

Healthy Swimming:

Prevention of Recreational Water Illnesses (RWIs)

Questions and Answers for Aquatics Facility Staff



The following information about recreational water illnesses and ways to help prevent them is for people who own, manage, operate, or work at pools, waterparks, hot tubs, and spas.

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INTRODUCTION

As you know, this summer swimming pools will be filled with millions of people having fun and staying cool. But germs from swimmers can contaminate the water. In the past we weren't as concerned but today there are new germs that can contaminate water and cause illness. This summer, learning about recreational water illnesses (RWIs) will help decrease the chance of illness transmission at your venue.



Recreational water illnesses are caused by germs such as “Crypto” (KRIP-toe, short for *Cryptosporidium*), *Giardia* (gee-ARE-dee-uh), *E. coli* O157:H7, and *Shigella* (Shi-GE-luh) and are spread by accidentally swallowing water that has been contaminated with fecal matter. People in the pool share the water with everyone else in the pool. If someone with diarrhea contaminates the water, swallowing the water can make people sick.

The great news is that germs causing RWIs are killed by the chlorine you have in your pool. However, chlorine doesn't work right away. It takes time to kill germs and some germs like Crypto are resistant to chlorine and can live in pools for days. That is why even the best maintained pools can spread illness. Therefore, the promotion of healthy swimming behaviors is essential for any recreational water venue. Healthy swimming behaviors can protect patrons and their children from RWIs and will help stop germs from getting in the pool in the first place.

In conclusion, healthy swimming is an “All-American” activity. Most people who swim don't get sick or injured. Although the risk of RWI outbreaks at a specific facility is probably low, current risk management practices suggest that planning for low-risk events (such as drowning, lightning strikes, etc.) is necessary and in everyone's best interest since RWI outbreaks occur regularly every year. So, expand your safety program to include the newest risk on the block—the spread of RWIs. Proactive prevention planning with staff and patrons on your part may reduce the risk of an outbreak at your facility.

How can swimming transmit illness?

Swimming is second to walking as the most popular exercise in the United States with more than 368 million annual visits to swimming pools. When people swim in pools, waterparks, spas, hot tubs, lakes, rivers, and the ocean, they share the same water.

Diarrheal illness is common in the United States (>1 diarrheal episode per person per year) which increases the potential for fecal contamination of recreational water. If someone is ill, he or she can contaminate the water for everyone who is swimming. Contaminated recreational water can cause a variety of illnesses such

as diarrhea or skin, ear, eye, and upper respiratory infections. People who are fecally-incontinent (can't control the release of feces) such as diaper- and toddler-aged children may be more likely to contaminate the water. If they have diarrheal illness, they can spread that illness to other swimmers.

Once the pool is contaminated, patrons may accidentally swallow the fecally contaminated water, which could make them ill. In addition, some germs such as Crypto (short for *Cryptosporidium*) may take days to be killed by chlorine, increasing the risk of spreading illness.

Why should pool owners and staff think about illnesses spread through the water?

The Centers for Disease Control and Prevention (CDC) has been gathering information from state health authorities on recreational water illness (RWI) outbreaks in the United States since 1978. Diarrhea, which is currently the most frequently reported symptom, is caused by germs such as Crypto (short for *Cryptosporidium*), *E. coli* O157:H7 (*E.*

coli), *Giardia*, and *Shigella*.

Since 1985, the number of outbreaks of

diarrhea connected with swimming pools is on the increase. Some of these outbreaks have affected thousands of swimmers. Much of the diarrheal illness



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reported to health officials, such as that caused by Crypto, happens during the summer swim season. CDC information from the past few years shows that Crypto is the major germ that causes outbreaks in swimming pools and waterparks, where its high chlorine resistance and small size make it a difficult problem for even the best-equipped and well-maintained pools. *E. coli* O157:H7 is sensitive to chlorine so most outbreaks have occurred in locations where no chlorine is added, such as lakes. *E. coli* O157:H7 outbreaks appear to be a rare occurrence in chlorinated pools.

Approximately 10 diarrheal outbreaks linked to swimming pools are reported each year and each one can potentially cause hundreds to thousands of people to become ill. However, pool staff need to keep in mind that most diarrheal illnesses are not reported to health care providers and health officials. This means that the number of outbreaks reported is probably only the tip of the iceberg. Because fewer than 10% of people with diarrhea ever go



to see a health care provider, public health officials never hear about most cases of illness. Therefore, illness prevention should be a part of every swimming safety program just like the prevention of drowning, injuries, and sunburn.

