

Hyperchlorination to Kill *Cryptosporidium**

Recommendations for Aquatics Operators of Treated Venues

Cryptosporidium (or “Crypto”) is an extremely chlorine-tolerant parasite, so even well-maintained pools and interactive fountains can spread Crypto among swimmers. If an outbreak of Crypto infections occurs in your community, the health department might ask you to hyperchlorinate. Additionally, to help keep Crypto levels low, you might choose to hyperchlorinate periodically (for example, weekly). If necessary, consult an aquatics professional to determine or identify the feasibility, practical methods, and safety considerations before attempting to hyperchlorinate at your facility.

Step 1: Close the pool to swimmers. If you have multiple pools that use the same filtration system — all of the pools will have to be closed to swimmers and hyperchlorinated. Do not allow anyone to enter the pool(s) until hyperchlorination is completed.

Step 2: Raise the water’s free chlorine concentration (see Table) and maintain pH 7.5 or less and the temperature at 77°F (25°C) or higher.

Step 3: Achieve a concentration time inactivation value (Ct) of 15,300^{†,§} to kill Crypto. The Ct refers to the concentration of free chlorine in parts per million (ppm) multiplied by time in minutes at a specific pH and temperature (see footnote [§] for guidance if chlorine stabilizer is used).

Use the formula below to calculate the time required for Crypto inactivation

Concentration time inactivation value (Ct)	÷	Free chlorine concentration (C) (parts per million)	Time (t) (minutes)
15,300 ^{†,§}	÷	20 [¶]	= 765
15,300	÷	10	= 1,530

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

Step 5: Backwash the filter thoroughly after reaching the Ct. Be sure the effluent is discharged directly to waste and in accordance with state or local regulations. Do not return the backwash through the filter. Where appropriate, replace the filter media.

Step 6:** Allow swimmers back into the water only after the required Ct has been achieved and the free chlorine and pH levels have been returned to the normal operating range allowed by the state or local regulatory authority.

* 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.

† 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.

§ Crypto Ct is based on killing 99.9% of Crypto. This level of Crypto inactivation cannot be reached in the presence of 50 ppm chlorine stabilizer, even after 24 hours at 40 ppm free chlorine, pH 6.5, and a temperature of 77°F (25°C). Extrapolation of these data suggest it would take approximately 30 hours to kill 99.9% of Crypto in the presence of 50 ppm or less cyanuric acid, 40 ppm free chlorine, pH 6.5, and a temperature of 77°F (25°C) or higher. Shields JM, Arrowood MJ, Hill VR, Beach MJ. The effect of cyanuric acid on the chlorine inactivation of *Cryptosporidium parvum* in 20 ppm free chlorine. J Water Health. 2009;7(1):109–14.

¶ Many conventional test kits cannot measure free chlorine levels 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.

** 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.

