes
  - Educate swimmers on the importance of avoiding pool water ingestion
  - Educate swimmers on pool water hazards
    - Group education on recreational water illness – swim teams, water aerobics, swim classes
  - Educate swimmers on test kit use
    - Group education on recreational water illness – swim teams, water aerobics, swim classes
    - Require pool facilities to provide test strips and make water chemistry standards available to swimmers
- Improve fecal incident observation and reporting by swimmers, parents of swimmers and pool staff
  - Group education on recreational water illness – swim teams, water aerobics, swim classes
  - Train lifeguards on indicators of diarrheal release
    - Indicators should be researched
- Enforce bathroom breaks
  - Swim teams, open swim – everyone out of the pool every hour (CDC recommendation)
- Enforce pre-swim showering
  - Hire staff to check if swimmers entering pool area have wet hair or clothing

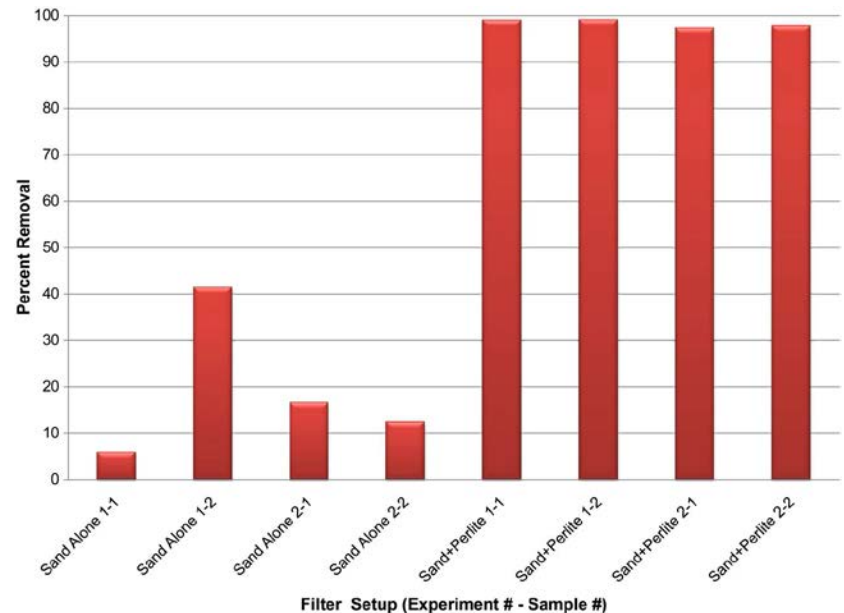
# Stop introduction of oocysts

- ▣ Engineering/PPE controls
  - ▣ Separate children and adults
    - ▣ Build separate pools for adults and children
      - ▣ Perhaps easier to control *Cryptosporidium*
        - ▣ Child pool, routine treatment to remove *Cryptosporidium* from pool water
- ▣ Make better swim diapers
  - ▣ Current swim diapers release 50 – 97% of *Cryptosporidium* oocysts into pool water within 5 min of swimming after diarrhea

# Use more effective filtration techniques

- ▣ Swimming pool water is recirculated
  - ▣ Use secondary disinfection (UV or ozone)
  - ▣ Maximize efficiency of the pool filter
    - ▣ Sand
      - ▣ Polyaluminum chloride coagulants at appropriate flow rates with deep sand
      - ▣ Add thin layer of precoat media

