



Increased Risk Venues

Understanding and Preventing Outbreaks

What is an Increased Risk Venue?

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MAHC 4th Edition Definition

An aquatic venue which due to its intrinsic characteristics and intended users has a greater likelihood of affecting the health of the bathers of that venue by being at increased risk for microbial contamination (e.g., by children less than 5 years old) or being used by people that may be more susceptible to infection (e.g., therapy patients with open wounds). Examples of increased-risk venues include spray pads, wading pools and other aquatic venues designed for children less than 5 years old as well as therapy pools.

Increased Risk Venues

Key risk factors

Spray Pads



Small volume of water.

Can be difficult to maintain water quality.

Wading Pools



Small volume of water.

Can be difficult to maintain water quality.

Therapy Pools



Small volume of water with a warmer temperature.

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Bather Characteristics

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Spray Pads

- Tend to be younger children
- Likely to ingest water either on accident or on purpose
- Can be in the process of potty training



Bather Characteristics

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Wading Pools

- Almost entirely very small children
- Likely to be in potty training or not fully potty trained
- Lots of oral interaction of water and objects



Bather Characteristics

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Therapy Pools

- Usually an older adult
 - Often immunocompromised
 - Post-surgery wounds still healing
 - More open wounds due to aging and related to diabetes
 - May have incontinence issues
- Post Surgery Adult
- Adult with cognitive deficits
- Can be younger children in potty training when accompanied by a parent in some facilities
- Can be an organized class (Parent/Child, early Learn to Swim) in some facilities



Concerning Pathogens

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- ❖ Cryptosporidium
- ❖ E.Coli
- ❖ Giardia
- ❖ Shigella
- ❖ ***Naegleria Fowleri***



Cryptosporidium

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Enteric pathogen. Chlorine Resistant.

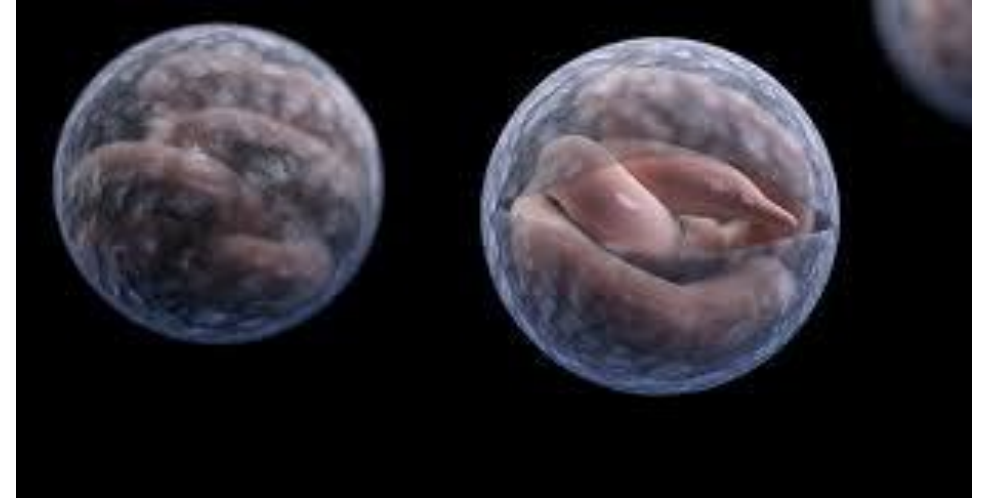
Transmission Route: Oral

CT Value: 15,355 (*10.7 days at 1 ppm / 7.5 pH*)

Found In: Diarrhea

Causes: Nausea, vomiting, fever, severe diarrhea and dehydration

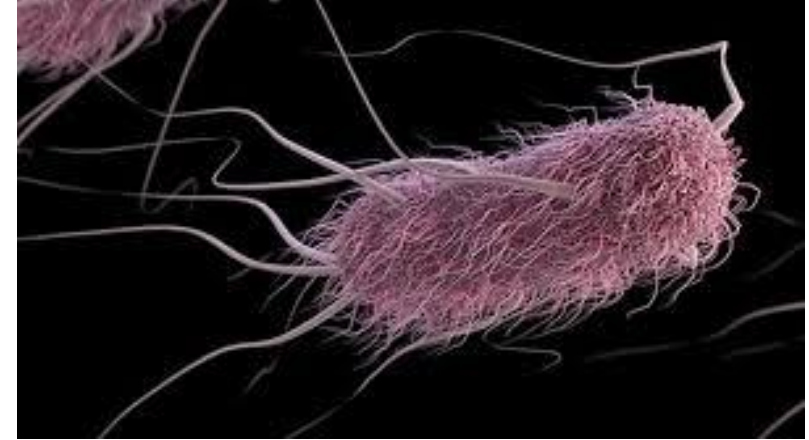
- As little as 10 oocysts causes infection
- The “big bad” of pool contamination



E.Coli

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Enteric pathogen.



