

## Basics of Koi Health

### Dr. Erik L Johnson -Veterinarian

Koi Health is always an issue of water quality, koi care or husbandry, and nutrition. It is absolutely true that Koi Disease is often the result of a parasite invasion, but almost always; the parasites require some sort of stressor to make the fish vulnerable. Notable exceptions exist, but if you are aware of water quality management, and can identify disease factors in your livestock, you can prevent more diseases and save fish lives.

### Ammonia

<ul style="list-style-type: none"><li>• Causes redness of fins, general poor health, excess mucus production, flashing, and pinecone disease.</li></ul>	<ul style="list-style-type: none"><li>• Usually tested with Nessler's Drop Type tests – Salicylate tests more accurate, both can be negated by de-chlorinator.</li></ul>
<ul style="list-style-type: none"><li>• Made from rotting fish wastes/urine/food</li><li>• More toxic at pH above 8.0</li></ul>	<ul style="list-style-type: none"><li>• Directly irritating to fish gills and tissues</li><li>• Ammonia is removed from the environment by beneficial bacteria called Nitrosomonas</li></ul>
<ul style="list-style-type: none"><li>• After (the regrettable) addition of aldehydes such as Formalin or Ammonia-binder agents, you must test with Salicylate reagent tests.</li></ul>	<ul style="list-style-type: none"><li>• You can control Ammonia with partial water changes, Ammo-Lock 2, Lymnozyme's KiFi bacteria, BRF13A or the addition of Zeolites.</li></ul>
<ul style="list-style-type: none"><li>• I generally discourage the use of chemicals for Ammonia binding. Water changes are preferable.</li></ul>	<ul style="list-style-type: none"><li>• Wet dry filtration and Bead filtration are superior modes of filtration. See <a href="http://www.aquadynamite.com">www.aquadynamite.com</a></li></ul>

### Nitrites

<ul style="list-style-type: none"><li>• Ammonia is converted into Nitrite by Nitrosomonas Nitrite is converted into Nitrate by Nitrobacter</li></ul>	<ul style="list-style-type: none"><li>• Nitrites cause reddening of the fins and irritation of the gills, gasping + excess mucus.</li></ul>
<ul style="list-style-type: none"><li>• Nitrites bind the fish Red Blood Cells resulting in suffocation and "Brown Blood Disease".</li></ul>	<ul style="list-style-type: none"><li>• Nitrite toxicity is <u>temporarily</u> reduced by the addition of salt at one teaspoon per gallon of water.</li></ul>
<ul style="list-style-type: none"><li>• Nitrites can be "reverse" created from Nitrate under anaerobic conditions. (Deep sand, glutted filters, stalled sand filters etc.)</li></ul>	<ul style="list-style-type: none"><li>• Nitrites should be controlled with wet-dry filtration and water changes as needed.</li></ul>
<ul style="list-style-type: none"><li>• Nitrite toxicity is only weakly reversed by addition of Methylene Blue.</li></ul>	


### pH


<ul style="list-style-type: none"><li>• Simple drop type test with Bromthymol Blue</li></ul>	<ul style="list-style-type: none"><li>• Stay above pH 7.0 for best results with Koi</li></ul>
<ul style="list-style-type: none"><li>• pH can "crash" to 5.5 overnight due to fish, plant and bacterial activity without adequate buffering of water - fatalities result</li></ul>	<ul style="list-style-type: none"><li>• Baking Soda (Check Total Alkalinity before its use, though. (Use one teaspoon per ten gallons if the TA &lt;100),</li></ul>
<ul style="list-style-type: none"><li>• pH Pill (<a href="http://www.koivet.com/phpill.htm">www.koivet.com/phpill.htm</a>) Bone meal, or Seachem Neutral Regulator or any of many commercial buffers are recommended.</li></ul>	<ul style="list-style-type: none"><li>• Low pH affects appetite, but later can cause illness and death. <b>If crashed, raise it at once!</b></li></ul>