Even though small or home pools may have fewer people swimming in them, owners still need to be concerned about RWIs spread through pool water. Poor maintenance of the pool and the lack of healthy swimming behaviors may lead to low chlorine levels, clogged filters, and contamination of pool water, which may place swimmers at risk for diarrheal illnesses and skin, ear, eye, and upper respiratory infections.

Why is diarrhea in the pool a problem?

Diarrhea is the most commonly reported symptom of recreational water illness (RWI). For any public swimming facility (remember everyone who is swimming shares the same pool water), continuous filtration and disinfection of water should reduce the risk of illness transmission. However, patrons may still be exposed to germs during the time it takes for chlorine to work or water to be recycled through filters.

Most diarrheal illness outbreaks in pools appear to be related to fecal contamination of the water by someone who is ill with diarrhea. In addition, tiny amounts of fecal matter also rinse off all swimmers' bottoms as they swim through the water. Infectious diarrhea can contain hundreds of millions of germs in a single

fecal accident. Many pools use one filtration system for several pools. This causes water from many pools to mix quickly, and distribute germs throughout connected pools in a very short amount of time. If other patrons then swallow the contaminated water, they may become infected and develop diarrhea or other illnesses. Since many illnesses can be spread by swallowing just a few germs, it is possible that a single diarrheal accident can contaminate water throughout the largest pool or waterpark. Therefore, isolating the filtration for your "kiddie" pool water from other pools to avoid cross-contamination is a good policy. (see "For Aquatics Staff: 12 Steps for Prevention of Recreational Water Illnesses" at www.cdc.gov/healthyswimming/twelvesteps.htm)

What's the difference between maintaining disinfectant in hot tubs/spas versus in swimming pools?

Skin infections are the most common infections spread through hot tubs and spas. The increased temperature of the water in hot tubs and spas can cause the chlorine to evaporate more rapidly than in swimming pools. As a result, chlorine or

other disinfectant levels in hot tubs and spas need to be checked and adjusted more regularly than in swimming pools. Skin infections should not be transmitted if the water quality is appropriately maintained and monitored.

How severe can these illnesses be?

Diarrhea can be caused by many different germs. It can last from a few days to weeks. Pool patrons may not associate their diarrhea with swimming pools because illness may not occur until several days to weeks after swallowing contaminated water.

Crypto (short for *Cryptosporidium*) causes diarrhea that has limited response to known medicines. Illness can be quite severe, resulting in emergency room or hospital visits for young children and pregnant women who can easily become dehydrated.

Crypto can be life-threatening and sometimes fatal in persons with compromised immune systems (such as persons living with AIDS, those who have received an organ transplant, or those receiving certain types of chemotherapy).

Persons living with compromised immune

systems should be aware that some swimming pools, waterparks, hot tubs, spas, ornamental water fountains, lakes, rivers, and salt-water beaches might be contaminated with human or animal waste that contains Crypto. To reduce the risk of illness, persons with compromised immune systems should avoid swimming in water that is likely to be contaminated and should avoid swallowing water while swimming or playing in recreational water.



E. coli O157:H7 infection can cause severe illness. The 1998 waterpark outbreak of *E. coli* O157:H7 resulted in seven children having kidney failure, and one death. Outbreaks caused by *E. coli* O157:H7 appear to be rare in pools if free chlorine levels are maintained at regulated levels.

For further information about *Cryptosporidium* go to:
http://www.cdc.gov/ncidod/dpd/parasites/cryptosporidiosis/factsheet_cryptosporidiosis.htm

1999 USPHS/IDSA Guidelines for Prevention of Opportunistic Infections in Persons with HIV.
<http://www.cdc.gov/epo/mmwr/preview/mmwrhtml/rr4810a1.htm>

Are there germs that are chlorine resistant?

Yes.

Fortunately, free chlorine at pH 7.5 kills most bacteria such as *E. coli* O157:H7 in less than a minute if the free available chlorine is maintained at proper disinfection levels throughout the pool.

However, a few germs are moderately (*Giardia*, Hepatitis A) to highly (*Crypto*, short for *Cryptosporidium*) chlorine-resistant. The table below shows the approximate disinfection times for these germs in chlorinated water.

Many discussions have revolved around “how” resistant each of these germs is and



whether the laboratory experiments represent swimming pool conditions. Current recommendations are based on the best and most reproducible laboratory information available.

