



KHA Corner — Jerry Kyle, Koi Health Advisor (“KHA”)

This Month In The Koi Pond

Or, Water Changes & How Bad Can Nitrates Really Be?

One of the first things I read about when learning about this hobby was “make it bigger,” and “water changes.” A koi friend, upon looking at my first plans, said, “Dig it deeper for more water volume.” Others said all sorts of things: “The solution to pollution is dilution. They won’t grow big in small ponds.” Advice from early koi keepers went on and on. Most of what early hobbyists learned was knowledge gained from observation. Seeing was believing. Unfortunately, we don’t always understand what we are seeing.

Dilution is not a solution. It is a band aid. It may temporarily postpone a visual acknowledgement of a problem but will not eliminate it. For centuries man dumped his effluent into the oceans since dilution was the solution but now that the water quality of the oceans is so bad laws are enacted to stop these practices. The oceans are compared to a ticking time bomb. There was so much water to dilute it took centuries for problems to manifest. But, manifest they have. If your pond is the size of the Pacific Ocean you do not have to worry as you and/or your koi will not live long enough to be affected so you can go on doing whatever you are doing without the need to learn or do more.

“They won’t grow big in small ponds,” was proven erroneous by “Doc” Johnson years ago with a fish growing experiment. He set up a number of small tanks with a fish in each one. Each was fed whatever it would eat in a certain length of time. Tank one had no water changes. Tank two had water changes once a month. Each tank thereafter having changes more often continuing to the last tank with water changes daily. As expected the fish in the tanks with not enough fresh water died and the tanks with enough changes lived. The biggest revelation, however, was that while the middle tanks had fish that lived and did not grow much, the last tanks had fish that virtually outgrew their containers. How could that be? The only difference between the smaller fish and the larger was the water. It is not about tank size. It is about water quality. Keepers couldn’t see the water quality, only the pond size, so they thought it was about size. Some will point out that bigger and deeper have stronger and therefore healthier koi and they are right but, this is not about that. It is only about growing and they grow and thrive in good quality water.

What is good water? Based on what we see it is clear, pre-filtered, and well bio-filtered water. Add good oxygenation and we are home free. Based on what we see that’s it, but we are wrong. We were taught the bio-filter changes the lethal ammonia to dangerous nitrites to harmless nitrates which we occasionally dilute with partial water changes or let the plants consume. Did you see that word “dilute” sneak in there? We eliminate (not dilute) ammonia, we eliminate (not dilute) nitrites, but we only dilute (not eliminate) nitrates which by observation must not be dangerous because the fish don’t die from them. As far as we can see.

Remember the ocean? The one that is dying unless mankind makes some changes? That ticking time bomb that took so long for man to recognize the problem? That is your koi pond. How many times

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have you heard, "I don't have that problem, I do partial water changes through regular filter cleaning, I watch my koi closely and see no problems." Tick, tick, tick. It is what you can not see that is the problem.

There is now conclusive evidence that nitrates suppress the koi immune system. That's it. Period. Bottom line. Fini. We know ammonia kills quickly, nitrites kill over a period of time, and now we know nitrates are bad over an even longer period of time. Tick, tick, tick. You will not see nitrates kill. You can see ammonia poisoning and see nitrite poisoning so will believe but you will not see nitrates kill and may not believe. Nitrates, depending on concentration, will take a longer time but when they finally do sufficiently suppress the immune system of your koi it will allow something else to do the killing. Sooner or later. That's the tick, tick, tick I refer to. You will blame the flukes or ich that you see or something else that a stronger immune system might have better resisted but the underlying cause may be the nitrates suppressed the immune system which allowed the thing you see to do its bad deed. You just won't see it as is really is and so may not believe and blame the fluke. We have heard of koi keepers that continue to have reoccurring problems despite appearing to have nice ponds. Suppressed immune systems? If I only took one thing away from the latest Fish Health Seminar at UG, it was the statement, "There is now conclusive evidence that nitrates suppress the koi immune system," said Dr. Eric Johnson. More studies are needed to determine just how much is too much or how long is too long but what some have suspected is now reality. The studies allowed the vets to see it so now we believe. It is suggested we start now to take steps from learning the breaking point the hard way. We are not going to totally eliminate nitrates but we can eliminate them with water changes to such a minimal level they have limited effect, but that brings up another problem.

Whatever the water parameters, be it ammonia, nitrites, nitrates, pH, or alkalinity we must consider the effects of wide fluctuations. Along with knowing koi don't like nitrates we know koi don't like water quality that widely fluctuates. Originally I was taught to do at a minimum a 40% water change every month. Ten percent a week was fine and if I missed a week to do twenty percent the next as long as it added up to forty percent a month. That was gospel then. Not anymore.

The hobby has come such a long way in reducing the dangers of so many serious problems that befall our koi that we now have time to be able to pay attention to less immediately dangerous or stressful situations. How water changes effect water quality is well known but now we can get down to finer details such as how large volume water changes swing certain readings greatly. Nitrate readings, as an example, can fluctuate widely with massive water changes and less widely with a smaller change but always will fluctuate along with necessary trace elements, alkalinity, pH, and everything else under the sun. Any sudden change is a potential stressor to the koi. Even good changes. It seems like they stress over everything so we must continually look for ways to reduce stress. Just as nitrates in concentration are a long term stressor due to immune suppression, continual short term changes of water parameters up and down are a stressor. I never considered that even a water change for good reason was a temporary stressor as I did it every week or two. Now we know we need to do water changes but in a manner that does not contribute to large changes in the water quality balance since that contributes to stress. Understand there will be situations that call for a massive water change such as an ammonia or nitrite

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spike. In that case I will choose to stress the koi with a sudden change rather than let the ammonia kill them outright but normally water changes will be gentle.

Loving simple solutions I was excited when Dr. Johnson indicated there was a simple cheap (I love cheap) solution at the local hardware store in the drip irrigation dept. A short length of 1/4" drip irrigation tubing set up to emit a small flow of fresh water constantly into the pond will do the trick. It does not amount to much at a time but over the long run amounts to a lot. A hose set up on the overflow can be moved around to use the overflow to irrigate the yard or garden plantings so the water is not wasted. When you consider a toilet that continually leaks because the flap is not properly seated will seep about 800 gallons a month you can see there is not much volume needed out of the 1/4" tubing if it runs continually. Using a five gallon pail, time how long it takes to fill from the tubing and multiply to determine how much it adds up to in a month. I did and turned down the tubing flow. If it takes 30 min to fill the bucket, that's 10 gal per hr or 240 gal per day or 7200 gal a month which is a 100% or more change for most of us and 100% is much better than a minimal passing score of 40%. That constant flow is so little that an added advantage in most ponds is the amount at any time is so low chlorine may not be an issue. Dechlorination may not be needed as the chlorine is so small it will dissipate all by itself and never be detectable. For those who find it an expense to buy a dechlor product, a pain to figure how much to use, and a chore to find the time to do a water change, this is an easy solution to improved water quality and reduction of stress on both yourself and your koi. All this plus you got rid of nitrates, stressful water quality fluctuations, and the tick, tick, tick.