Percent particle removal for different sand filtration scenarios

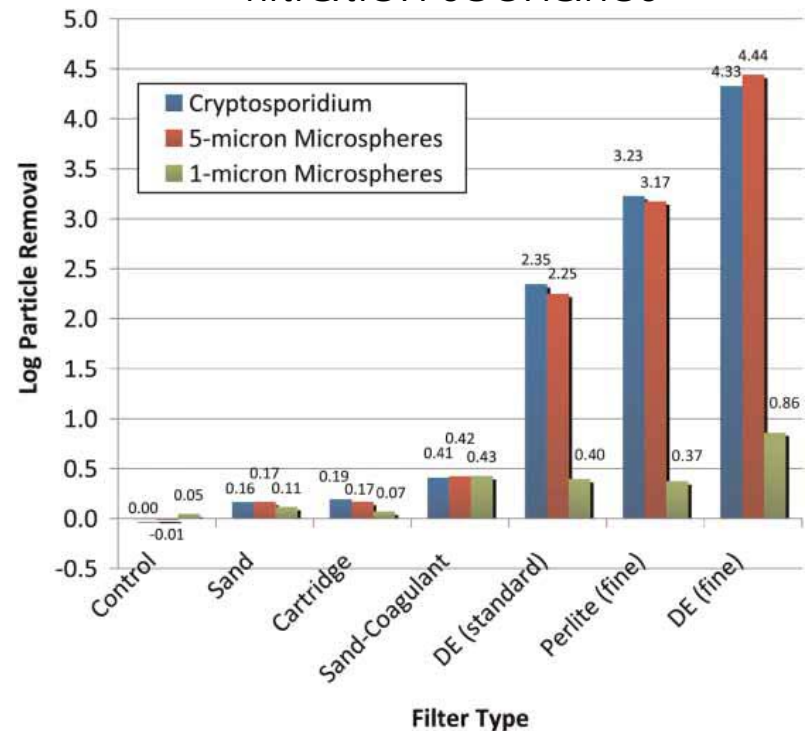


Amburgey 2011

# Use more effective filtration techniques

- Swimming pool water is recirculated
  - Use secondary disinfection (UV or ozone)
  - Maximize efficiency of the pool filter
    - Sand
      - Polyaluminum chloride coagulants at appropriate flow rates with deep sand
      - Add thin layer of precoat media
    - Precoat media
      - Perlite media
      - Diatomaceous Earth

Log particle removal for different filtration scenarios



Amburgey et al., 2012

What are the most feasible methods for Environmental Health Specialists to reduce *Cryptosporidium* infection risk?

## What are the most feasible methods for reducing *Cryptosporidium* infection risk?

- A combination of controls must be used to reduce risk of *Cryptosporidium* infection:
  - Group education on recreational water illness
    - Environmental Health Specialists
      - Provide education materials (fact sheets, videos, handouts) to aquatic venues that host groups of swimmers, and encourage or require organized trainings
      - Provide trainings to groups of swimmers

# What are the most feasible methods for reducing *Cryptosporidium* infection risk?

- Waivers as a form of education
  - Environmental Health Specialists
    - Provide waiver examples to aquatic facility staff
      - By swimming in this pool, you agree not to:
        - Swim until two weeks after diarrhea has stopped
        - Intentionally swallow pool water
        - Allow children with diarrhea to swim in bathing suits or swim diapers since neither control diarrheal releases
        - Intentionally pee or poop in the pool water
        - Splash other swimmers in the face (associated with pool water ingestion)
        - Enter the pool without showering for at least 60 sec. (recommended minimum pre-swim shower length)
        - Fail to report a diarrheal release into pool water

# What are the most feasible methods for reducing *Cryptosporidium* infection risk?

- Environmental Health Specialists can also:
  - Require pool facilities provide swimmers with test strips and handouts or signage on pool water quality standards
  - Suggest implementation of mandatory breaks for open swim or swim teams every hour to high-use facilities
  - Explain the purpose and importance of the new CDC Fecal Incident Response Guidelines to pool operators
    - Make sure operators understand how to respond appropriately to a diarrheal release
  - Require pool facilities install secondary disinfection
  - Suggest operators with sand filters routinely apply a coagulant
    - Operators should follow manufacturers instructions when dosing pool water with a coagulant
  - Adopt parts of the Model Aquatic Health Code when updated with recommendations for improving filtration and disinfection techniques to remove *Cryptosporidium* from pool water



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