# Fecal Incident Response Recommendations for Aquatic Staff

## What do you do when you find poop in the water?



**Check for existing guidelines from your local or state regulatory agency before use. CDC recommendations do not replace existing state or local regulations or guidelines.**

These recommendations are for responding to fecal incidents in chlorinated aquatic venues (for example, pools and water playgrounds).

Improper handling of chlorine-based disinfectants can cause injury. Follow proper occupational safety and health requirements when following these recommendations. For more pool chemical safety information, visit www.cdc.gov/healthywater/swimming/aquatics-professionals/preventing-pool-chemical-events.html.

**CLOSURES:** Fecal incidents are a concern and an inconvenience to both aquatic staff and patrons. Aquatic staff should carefully explain to patrons why the aquatic venue needs to be closed in response to a fecal incident. Explaining the reasons for closing the venue (for proper disinfection and protection of swimmer health) is likely to promote patron understanding and minimize their frustration. Closures allow chlorine to do its job—kill germs and help prevent recreational water illnesses (RWIs).

Hot tubs/spas, and some water playgrounds, can have much smaller amounts of water. In response to formed or diarrheal fecal incidents in small-volume venues, it might be more efficient to completely drain as much water as possible from the venue and associated plumbing; scrub and clean all accessible surfaces in contact with contaminated water; replace or clean filter media when appropriate, and refill with uncontaminated water from an approved source (for example, municipal water system).

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# What do I do about...

## formed fecal matter (poop) in the water?

Formed fecal incidents pose a risk for spreading germs, including moderately chlorine tolerant *Giardia*. To disinfect the water following a formed fecal incident, aquatic staff should follow the steps below, which are based on killing or inactivating *Giardia*.

***Step 1***: Close the aquatic venue to swimmers. If you have multiple venues that use the same filtration system—all of the venues will have to be closed to swimmers. Do not allow anyone to enter the venue(s) until the disinfection process is completed.

***Step 2***: Remove as much of the fecal matter as possible (for example, using a net or bucket) and dispose of the fecal matter in a sanitary manner. Clean and disinfect the item used to remove the fecal matter (for example, after cleaning, leave the net or bucket immersed in the water during disinfection). **VACUUMING FECAL MATTER FROM THE WATER IS NOT RECOMMENDED.**

***Step 3***: Using unstabilized chlorine (for example, sodium hypochlorite), raise the water's free chlorine concentration to 2 parts per million (ppm), if less than 2 ppm. Maintain free chlorine concentration at 2 ppm and water at pH 7.5 or less for 25–30 minutes.[1] Other concentrations or closure times can be used (see table). State or local regulators may require higher free chlorine concentration in the presence of chlorine stabilizers,[2] which are known to slow the rate at which free chlorine inactivates or kills germs.

***Step 4***: Confirm that the filtration system is operating while the water reaches and is maintained at the proper free chlorine concentration and pH for disinfection.

***Step 5***: Allow swimmers back into the water only after the disinfection process has been completed and the free chlorine concentration and pH are within the operating range allowed by the state or local regulatory authority.

**Establish a fecal incident log.**
Document each fecal incident by recording date and time of the event, whether it involved formed fecal matter or diarrhea and the free chlorine concentration and pH at the time or observation of the event. Before reopening the aquatic venue, record the procedures followed in response to the fecal incident (including the process used to adjust chlorine concentration and pH [if necessary], the free chlorine concentration and pH, and the disinfection time). You can download a Water Contamination Response Log at **http://www.cdc.gov/healthywater/swimming/aquatics-professionals/fecalresponse.html**

| ***Giardia*** **Kill or Inactivation Time for a Formed Fecal Incident** | |
|---|---|
| **Free Chlorine Concentration (ppm)** | **Disinfection Time[3]** |
| 1.0 | 45 minutes |
| 2.0 | 25–30 minutes |
| 3.0 | 19 minutes |

1. Ideally, the water temperature should be 77°F (25°C) or higher during the disinfection process.
2. Chlorine stabilizers include compounds such as cyanuric acid, dichlor, and trichlor.
3. These closure times are based on 99.9% kill or inactivation of *Giardia* cysts by chlorine at pH 7.5 or less and temperature of 77°F (25°C) or higher. The closure times were derived from the U.S. Environmental Protection Agency (EPA) Disinfection Profiling and Benchmarking Guidance Manual. These closure times do not take into account "dead spots" and other areas of poor pool water mixing.

