Waterborne Diseases & Outbreaks

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Sanitarian Training
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Water Uses

- **Recreational Use** (treated or untreated)
  - Swimming pools, hot tubs, splashpads,
  - Decorative fountains, sprayers

- **Drinking water**
  - Public systems
  - Private systems
  - Bottled water
Waterborne Diseases (WBD)

- Found in recreational water sources and drinking water
- Caused by contact with or consumption of contaminated water
- Contamination can be microorganism, biotoxin or chemical
- WHO-- 1.5 million deaths world-wide a year to WBD illness
- CDC -- 4-32 million cases in US per year from water systems
- Can cause large community-wide outbreaks
Sources of WBD Contamination

Agriculture
- Nitrogen fertilizer
- Pesticides
- Livestock waste runoff

Water treatment, distribution & storage
- Disinfection byproducts
- Tank or pipe leaching
- Line breaches

Industry
- Chemical discharge
- Storage leaks

Human & animal waste
- Raw sewage
- Domestic and wild animal waste

Naturally occurring contamination
- Natural erosion
WBD Contamination Effects on Humans

• Chemical Exposure
  • Gastroenteritis
  • Skin discoloration or rashes
  • Neurologic disorders
  • Cancer

• Microbial Infection & Biotoxin Exposure
  • Acute gastroenteritis -- ingestion
  • Respiratory illnesses -- inhalation
  • Eye, ear, wound or skin infections -- contact
39 species of *Legionella*; 64 serogroups

25 species are pathogenic

*L. pneumophila* serogroup 1 responsible for most human infections
Legionella in Nature

Natural Environment

• Ubiquitous -- found in water and soil
• Ideal growth temps: 77-108 °F
• Intracellular parasites of amoeba
Legionella in Man-made Systems

Building Water Systems

- Showerheads and sink faucets
- Cooling towers
- Hot tubs
- Decorative fountains
- Hot water tank
- Respiratory therapy devices
Legionella Modes of Transmission

- Airborne inhalation of contaminated aerosols
- Aspiration of contaminated water—less common
- **Not** transmitted person to person

https://www.cdc.gov/media/dpk/diseases-and-conditions/legionnaires-disease
Legionella Clinical Manifestations

Legionnaires’ disease (LD):
- Presents as pneumonia
- Usually requires hospitalization
- Incubation period: 2-14 days

Pontiac fever (PF):
- Milder illness without pneumonia
- Self-limited--resolves without antibiotic treatment
- Incubation period: 5-66 hours

Extrapulmonary legionellosis (XPL):
- Infection outside the lungs-- endocarditis, wound infection, joint infection’ etc.
- Incubation period: varies
Legionella Risk Factors

- Age ≥50 years
- Smoking (current or historical)
- Chronic lung disease (such as emphysema or COPD)
- Immunocompromised
- Underlying illness---diabetes, renal failure, or hepatic failure, etc.
- Exposure to hot tubs and aerosolized water
Public Health Significance

- 15% of community acquired pneumonia
- Most cases are associated with travel or healthcare settings
- WV has had significance increase in cases over past 3 years

Prevention

- Proper maintenance of water systems and water devices
- Timely identification and reporting of cases to identify outbreaks
Life cycle requires human
Cyst/spore—environment
Mature/reproductive phase—inside host
Shedding—cyst/spore released in environment
Cyst/spore can be difficult to kill
Harmful Algal Blooms (HABs)

- Rapid growth of cyanobacteria in water
- Increase in nutrients and temperature contribute to bloom
- Production of cyanotoxins that can be:
  - Neurotoxins
  - Hepatotoxins
  - Dermatoxins
  - Intestinal toxins
- Common exposure routes: skin, inhalation, ingestion
- Severity of illness varies depends on type of exposure and HAB toxin
HABs
WBD - Ingestion

• Common Enteric Diseases:
  • Campylobacteriosis
  • Cholera
  • Cryptosporidiosis
  • Cyclospora
  • *E. coli*
  • Vibriosis
  • Giardiasis
  • Hepatitis A
  • Norovirus
  • Salmonellosis
  • Shigellosis
  • Typhoid Fever
  • HAB toxins
• **Common Symptoms:**
  - Nausea
  - Vomiting
  - Diarrhea (sometimes bloody)
  - Fever
  - Abdominal cramping

• Dehydration
• Weight loss
• Bloating
• Asymptomatic
• **Common Illnesses:**
  - Legionellosis
  - HAB toxins
  - Pseudomonas pneumonia

• **Common Symptoms:**
  - Cough
  - Fever
  - Congestion
  - Wheezing
  - Sore throat
  - Pneumonia
  - Cold or allergy like symptoms
Waterborne Diseases – Contact

- **Common Illnesses:**
  - Vibrio wound infections
  - HAB toxin
  - Streptococcus cellulitis
  - Pseudomonas—swimmer’s ear, hot tub rash
  - Salmonella wound infections

- **Common Symptoms:**
  - Pus/drainage
  - Itching/tingling
  - Burning
  - Blisters
  - Rash
  - Redness
  - Pain
  - Fever
  - Abscess
WBD Outbreaks

