

Fish Pond Water Changes

When it comes to chlorine and fish pond water, making water changes can become a big deal.

By Stephen M. Meyer

Q. I've raised tropical fish for many years. Now I am thinking about branching out into pond keeping. My plan is to dig a 2400-gallon pond in my backyard. Our municipal water has a very high chlorine level. I'm not sure what it is, but you can smell chlorine whenever you turn on the tap. When I do water changes for my tropical aquarium I let the water sit in two 5-gallon buckets for a few days before adding it to the tank.

Although I could use 80 such buckets to dechlorinate the tap water for a 10-percent weekly water change for my pond, it is obvious that this is not the way to go. How do I dechlorinate my pond water?

A. Chlorine is harmful to pond fish and other pond life. The sensitivity of fish to the harmful effects of chlorine depends on a number of variables, including fish species, the organic load in the water, pH, temperature, length of exposure and dissolved oxygen concentrations. Carp (koi) face certain death after eight hours exposure at 4 milligrams per liter (mg/l). But substantially lower concentrations can be lethal if exposure continues over a longer period of time.

Chlorine persists longer in cool and still waters, and dissipates rapidly in warm, churning waters. So spring and fall water changes may pose more risks than mid-summer maintenance.

Clearly, then, it is as important to manage chlorine concentrations in new water added to ponds as it is in aquarium maintenance. As your question implies, if one approached pond water dechlorination in the same way it is done with fish tanks it would be a daunting task. Fortunately, ponds have a few characteristics that make this task a bit easier.

Chlorine levels in municipal systems at the tap can run anywhere from 0.1 to 1 mg/l. By comparison, the highest concentration of chlorine that has failed to show a measurable harmful effect on fish is about 0.02 mg/l. Most fish health specialists recommend that chlorine concentrations not exceed 0.05 mg/l for more than 30 minutes per day; nor should average ambient levels exceed 0.003 mg/l. So these numbers set some boundaries for us to think about.

When dissolved in water, chlorine exists as hypochlorous acid. When the pH is around 6.0 or lower, about 95 percent of the chlorine exists in this acid form. In contrast at a high pH, over 9.0, about 95 percent of the chlorine exists as hypochlorite ion. The hypochlorous acid form is more toxic than the hypochlorite ion form. What matters is that you understand that chlorine is more toxic to fish and other aquatic life as the pH decreases.

So what does this mean for water changing? Assume that the chlorine concentration coming out of the tap is about 0.5 mg/l, that your 2400 gallon pond contains virtually chlorine-free water, and that you want to do 10 percent weekly water changes.

Diluting 240 gallons of fresh tap water containing chlorine (at 0.5 mg/l) in 2160 gallons of "old" pond water produces a final concentration of 0.05 mg/l — presuming thorough mixing. Based on the guidelines noted above, this would seem to be too high.

However, pond water will have a much higher concentration of suspended and dissolved organic matter compared with an indoor aquarium. Levels of phytoplankton (algae suspended in the water), for example, are dozens of times that of a well-maintained aquarium. This organic matter will take up much of the chlorine very quickly. Therefore the fish may only be exposed to harmful concentrations for a short period of time.

If the chlorine is merely in the form of a dissolved gas, you can further reduce the concentration entering the water by spraying the water through the air, rather than just letting it enter the pond from a hose. Spraying dissipates the gas. This will not work, however, if it is chloramine, not chlorine.

You will notice that the animals definitely react to the new water. They will avoid the chlorinated water, and many begin jumping and flashing. Then, too, freshwater aquatic invertebrates are much more sensitive and may die off even after pond organics have reduced the chlorine levels. This can alter the biology of your pond, including affecting the biological filtering action.

Now consider tap water chlorine concentrations that are around 0.1 mg/l. Mixing this in your pond will produce a diluted concentration of 0.01 mg/l. This is probably acceptable for the fish (and perhaps even for other pond life). Again, spraying the water over the pond will cut chlorine levels.

Given the number of uncertainties I have mentioned, the first thing you need to do is find out what the true chlorinating levels are exiting your tap. Call the local water authority and ask for the chlorine concentration target they set. Be sure to ask if they vary the target by season.

Also find out if they use chlorine gas or chloramine. Chloramine is used instead of chlorine in some municipal water systems, and is more deadly than chlorine alone. As already mentioned, chloramine will not dissipate into the air as readily as chlorine does.

Next, purchase a good chlorine test kit and test your tap water. It makes sense to test your tap water daily for a few weeks to get a good reading of average chlorine levels. Chlorine levels also vary by season, so I would test for a few weeks every couple of months.

Then do a little calculation to see what the diluted chlorine concentration will be. Take the measured chlorine concentration, say 0.8 mg/l (or parts per million) and multiply it by the total volume of the new water to be added (in your case, 240 gallons). Then divide that number by the total volume of the pond (2400 gallons). In this case the result is 0.08 mg/l because you are doing a 10-percent water change.

Now you have to decide whether you want to risk adding raw tap water to the pond or use a dechlorinating aid. There are no firm rules. There are a number of commercial products on the market, and their marginal cost is really quite small compared to all the other elements of the pond: fish, fish food, electricity for the pump, etc.

I would suggest erring on the side of caution. Pond fish, such as koi and goldfish, should live decades if properly kept.