Outbreak of Gastrointestinal Illness Among Patrons and Employees of a Waterpark Following a Backflow Prevention Error, Colorado, 2018

Tori Burket, MS, CPO
Waterborne Disease Epidemiologist
Park Fun Facts

- One of America’s largest family water parks
- Located 15 minutes north of downtown Denver
- 50+ attractions
- Opens from end of May - Labor Day
- Onsite food/drink purchase options
Ticket Sales

• Online
  – Specific date tickets
  – Any day tickets
• In person at gate
• Partnered retail stores (grocery stores)
• Season passes
Recreational Water Systems

- Water attractions range in size from 8,000 - 1,250,000 gallons
- Chlorine disinfection
- Some pools have supplemental UV systems
Irrigation System

- Onsite retention pond used only for irrigation
- Domestic water system serves as backup for irrigation
- Backflow valve installed between retention pond and domestic water supply
The Contamination
June 11, 2018

Late morning

Power outage resulted in irrigation stoppage.

Switch to using domestic water for irrigation.

Midday

Power is restored and they switch back to pond water for irrigation.

Supervisors noted cloudy water and discovered a leaky valve.
June 12, 2018

Early Morning
- Dug up and repaired leaky valve but still saw cloudy water.
- Called Federal Heights Water system for assistance.

Midday
- Federal Heights comes on sight and finds backflow valve is on backwards.
- Water park notifies Tri-County Health Department at 5:00 pm.
June 13, 2018

Early Morning

CDPHE Water Quality Control Division is notified, who then notifies Disease Control.

Discover that the park is still open, but is only serving bottled water and ready-to-eat foods.

Afternoon

The park is closed for remediation.

TCHD publishes a press release about the situation.
REMEDIATION

Potable Water System
• Flushed water system
• Disassembled and cleaned misters, fountains, faucets, and showerheads
• Drained water heaters

Recreational Water Systems
• Hyperchlorinated all pools (20 ppm Cl for 12.75 hours)

Other Systems
• Replaced soda fountains
• Cleaned and disinfected all other equipment with 3% hydrogen peroxide solution, including surfaces
The Pond

- Irrigation pond not intended for drinking water.
- Many types of wild animals have access including raccoons, geese, and ducks.
- Walking trail around the pond.
- Baseball/softball fields nearby.
Pond Water Sampling Results

- **Initial Sampling - June 18**
  - Undiluted sample was greater than the 2419.6 MPN/100mL test limit for both total coliform and *E. coli*.

- **Secondary Sampling - July 2**
  - *E. coli* - 12.2 MPN/100mL
  - Total coliform - 1732.9/100mL
  - *Enterococcus* - 21.6 MPN/100mL
  - *Cryptosporidium* - positive through PCR
Pond Water Sampling
Media Response and Community Messaging
Water World Reopens After Possible Contamination Forced Closure

June 15, 2020 at 12:40 pm  Filed Under: Colorado Department of Public Health and Environment, Federal Heights, Tri-County Health Department, Water Contamination, Water World

FOLLOW US
Facebook  Twitter  Instagram  YouTube  LinkedIn

POSSIBLE WATER CONTAMINATION AT WATER WORLD
UNTREATED WATER MAY HAVE REACHED POOL & CONCESSIONS

FOLLOW US
Facebook  Twitter  Instagram  YouTube  LinkedIn
If you're heading to the pool, here are some tips on how to protect yourself and your family from illness. 

https://www.colorado.gov/pacific/cdphe/news/healthy-swimming

Practice healthy swimming to prevent spread of Crypto, other waterborne illness...

Tri-County Health Department
June 14 at 10:55 AM

Water World update: A faulty valve likely allowed water from an irrigation pond to flow into the domestic water supply, which might have affected drinking fountains, and been used to make ice, drinks and food at all concession stands. This may also include water in some of the swimming pools.

If you visited Water World between Monday, June 11 and Wednesday, June 13 AND are experiencing symptoms like vomiting, diarrhea and fever you should call the Colorado Department of Public Health and Environment at 303-692-2700

People who aren't sick don't need to CDPHE.

Questions about the Water World issue? Call COHelp at 303-389-1687 or 1-877-462-2911.

Water World is in full cooperation to ensure that the retail food and swimming areas are safe. Water World will be closed Thursday, June 14 and will reopen Friday, June 15.

More info: https://www.colorado.gov/pacific/cdphe/water-world

Colorado Department of Public Health and Environment
June 25 at 1:25 PM

If you visited Water World Colorado on June 11, 12 or 13 and experienced illness like fever, vomiting, diarrhea, or stomach issues after your visit, please call the Colorado Department of Public Health and Environment at 303-692-2700.