# What do I do about...

## diarrhea in the water when chlorine stabilizer[1] is NOT in the water?

A diarrheal incident is a high-risk event for contamination caused by *Cryptosporidium* (or "Crypto"), an extremely chlorine-tolerant parasite. Therefore, it is important that aquatic staff educate patrons not to swim when ill with diarrhea. To disinfect the water following a diarrheal incident, aquatic staff should hyperchlorinate, or raise the free chlorine concentration to a high concentration for a long period of time. If necessary, before attempting to hyperchlorinate, consult an aquatic professional to determine the feasibility, the most optimal and practical methods, and needed safety considerations.

***Step 1***: Close the aquatic venue to swimmers. If you have multiple venues that use the same filtration system—all of the venues will have to be closed to swimmers. Do not allow anyone to enter the venue(s) until the hyperchlorination process is completed.

***Step 2***: Remove as much of the fecal matter as possible (for example, using a net or bucket) and dispose of the fecal matter in a sanitary manner. Clean and disinfect the item used to remove the fecal matter (for example, after cleaning, leave the net or bucket immersed in the water during hyperchlorination).

***VACUUMING FECAL MATTER FROM THE WATER IS NOT RECOMMENDED.***

***Step 3***: Using unstabilized chlorine (for example, sodium hypochlorite), raise the water's free chlorine concentration (see Table below) and maintain water at pH 7.5 or less.[2]

**Establish a fecal incident log.**
Document each fecal incident by recording date and time of the event, whether it involved formed fecal matter or diarrhea and the free chlorine concentration and pH at the time or observation of the event. Before reopening the aquatic venue, record the procedures followed in response to the fecal incident (including the process used to adjust chlorine concentration and pH [if necessary], the free chlorine concentration and pH, and the hyperchlorination time). You can download a Water Contamination Response Log at **http://www.cdc.gov/healthywater/swimming/aquatics-professionals/fecalresponse.html**

***Step 4***: Achieve a concentration × time (CT) inactivation value of 15,300[3] to inactivate or kill Crypto. The CT inactivation value refers to the concentration of free chlorine in parts per million (ppm) multiplied by time in minutes at a specific pH and temperature.

***Step 5***: Confirm that the filtration system is operating while the water reaches and is maintained at the proper free chlorine concentration and pH for hyperchlorination.

***Step 6***: Backwash the filter thoroughly after reaching the CT inactivation value. Be sure to discharge directly to waste and according to state or local regulations. Do not return the backwash through the filter. Where appropriate, replace the filter media.

***Step 7***[4]: Allow swimmers back into the water only after the required CT inactivation value has been achieved and the free chlorine concentration and pH are within the operating range allowed by the state or local regulatory authority.

**Use the formula below to calculate the time required to inactivate or kill Crypto[5]**

| Concentration × time (CT) inactivation value | ÷ | Free chlorine concentration (parts per million [ppm]) | Time (in minutes) |
|---|---|---|---|
| 15,300 | ÷ | 20* | = 765 (or 12.75 hours) |
| 15,300 | ÷ | 10 | = 1,530 (or 25.5 hours) |

1. Chlorine stabilizers include compounds such as cyanuric acid, dichlor, and trichlor.
2. Ideally, the water temperature should be 77°F (25°C) or higher during the hyperchlorination process.
3. Alternative options could include circulating the water through a secondary disinfection system (for example, ultraviolet light or ozone) to theoretically reduce the number of Crypto oocysts in the aquatic venue(s) below one oocyst/100 mL as outlined in the Model Aquatic Health Code (MAHC) standard 4.7.3.3.2.4 (current edition of the MAHC is available at www.cdc.gov/mahc/currentedition/index.html) or draining the aquatic venue(s).
4. CDC does not recommend testing the water for Crypto after hyperchlorination is completed. Although hyperchlorination destroys Crypto's infectivity, it does not necessarily destroy the structure of the parasite.
5. Shields JM, Hill VR, Arrowood MJ, Beach MJ. Inactivation of *Cryptosporidium parvum* under chlorinated recreational water conditions. J Water Health. 2008;6(4):513–20.