### NITRATE

<ul style="list-style-type: none"><li>• Made from Nitrite by Nitrobacter</li></ul>	<ul style="list-style-type: none"><li>• Toxic above 120 ppm :</li></ul>
<ul style="list-style-type: none"><li>• Signs include red streaking in fins, dilated blood vessels in fins and skin, "heavy smelling water", and lethargic fish.</li></ul>	<ul style="list-style-type: none"><li>• Remove by starting some live planting, or water changes. <b>Allow algae to grow on the liner!</b></li></ul>
<ul style="list-style-type: none"><li>• If you use Simazine or another Algae destroyer, you will have no plant Nitrate utilization. This can be hazardous.</li></ul>	<ul style="list-style-type: none"><li>• Generally non toxic unless plants and algae are specifically excluded.</li><li>• Nitrates are IMMUNE SUPPRESSIVE!!!</li></ul>

### Hydrogen Sulfide H<sub>2</sub>S

<ul style="list-style-type: none"> <li>Produced in anaerobic areas, deep mulm or sand. Under pots and in crevices of liners.</li> </ul>	<ul style="list-style-type: none"> <li>Losses may continue for up to two weeks after correction.</li> </ul>
<ul style="list-style-type: none"> <li>Treatment is by removal of fish, clearance of mulm and sand, replacement of 100% of the water. Remove fish first!</li> </ul>	<ul style="list-style-type: none"> <li>Signs are respiratory, gasping. Fish hang at surface, lolling for air, and dart madly when disturbed.</li> </ul>
<ul style="list-style-type: none"> <li>LaMotte Chemical has a test for H<sub>2</sub>S</li> </ul>	
<b>PARASITES</b>	
Divided into three broad classes: <b>Protozoans, Trematodes, and Crustaceans</b>	
<b>PROTOZOANS</b>	
Ich, Trichodina, Chilodonella, Costia, Epistylis	
<ul style="list-style-type: none"> <li><b>Ich</b> causes white spot disease and can account for mortality in smaller Koi, especially when crowded or chilled.</li> </ul>	<ul style="list-style-type: none"> <li>Ich is controlled by Salt, described later.</li> </ul>
<ul style="list-style-type: none"> <li><b>Trichodina</b> (cousin: Tripartiella) causes flashing and spiderweb lesions in the skin. Can precipitate Ulcer Disease.</li> </ul>	<ul style="list-style-type: none"> <li>Trichodina responds readily to salting, unless it is the Japanese import variety. Double dose salting (0.6%) does fine for these.</li> </ul>
<ul style="list-style-type: none"> <li><b>Chilodonella</b> causes respiratory damage and excess mucus production. Salt is the treatment of choice, clearing losses within 24 hours.</li> </ul>	<ul style="list-style-type: none"> <li>Chilodonella is one of the fastest killers of fish, even large ones under the right conditions of crowding and chilling. *Fish gather at the water fall - sudden death</li> </ul>
<ul style="list-style-type: none"> <li><b>Costia</b> (Ichthyobodo necatrix) causes much the same condition as Chilodonella, and is also a rapid killer of fish, who die after suffering severe gill damage. *Fish gather at the water fall - sudden death</li> </ul>	<ul style="list-style-type: none"> <li>Salt is the treatment of choice, clearing losses within 24 hours. Rare salt resistant forms exist. See <a href="http://www.koivet.com">http://www.koivet.com</a> for details.</li> </ul>
<ul style="list-style-type: none"> <li><b>Epistylis</b> looks like a goblet under the scope, but looks just like Fungus to the naked eye. Not a fish killer. This belies a dirty-pond or filter, shame shame!</li> </ul>	<ul style="list-style-type: none"> <li>Salt is the treatment of choice, clearing Epistylis within 24 hours.</li> </ul>
<b>TREMATODES</b>	
	<ul style="list-style-type: none"> <li>Flukes: Gyrodactylus/Dactylogyrus are larger parasites, easily diagnosed from skin and gill scrapes under the microscope.</li> </ul>
<ul style="list-style-type: none"> <li>Flukes cause FLASHING! Spiderweb lesions in the skin and reddened fins. Gill damage may be severe, and Flukes kill lots of fry annually.</li> </ul>	<ul style="list-style-type: none"> <li>Clearance by Fluke Tabs® is ideal. be sure to remove Fluke Tabs medicine by water change after 48 hours and re-treat 24-36 hours after the first treatment is removed. Potassium permanganate is also excellent</li> <li>Actively writhing "worms" with hooks on one-end and suction cups on the other.</li> </ul>
<ul style="list-style-type: none"> <li>Look for these anytime SALT fails to limit your losses or sickness</li> </ul>	<ul style="list-style-type: none"> <li>Also, Flukes are the NUMBER ONE cause of Koi Ulcer Disease. They carry pathogenic bacteria on their haptens and inject the bacteria into the sores they create.</li> <li>Scan under 40X combined power with iris diaphragm closed and light low.</li> </ul>
See <a href="http://www.koivet.com">http://www.koivet.com</a> for images of all the above parasites	

