Mid~Atlantic Koi

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KHA Korner – Ammonia

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"Water, never touch the stuff, heard Koi spawn in it…" (this is a family read newsletter).

When we examine the health of our Koi, almost without fail predating whatever illness we diagnose is a problem with water quality. We all know this, but all too often we are lulled into a false sense of security because of the clarity of our water and the findings of a normal pH and temperature. Is that all we should be monitoring? Why is it that we spend hundreds or even thousands of dollars on fish, yet we sometimes skip the ten or twenty dollar purchase of an ammonia or nitrite test? Remember that even a crystal clear pond might contain toxic levels of chemicals potentially lethal to your fish, while an algae bloom might look terrible (and make it difficult or impossible to see your fish) but actually might be beneficial to your fish.

Our ponds are artificial self contained ecosystems. Koi are *ammonotelic*, that is the majority of their nitrogenous waste is excreted by diffusion (the movement of a substance from an area of higher concentration to one of lower concentration attempting to achieve equilibrium) via the gills into the water as ammonia. Ammonia is excreted in two forms: NH3 the toxic form, and NH4+ the ionized and non-toxic form. The relationship between these two forms is greatly pH and temperature dependent. The higher (more alkaline) the pH, the greater the amount of (toxic) NH3, while the lower (more acidic) the pH, the greater the amount of (non-toxic) NH4+. The colder the water, the more NH3, the warmer, the more NH4+. Because of Koi's body temperature and blood pH, most excreted ammonia is in the form of NH4+; this can change quickly depending upon the pond environment. Our biofilters become populated with families of bacteria that convert ammonia to nitrite. Nitrite is also a very toxic substance. Unlike ammonia, it does not come directly from Koi, but is formed almost solely in the filter or source of that family of bacteria. Because nitrite does not come from the Koi, when it contacts the Koi's gills it enters the fish by diffusion (again from the area of higher concentration, the pond, into the lower concentration of the Koi blood) binding hemoglobin in blood rendering it unable to carry oxygen. A second population of bacteria grow in our biofilters to convert nitrite to nitrate, fairly harmless to Koi but usable by algae and plants. As the Koi eat the algae and plants, this cycle begins all over again. The bacteria that convert nitrite to nitrate are the most susceptible to aberrations in water quality and are therefore the first to decrease in number.

Causes of excess ammonia and/or nitrite may include overstocking, overfeeding, low oxygen saturation, an undersized biofilter, an immature filter (the bacterial colonies have not increased to a sufficient number yet such as in the spring), a dirty filter, a filter too aggressively or frequently cleaned (especially if tap water is used), or chemical treatments that may harm the bacteria.

Symptoms of high ammonia may include lethargy and red streaking. Symptoms of high nitrite may also include lethargy (sometimes lying on the pond bottom, though swimming up for food before going down again) and flashing.

There are two types of test kits for ammonia, Nessler and Salicylate. The former uses one drop or tablet and the color goes from clear to shades of yellow. The latter uses two steps of drops or tablets and goes from yellow to shades of blue or green. The problem with the Nessler test is that if you are using treatments in the water that bind ammonia it still reads ammonia being present while the salicylate will not. Nitrite tests usually will change from clear to purple.

Treatment for high ammonia may include water changes to dilute it, binders such as Amquel, or Zeolite rocks which absorb ammonia from the system. Remember that salt in the system greater than 0.3% will release the ammonia bound to the Zeolite.

Treatment of high nitrite includes water changes, suspend feeding, salt to 0.3% and increased oxygenation.

In all cases try to address the underlying cause, especially checking your filter. In the spring check these water parameters with your test kits daily until your bacterial colonies are populated, then weekly, and when stable one each month. These simple precautions may prevent a small problem from evolving into a disaster! ❖