* Many conventional test kits cannot measure free chlorine concentrations this high. Use chlorine test strips that can measure free chlorine in a range that includes 20–40 ppm (such as those used in the food industry) or make dilutions for use in a standard DPD test kit using chlorine-free water.

# What do I do about...

## diarrhea in the water when chlorine stabilizer[1] is in the water?

A diarrheal incident is a high-risk event for contamination caused by Cryptosporidium (or "Crypto"), an extremely chlorine-tolerant parasite. Therefore, it is important that aquatic staff educate patrons not to swim when ill with diarrhea. To disinfect the water following a diarrheal incident, aquatic staff should hyperchlorinate, or raise the free chlorine concentration to a high concentration for a long period of time. If necessary, before attempting to hyperchlorinate, consult an aquatic professional to determine the feasibility, the most optimal and practical methods, and needed safety considerations.

***Step 1***: Close the aquatic venue to swimmers. If you have multiple venues that use the same filtration system—all of the venues will have to be closed to swimmers. Do not allow anyone to enter the venue(s) until the hyperchlorination process is completed.

***Step 2***: Remove as much of the fecal matter as possible (for example, using a net or bucket) and dispose of the fecal matter in a sanitary manner. Clean and disinfect the item used to remove the fecal matter (for example, after cleaning, leave the net or bucket immersed in the water during hyperchlorination).

**VACUUMING FECAL MATTER FROM THE WATER IS NOT RECOMMENDED.**

***Step 3***: Using unstabilized chlorine (for example, sodium hypochlorite), raise the water's free chlorine concentration (see bullets below) and maintain water at pH 7.5 or less.[2]

***Step 4***: Hyperchlorinate.[3] Chlorine stabilizer slows the rate at which free chlorine inactivates or kills Crypto, and the more stabilizer there is in the water the longer it takes to kill Crypto.

**If the cyanuric acid concentration is 1–15 parts per million (ppm)[4]**

- Raise the free chlorine concentration to 20 ppm[5] and maintain it for 28 hours or
- Raise the free chlorine concentration to 30 ppm[5] and maintain it for 18 hours or
- Raise the free chlorine concentration to 40 ppm[5] and maintain it for 8.5 hours

**If the cyanuric acid concentration is more than 15 ppm, lower the concentration to 1–15 ppm by draining partially and adding fresh water without chlorine stabilizer before attempting to hyperchlorinate.**

***Step 5***: Confirm that the filtration system is operating while the water reaches and is maintained at the proper free chlorine concentration and pH for hyperchlorination.

***Step 6***: Backwash the filter thoroughly after hyperchlorination has been completed. Be sure to discharge directly to waste and according to state or local regulations. Do not return the backwash through the filter. Where appropriate, replace the filter media.

***Step 7***[6]: Allow swimmers back into the water only after hyperchlorination has been completed and the free chlorine concentration and pH are within the operating range allowed by the state or local regulatory authority.

**Establish a fecal incident log.**
Document each fecal incident by recording date and time of the event, whether it involved formed fecal matter or diarrhea and the free chlorine concentration and pH at the time or observation of the event. Before reopening the aquatic venue, record the procedures followed in response to the fecal incident (including the process used to adjust chlorine concentration and pH [if necessary], the free chlorine concentration and pH, and the hyperchlorination time). You can download a Water Contamination Response Log at **http://www.cdc.gov/healthywater/swimming/aquatics-professionals/fecalresponse.html**

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4. Murphy JL, Arrowood MJ, Lu, X, Hlavsa MC, Beach MJ and Hill VR. Effect of cyanuric acid on the inactivation of *Cryptosporidium parvum* under hyperchlorination conditions. *Environ Sci & Technol*, 2015;49:7348-55.
5. Many conventional test kits cannot measure free chlorine concentrations this high. Use chlorine test strips that can measure free chlorine in a range that includes 20–40 ppm (such as those used in the food industry) or make dilutions for use in a standard DPD test kit using chlorine-free water.
6. CDC does not recommend testing the water for Crypto after hyperchlorination is completed. Although hyperchlorination destroys Crypto's infectivity, it does not necessarily destroy the structure of the parasite.