<b>Crustaceans</b>	
<ul style="list-style-type: none"> <li><b>Lerneia</b> - Anchor worm appears as a tiny tan or greenish worm sticking out from the lips, fins or scales of fish. Causes a red sore at the spot they are attached, sometimes the red spot is all you can see from a distance.</li> </ul>	<ul style="list-style-type: none"> <li>Highly contagious, these can come in with water or fish. They have a freeswimming larval stage. Dimilin™ is the treatment of choice for both Lerneia and Argulus..</li> </ul>
<ul style="list-style-type: none"> <li><b>Argulus</b> - Fish Lice look like little (4mm) greenish or yellow "flying saucers" and are easily visible with the naked eye. They suck blood with a tiny stiletto and are very damaging to fish.</li> </ul>	 <p>Argulus at left. (Slightly larger than actual size)</p>
<b>Formulary Listing of Drugs</b>	
<b>Salt</b>	
<ul style="list-style-type: none"> <li>Kosher salt, Sea Salt, Non-Iodized Table, Rock and Ice Cream Salts are acceptable. Caution! No YPS or Yellow Prussiate of Soda should be in the salt. Prussic Acid is toxic!</li> </ul>	<ul style="list-style-type: none"> <li>Will cause yellowing of Hyacinths, Celery and Water Lettuce, but will kill Anachris, String Algae, Cabomba and Elodea. Will not harm hardy Lilies, common Papyrus, or Irises.</li> </ul>
<ul style="list-style-type: none"> <li>Add one pound per hundred gallons, per day, for three days if fish are only sick. This avoids occasional filter-shock. (2-3 day nitrite spike) Add all at once if fish are dying off rapidly</li> </ul>	<ul style="list-style-type: none"> <li>Leave salt in the pond for 14 days minimum, then remove by partial water changes over subsequent weeks.</li> </ul>
<ul style="list-style-type: none"> <li><b>Strengths</b></li> <li>3 pounds per hundred gallons = 0.3%</li> <li>6 pounds per hundred gallons = 0.6%</li> <li>9 pounds per hundred gallons = 0.9%</li> </ul>	<ul style="list-style-type: none"> <li>Pull sensitive plants to baby-pool and treat with Formalin in this. (25 ppm 8-12 hours)</li> </ul>
<b>Dimilin</b>	
<ul style="list-style-type: none"> <li>Insect gyrase stops crustacean moulting, ends the life cycle of parasites you can see, like Anchor Worm and Fish Lice.</li> </ul>	<ul style="list-style-type: none"> <li>These parasites are cleared in 3-4 days</li> </ul>
<ul style="list-style-type: none"> <li>One gram per thousand gallons per week x 2-3 weeks. Mix in water, distribute.</li> </ul>	<ul style="list-style-type: none"> <li>Non toxic to filter, fish, frogs, snails or plants BUT Will kill crayfish, dragonflies, etc.</li> </ul>
<ul style="list-style-type: none"> <li><a href="http://www.pondrx.com/">http://www.pondrx.com/</a> for "Anchors Away"</li> </ul>	<ul style="list-style-type: none"> <li>Program is equally effective.</li> <li>See <a href="http://www.koivet.com/program.htm">http://www.koivet.com/program.htm</a></li> </ul>
<b>Malachite Green</b>	
<ul style="list-style-type: none"> <li>0.11 ppm (mg/L) for any long term exposure</li> </ul>	<ul style="list-style-type: none"> <li>Zinc free should be chosen</li> </ul>
<ul style="list-style-type: none"> <li>Teratogen and carcinogen</li> </ul>	<ul style="list-style-type: none"> <li>FDA removing it from market</li> </ul>