Transmission Route: Oral

CT Value: 30 (at 0.5 ppm / 7.5 pH. *Owoseni, et al 2017*)

Found In: Diarrhea

Causes: Nausea, vomiting, fever, severe diarrhea and dehydration

- Major outbreak in ATL circa 1996
- More severe forms can cause bloodstream infections and other system infections
- Rare cases can cause Pneumonia and Meningitis

Giardia

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Enteric pathogen.

Transmission Route: Oral

CT Value: 45 (at 1 ppm / 7.5 pH)

Found In: Loose to Solid Stool

Causes: Diarrhea, fatigue, stomach cramps, bloating, and dehydration



Shigella

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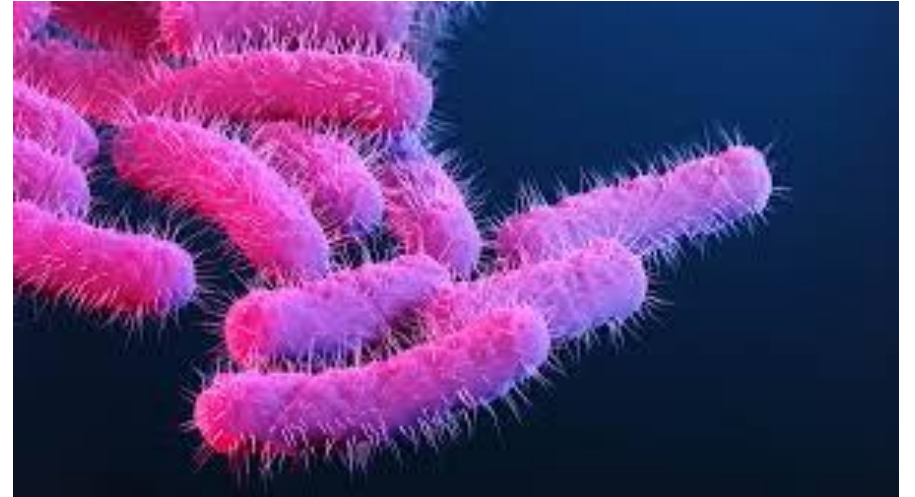
Enteric pathogen.

Transmission Route: Oral

CT Value: 45 (at 1 ppm / 7.5 pH)

Found In: Loose to Solid Stool

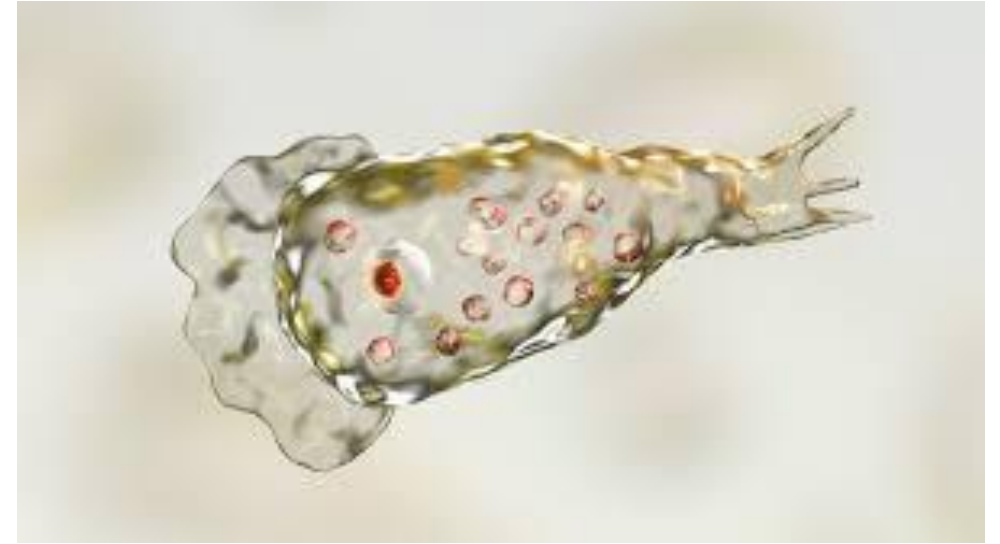
Causes: Diarrhea (possibly bloody), fever, stomach pain



Naegleria Fowleri

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Amoeba. Deadly.