Symptoms might appear up to 45 days after swallowing or drinking contaminated water. The state health department and Tri-County Health Department are following up on this event to find out what, if any, illnesses may be linked to the June 11-13 issue at Water World.

If you don't have symptoms but have questions about the situation, you can call CO-HELP at 1-877-462-2911 (or 303-389-1687).
Messaging

- Health alert for healthcare providers
- Childcare Providers
- Local Environmental Health Depts
- Pool Operators
Epidemiologic Investigations
Number of People

**Employees**
Around 500 employees worked on either June 11, 12, or 13.

**Patrons**
- June 11 - 9,000 guests
- June 12 - 7,000 guests
- June 13 - 5,000 guests
"WORST. DAY. EVER."

— CDPHE On-Call Epidemiologist

June 14, 2018
Community Calls

CDPHE received more than 350 calls from the public.
• ~200 calls received within first 1.5 days.

Activated CO-Help
• Emergency health hotline to provide up-to-date public health information.
• Used to answer questions for non-ill callers.

CDPHE/TCHD continued to answer calls from ill callers for several weeks.
1 person was co-infected with *Giardia* and *E. coli*
Season Pass Holder Study

• Received a list of all season pass holders who visited the park on June 11, 12, or 13.
• De-duplicated the data set and then randomly selected 300 names.
• Created a survey in REDCap and teams of CDPHE employees and students called the selected season pass holders for interview.
• Of the 300 selected season pass holders, 74 agreed to interviewed and completed the survey.
• If the pass holder was under 18 years old, either the parent completed the interview or permission was received to interview the child.
Season Pass Holder Study

Number of Days Visited Between June 11-13

- 1 Day: 86%
- 2 or 3 days: 14%

Statistics among all study respondents

Date attended is not mutually exclusive

- 45% Attended on June 11
- 38% Attended on June 12
- 34% Attended on June 13
Season Passholder Study (n=74)

7.4% Reported gastrointestinal illness (n=10)

Symptoms:
- Diarrhea: 80%
- Abdominal Pain: 90%
- Nausea: 70%
- Loss of appetite: 60%

Hospitalized: 0%
Died: 0%

Age:
- 0-19 years: 60%
- 20-39 years: 20%
- 40-59 years: 20%
- 60+ years: 0%

Statistics among persons reporting gastrointestinal illness
Season pass holder respondents by county

Passholder County of Residence
- Missing / Excluded
- Less than 2
- 2 to 5
- 5 to 10
- 10 and above

Min: 1 (Arapahoe)
Max: 16 (Adams)

Water Park
Season Pass Holder Study

Significant Variables

- Spent longer at the park on June 12
- Drank from water fountain
- Drank a fountain drink*

*Consuming ice and drinking a fountain drink were highly correlated

P-value = 0.01

OR: 5.88 (1.44 - 23.9)

OR: 7.00 (1.62 - 30.3)
Employee Study

• An online survey was sent to all employees who worked at the park between June 11 - 13.
• The survey collected information on demographics, job duties, water exposures, and illness.
• Any employees reporting gastrointestinal illness after June 13 were individually screened by both TCHD and facility management prior to each shift.
• Any employee who met the case definition or actively had diarrhea was put on restricted work duties.
• Employees were screened until July 10, the maximum incubation period for *Giardia*. 
Employee Study (n=323)

Reported gastrointestinal illness (n=95)

- 100% Diarrhea
- 81% Abdominal Pain
- 72% Nausea
- 56% Loss of appetite
- 0% Hospitalized
- 0% Died

17 years

Median Age

Statistics among persons reporting gastrointestinal illness
Employee Study
Significant Variables

- Job Requires Water Contact: OR: 3.46 (1.88 - 6.35)
- Drank from water fountain on June 11: OR: 2.90 (1.58 - 5.31)
- Drank from water fountain on June 12: OR: 2.56 (1.35 - 4.85)
Conclusions

- Delay in communication between the park, TCHD, and CDPHE could have prompted slow initial response.
- Using the media helped notify public of event and to identify ill persons, however timing was not ideal.
- Thorough employee follow-up ensured no further contamination or secondary illnesses.
- Coordinating studies helped assess burden of the event.
- Integrating expertise from environmental health specialists, epidemiologists, and laboratorians ensured a collaborative and comprehensive response.
THANKS!

More questions?
Tori Burket, MS
Tori.burket@state.co.us