<b>POTASSIUM PERMANGANATE</b>	
<ul style="list-style-type: none"> <li>• 4 ppm for most fish, 2 ppm for Doitsu</li> </ul>	<ul style="list-style-type: none"> <li>• SOURCE: Pondrx.com ships KmnO4 with instructions.</li> </ul>
<ul style="list-style-type: none"> <li>• Turn off filter but aerate and circulate well during treatment. Will not harm most plants. <b>Dechlorinator INACTIVATES Potassium cold.</b> Use this information to salvage an overdose.</li> </ul>	<ul style="list-style-type: none"> <li>• You can also <b>de-colorize</b> and <i>inactivate</i> KMnO4 with hydrogen peroxide 3% USP - 1 pint/5000 gal when you're all done. Cannot reapply KMnO4 for 3 days.</li> </ul>
<ul style="list-style-type: none"> <li>• Method A: treat every morning at 4 ppm for 5 days. As soon as water turns from pink to brown, resume filtration and if possible, do a 30-40% water change.</li> </ul>	<ul style="list-style-type: none"> <li>• Method B: treat 4 ppm and maintain (via repeat additions of PP) the pink color as viewed in white coffee cup for a full 8-12 hours. Re-treat in 3-4 days for Fluke larva.</li> </ul>
<ul style="list-style-type: none"> <li>• If at any time, water become opaque brown, stop treatment, do 30% waterchange and resume filtration.</li> </ul>	<ul style="list-style-type: none"> <li>• Observe closely for signs of oxygen deprivation. Stop if fish stay at surface despite your obvious presence there.</li> </ul>
<ul style="list-style-type: none"> <li>• Dose is critical!!!! Do not overdose, do not leave fish unattended!</li> </ul>	<ul style="list-style-type: none"> <li>• <b>4 ppm = 1 gram per hundred gallons</b></li> <li>• <b>6 grams powdered KMnO4 = 1 level teaspoon.</b></li> </ul>
<p><b>See also: <a href="http://www.koivet.com/potassium.htm">http://www.koivet.com/potassium.htm</a> for a third, better regimen for success.</b></p>	

<b>Chloramine T</b>	
For fluke infestations and bacterial infections, see <a href="http://www.koivet.com/chloraminet.htm">http://www.koivet.com/chloraminet.htm</a>	Up to 20 ppm per dose, or a half teaspoon per hundred gallons
Treat daily for 6-8 hours and then do a fifty percent water change.	Treat daily for three days then switch to every other day dosing. Do not treat if fish appear to be "pinking up" or they resume eating, suggesting recovery.
Also known as Argent's BGDx - Indications: Acute bacterial gill disease.	Buy Chloramine T at <a href="http://www.pondrx.com">www.pondrx.com</a>

**BIOGRAPHICAL:**

I have been seeing fish cases since graduation from University of Georgia in 1991. Each year, I travel nationally to selected functions to deliver topics in fish health. My Web site is available to help hobbyists - <http://www.koivet.com>.  
 Finally, if you want to order a copy of "Koi Health & Disease", that can be done online above via secure server, or you may call (770) 977 5377 and the technician will take your order over the phone.

**"Dr. Johnson - I have learned more from your book, and your web site in the past few months than I had previously in my 30 year love affair with Koi."**

----- **Dr. J. Maxwell, M.D.**

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