• **Top 5 Causes – Drinking Water Outbreaks**
  - Giardia
  - Legionella
  - Shigella
  - Norovirus
  - Campylobacter

• **Top 5 Causes – Recreational Water Outbreaks**
  - Cryptosporidium
  - Pseudomonas
  - Shigella
  - Legionella
  - Norovirus
• Recreational Water
  • Avoid swimming if the water is murky or has an odor
  • Check diapered swimmers frequently (risk of leakage)
  • No swimming for 7 days after diarrhea resolution
  • Shower before using swimming pool or hot tub
  • Do not ingest recreational water
  • Cover open wounds with water-proof bandages
  • Do not immerse new open wounds
**WBD Prevention – Drinking Water**

- **Drinking Water**
  - Enforce national, state and local regulations and codes for water systems
  - Follow Drinking Water Advisories
  - Periodic testing of private water systems
  - Do not drink untreated/filtered water
  - Flush inactive or low use water systems/lines
WHEN IN DOUBT, STAY OUT!

STAY AWAY FROM THE WATER WHEN YOU SUSPECT A HARMFUL ALGAL BLOOM IS PRESENT.

DON'T
- Play with scum or mats on the shore
- Let animals drink water, eat algae, or swim
- Swim
- Fish or wade
- Boat or kayak
How *Legionella* affects building water systems and people

1. Internal and external factors can lead to *Legionella* growth in building water systems.

2. *Legionella* grows best in large, complex water systems that are not adequately maintained.

3. Water containing *Legionella* is aerosolized through devices.

4. People can get Legionnaires’ disease when they breathe in mist or accidentally swallow water into the lungs containing *Legionella*. Those at increased risk are adults 50 years or older, current or former smokers, and people with a weakened immune system or chronic disease.

[www.cdc.gov/legionella](http://www.cdc.gov/legionella)
Safe Swim Public Health Education

HEALTHY and SAFE SWIMMING WEEK
MAY 18-24, 2020
Keep Kids Healthy in the Water

Even in well-maintained pools, some germs can survive for days.

Tips for Parents:
- Keep kids out of water if sick with diarrhea.
- Don’t let kids swallow the water.
- Take kids on bathroom breaks every hour.
- Change diapers away from the water.

Swim healthy. Stay healthy.
www.cdc.gov/healthyswimming
The Problem

But some places we swim aren’t clean or safe.

1 in 8

Pools closed immediately on routine inspection for critical health and safety problems.
The Public Health Impact

the MAHC can help:

- Prevent drowning, illness, and injury
- Raise minimum standards and reduce inspection violations
- Keep pools open for more summer and year-round fun

Help make swimming healthier and safer.

Learn more about the Model Aquatic Health Code: www.cdc.gov/mahc
Healthy Water Topics

**Drinking Water**
Public water systems, private water systems, water fluoridation, camping, hiking, travel...

**Healthy Swimming**
Pools and spas, oceans/lakes/rimers, injury and skin cancer, recreational water illnesses...

**Water, Sanitation, & Hygiene**
Handwashing, body washing, facial cleanliness, hygiene etiquette...

**Global Water, Sanitation, & Hygiene (WASH)**
Community systems, household treatment & storage, sanitation and hygiene, travelers' health...

**WASH-related Emergencies & Outbreaks**
Safe water, wastewater, hygiene, public health toolkits...

**Other Uses of Water**
Agricultural, industrial, medical...

[https://www.cdc.gov/healthywater/index.html](https://www.cdc.gov/healthywater/index.html)
Legionella Resources

What is Legionnaires’ disease?

Legionnaires’ (LEE-juh-naires) disease is a serious type of pneumonia (lung infection) caused by Legionella (LEE-juh-nell-a) bacteria. People can get sick when they breathe in mist or accidently swallow water into the lungs containing Legionella.

Hotels and Resorts
Learn steps you can take to Prevent Legionnaires’ Disease

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<th>About the Disease</th>
<th>Prevention with Water Management Programs</th>
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https://www.cdc.gov/legionella/index.html
2018 Enteric Surveillance Data

WV Cases of Reportable Enteric Illnesses
2018

<table>
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<th>Disease</th>
<th>Number Reported</th>
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<tr>
<td>Campylobacter</td>
<td>442</td>
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<tr>
<td>Salmonella</td>
<td>247</td>
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<tr>
<td>Legionella</td>
<td>107</td>
</tr>
<tr>
<td>Giardia</td>
<td>105</td>
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<tr>
<td>STEC</td>
<td>79</td>
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<tr>
<td>Cryptosporidium</td>
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<tr>
<td>Shigella</td>
<td>21</td>
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<tr>
<td>Vibrios</td>
<td>10</td>
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<td>Listeria</td>
<td>6</td>
</tr>
<tr>
<td>Cyclospora</td>
<td>5</td>
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<tr>
<td>Botulism (food)</td>
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5-Year Legionellosis Trend

Reported Legionellosis Cases, 2014 - 2018

Number of Cases

Year

2014  2015  2016  2017  2018

49  36  33  51  110

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