

POOL FOULING RESPONSES - FORMED FECAL MATTER

Formed fecal matter in the water:

Formed fecal incidents pose a risk for spreading pathogens, such as the moderately chlorine-tolerant pathogen *Giardia*. To effectively inactivate or kill *Giardia* and disinfect the water following a formed fecal incident, aquatic staff should follow the steps below:

STEP 1:	Immediately evacuate the pool and switch off the recirculation and disinfection systems. 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(s) used to remove the fecal matter (for example, after cleaning, leave the net or bucket immersed in the water during disinfection or disinfect all items with *50 parts per million (ppm) of chlorine). VACUUMING FECAL MATTER FROM THE WATER IS NOT RECOMMENDED. * 50ppm of Chlorine solution is mixing of 1 teaspoon (5ml) of household unscented bleach (5.25% Sodium hypochlorite) in 4 litres of water.
STEP 3:	Using unstabilized chlorine (for example, sodium hypochlorite), raise the water's free available chlorine (FAC) concentration to 2 ppm if less than 2 ppm, while recirculation system is still switched off. Maintain FAC concentration at 2 ppm and water pH at 7.5 or less for 25–30 minutes. Other chlorine concentrations or closure times can be used (see table below). Higher FAC concentration may be required in the presence of chlorine stabilizers, which are known to slow the rate at which FAC inactivates or kills germs.
STEP 4:	Confirm that the filtration system is operating for 30 minutes while the water reaches and is maintained at the proper FAC and pH for disinfection.
STEP 5:	Allow swimmers back into the water only after the disinfection process has been completed and the FAC and pH are within the operating range.

Giardia Kill or Inactivation Time for a Formed Fecal Incident

FAC Concentration (ppm)	Disinfection Time
1.0	45 minutes
2.0	25–30 minutes
3.0	19 minutes

References

Centers for Disease Control and Prevention, 2016.
Ministry of Health and Long-Term Care- Recreational Water Reference Document, 2019
Toronto Public Health- Public Pool, Public Spa and Class C Facilities Operator's Manual, 2019

POOL FOULING RESPONSES - DIARRHEA and VOMIT

Diarrhea and vomit in water that does NOT contain chlorine stabilizer:

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 available chlorine (FAC) 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:	Immediately evacuate the pool and switch off the recirculation and disinfection systems. 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 or disinfect all items with *50 parts per million (ppm) of chlorine). VACUUMING FECAL MATTER FROM THE WATER IS NOT RECOMMENDED. * 50ppm of Chlorine solution is mixing of 1 teaspoon (5ml) of household unscented bleach (5.25% Sodium hypochlorite) in 4 litres of water.
STEP 3:	Using unstabilized chlorine (for example, sodium hypochlorite), raise the water’s FAC concentration (see Table below) and maintain water at pH 7.5 or less.
STEP 4:	Achieve a concentration × time (CT) inactivation value of 15,300 to inactivate or kill Crypto. The CT inactivation value refers to the concentration of FAC in 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 FAC 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:	Allow swimmers back into the water only after the required CT inactivation value has been achieved and the FAC concentration and pH are within the operating range.

Use the formula below to calculate the time required to inactivate or kill Crypto

Concentration × time (CT) inactivation value	÷	FAC concentration (ppm)	Time (in minutes)
15,300	÷	20	= 765 (or 12.75 hours)
15,300	÷	10	= 1,530 (or 25.5 hours)

References

Centers for Disease Control and Prevention, 2016.
Ministry of Health and Long-Term Care, Recreational Water Reference Document, 2019
Toronto Public Health- Public Pool, Public Spa and Class C Facilities Operator’s Manual, 2019
Last Updated: Nov 2022

POOL FOULING RESPONSES - DIARRHEA and VOMIT

Diarrhea and vomit in water that DOES contain a chlorine stabilizer:

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 available chlorine (FAC) 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:	Immediately evacuate the pool and switch off the recirculation and disinfection systems. 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 or disinfect all items with *50 parts per million (ppm) of chlorine)). VACUUMING FECAL MATTER FROM THE WATER IS NOT RECOMMENDED. * 50ppm of Chlorine solution is mixing of 1 teaspoon (5ml) of household unscented bleach (5.25% Sodium hypochlorite) in 4 litres of water.
STEP 3:	Using unstabilized chlorine (for example, sodium hypochlorite), raise the water’s FAC concentration (see Table below) and maintain water at pH 7.5 or less.
STEP 4:	Hyperchlorinate. Chlorine stabilizer slows the rate at which FAC 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 ppm <ul style="list-style-type: none"> • Raise the FAC concentration to 20 ppm for 28 hours or • Raise the FAC concentration to 30 ppm for 18 hours or • Raise the FAC concentration to 40 ppm 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 FAC concentration and pH for hyperchlorination.
STEP 6:	Backwash the filter thoroughly after hyperchlorination has been completed. Be sure to discharge directly to waste. Do not return the backwash through the filter. Where appropriate, replace the filter media.
STEP 7:	Allow swimmers back into the water only after the required CT inactivation value has been achieved and the FAC concentration and pH are within the operating range.

References

Centers for Disease Control and Prevention, 2016.
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