Transmission Route: Nasal

CT Value: 30 (at 1 ppm / 7.5 pH. *Jonckheere & De Voorde, 1975*)

Found In: Natural waterways, untreated water

Causes: Extreme neurological damage / PAM

- Approx. 156 cases in US. **Only 4 survivors.**
- 2 cases associated with splash pads in last decade
- Miller, et al – constant 1 ppm protective
- Arberas-Jimenez, et al – possible CL2 resistance, non-viable with CL2 / UV combination

Key Theme

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4 of the 5 concerning pathogens cause gastrointestinal illness and are passed through swallowing of fecal contaminated water.



Individuals With....

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- ❖ *Giardia* may be asymptomatic.
- ❖ *Giardia* may recover in about 7 days
- ❖ Shigellosis will need antibiotics and will recover in about 7 days
- ❖ *E.Coli* can show symptoms up to 14 days after infection and can last for up to 2 weeks
- ❖ Norovirus can inadvertently spread these concerning pathogens as a result of diarrhea. Norovirus can be spread via vomiting.





MMWR – *published 12/5/24*

1st summary of waterborne diseases associated with Interactive Water Features

Encompasses 1997 to 2022

Examines data from 23 states and Puerto Rico involving 60 waterborne outbreaks

Report Statistics

- 60 outbreaks
- 10,611 individual cases
- 152 hospitalizations
- 99 ER visits
- ***No reported deaths****

Report Statistics

- 40 outbreaks (**67%**) confirmed as *Cryptosporidium*
- 2 outbreaks confirmed Norovirus
- 5 outbreaks were *Shigella* related
- 3 outbreaks were *E.Coli* related
- *Giardia*, Norovirus, *Salmonella*, & *Campylobacter* caused 1 each
- *Legionella* and Chloramines caused 1 outbreak each

Report Statistics

- 95% of outbreaks were reported from May-August
- 65% of outbreaks were reported from only Interactive Water Play Features

Hospital Related Statistics

73% of the 99 ER visits from Norovirus from 2 outbreaks

81% of hospitalizations were related to Cryptosporidium



Since 2022, 2 deaths are attributed to Interactive Water Play Features.

Both were from Naegleria Fowleri / PAM

Report Statistics

**91% of cases and 81% of hospitalizations
caused by *Cryptosporidium***

Notable Outbreaks *(from report)*

- Massachusetts in '02 – 767 cases
- *New York in '05 – 2307 cases*
- *Idaho in '07 – 2000 cases*
- *Ohio in '07 – 665 cases*
- *Texas in '08 – 2050 cases*
- *Arizona in '16 – 459 cases*
- *Ohio in '16 – 638 cases*

Contributing Factors

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4 Areas of Contributing Factors



- ❖ Maintenance
- ❖ Person
- ❖ Policy & Management
- ❖ Facility Design

Maintenance Factors

26 Documented / 17 Suspected

Most commonly reported were Disinfectant Control System issues:

- ❖ Lack of (Hand Feeding)*
- ❖ Malfunctioning*
- ❖ Inadequate*

Policies and Management

21 Documented / 6 Suspected

Most commonly reported....

Inadequate Water Quality Monitoring (inadequate test kit or testing frequency)

Person



14 Documented / 21 Suspected

Most commonly reported....

Primary intended use by diaper/toddler age children

Facility Design

7 Documented / 2 Suspected

Most commonly reported were

No Supplemental Disinfection (that would have inactivated Cryptosporidium)

See The Theme?

No or Improperly working Automated Controllers

Poor testing practices

High risk bather profile

Not using Secondary Disinfection

Increased Risk Venue – Honorable Mention

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Spas

- Small volume of water
- Very high temperatures contribute to microbial concerns
- Can be difficult to maintain
- Often not drained and cleaned frequently enough
- Average owner / operator may not understand all the risks
- While not submerged, aerosolization of water can contribute to transmission of pathogens

An emerging serious concern with Spas is Legionella.

Prevention Strategies

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Surprisingly Simple

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- Have **properly** functioning **Automated Controllers** and **properly** sized **disinfection** feed and **pH** control systems
- Perform Chlorine and pH testing every **2-4 hours** with a **FAS-DPD** or **DPD** based test kit for chlorine, that is **properly performed** with reagents that are **in date** and **properly stored**
- Install a properly sized **NSF-50 Cryptosporidium** certified Secondary Disinfection system that treats **100%** of flow
- Create policies that are **protective** of bathers – **especially vulnerable children**



Surprisingly Simple

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Just.

Follow.

The.

MAHC.



Q&A