Agent	Disinfectant Times for Germs in Chlorinated Water*
<i>E. coli</i> O157:H7 Bacteria	<< 1 minute
Hepatitis A Virus	approximately 16 minutes
<i>Giardia</i> Parasite	approximately 45 minutes
<i>Cryptosporidium</i> Parasite	approximately 9600 minutes (6.7 days)

***1mg/L (1ppm) chlorine at pH 7.5 and 77°F (25°C)**

Should all fecal accidents be treated the same?

No.

You keep hearing about diarrhea spreading illness, but all you see is the formed stool in the pool. With most diarrheal illnesses, the number of infectious germs found in each bowel movement decreases as the diarrhea stops and the person's bowel movements return to normal. Therefore, a formed stool is probably less of a risk than a diarrheal accident that you may not see.

A formed stool may contain no germs or only a few that can cause illness. The germs that may be present are less likely to be released into the pool because they are mostly contained within the stool. However, formed stool also protects germs inside from being exposed to the chlorine in the pool so prompt removal is necessary.

So how should you treat a formed fecal accident? Should you treat it as a Crypto (short for *Cryptosporidium*) accident with a long pool closure, or with



hyperchlorination, and so on?

Not a great deal is known about this subject. In 1999, pool staff across the country collected almost 300 samples from fecal accidents that occurred at waterparks and pools and CDC tested them for the presence of *Giardia* and Crypto. None of the sampled fecal accidents tested positive for Crypto, but *Giardia* was found in 4.4% of the samples collected. These results suggest that formed fecal accidents pose a very small Crypto threat, but should be treated as a risk for spreading other germs (such as *Giardia*). Remember a diarrheal fecal accident is considered to be the higher risk event than a formed stool fecal event.

For detailed fecal accident response recommendations from CDC, go to:
<http://www.cdc.gov/healthyswimming/fecalacc.htm>

Why is it important to clean the surfaces around the pool?

Because illness is not only spread through the water, but can also be spread by contact with contaminated surfaces and structures around or in the pool.

Lounge chairs and tables can also become contaminated with microscopic amounts of fecal matter when parents use the furniture as diaper-changing areas. The invisible fecal matter left behind may be easily transferred to the next patron using the pool furniture. Play structures in and around the pool that fail to get rinsed off by chlorinated pool water may get covered in germs from unwashed hands.

By keeping your restrooms and diaper-changing areas



clean, convenient, and close to the pool, you can discourage parents from changing diapers at poolside. Lifeguards and park staff can be trained to spot these inappropriate behaviors and talk to parents about why it is important to use the diaper-changing areas.

What did parents think and know about recreational water illnesses (RWIs)?

In 1998, CDC interviewed some parents about swimming. Many parents don't think of swimming as sharing water with others and don't realize that illness can be spread through recreational or pool water. If they "smell the chlorine," they believe the pool water is "sterile" and can't spread illness.



Many believe that germs released from a sick child into chlorinated water are killed

immediately. It is true that chlorine kills germs but it takes time and some germs

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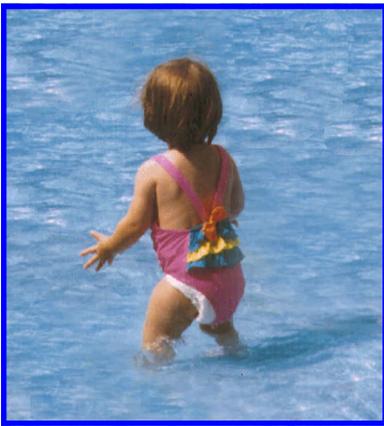
can live for hours or even days in a well-maintained pool. It is in everyone's best interest to educate swimmers about how healthy swimming behaviors in a pool can protect everyone from the spread of illness.

Patrons need to realize that no one should swim when ill with diarrhea. Patrons should not swallow the water because swallowing

contaminated water is how most RWIs are spread.

Parents said they wanted to be educated about how RWIs are spread and believed that this education should take place at pools. They also felt the general public must be educated (through doctors' offices, parents' magazines, etc.).

What do I need to know about swim diapers and swim pants?



The use of swim diapers and swim pants may give many parents and pool staff a false sense of security

regarding fecal contamination.

Little published scientific information exists on how well they are able to keep feces or infection-causing germs from leaking into the pool. Many pools are now requiring children to be in swim pants or diapers. However, it is unlikely that swim diapers are

able to keep diarrheal stools from leaking into the pool.

Try and make sure that parents:

- Understand the importance of NOT swimming when ill with diarrhea.
- Plan regular diaper changing and frequent (approximately every 30 to 60 minutes) trips to the toilet that will further reduce the chance of fecal contamination. This also reduces the amount of urine in the pool that is binding with disinfectant so that it is not available for killing germs.