



President Corner

It looks like spring has evaded us again. Summer is just around the corner. Where did all the time go? Time is running short so be sure to clean your pond, plants, etc. Water temps are rising. Check your pond chemistry often to make sure everything is in balance. This time of year it is important to do this since our fish are coming out of hibernation.

A big thanks goes to the Essis' for hosting our last meeting. Then another big thanks to C. Richardson for hosting this month's meeting. If anyone would like to host a meeting just contact our newsletter editor. We will see that your name goes to a meeting date. A big thanks to all our host.

Pond Tour 2005 is right around the corner. Let's get those tickets out there. The first weekend in May is almost here. Let us make this the best tour ever.

This is also the time of year when our Koi want to breed, if they haven't already. If they have you will know because your pond will be a mess. Do not fear your water will get back to normal.

We do hope all of you are having fun with your hobby. Raising Koi is fun, and watching them grow is the best of all.

For the love of Koi,

Bob Panter

Bob Panter
President SAKA



Koi People of the year
Dave & Debby Young

**Destination:
Koi Powwow in Tulsa, OK
24th Annual AKCA
Convention
June 23-25, 2005**



Located in the center of the country on historic Route 66, Tulsa was created by Oil Barons (large collection of art deco buildings) with renowned Southern Hospitality and a touch of Western. The 2005 AKCA Seminar will be held in Tulsa, Oklahoma at the Crowne Plaza Hotel-Tulsa. Seminar special room rate is \$80/night. Registration for the hotel at 1-800-227-6963

The Koi Powwow will be just as unique as it's host city.



Thinking of flying? Upon arrival, you will be greeted with a special **Powwow welcome**. Check in to a first class, newly renovated hotel with high-speed Internet connections in every room.

The **city tour** is comprised of shopping, gardens, unique museums with private docents, casinos, an aquarium and, of course, lunch. You select where you would

like to go; stay as long as you would like. The Powwow express will shuttle you.

The Friday morning opening *don't miss!* Will be followed by seminars and break out sessions on topics including the current status of the Koi industry in Japan, the affect of shade on Koi color, picking and raising show Koi, Bonsai and many more for both the seasoned pro and the new hobbyist.

No seminar would be complete without a raffle. The Powwow raffle will donate half the proceeds to KHV research. Items are coming in weekly. To date, items include: Champion Nishikigoi, Tetra Pond Dynamag 500 pump, Aqua Ultraviolet, Hikari, Chengro Koi Foods, Mighty Pump, a 67" umbrella, Emperor Aquatics 40 watt Smart UV, a Samurai sword, original artwork and much, much more.

Remember; bring your key from Hawaii! Didn't go to Hawaii? Not to worry, each club will be receiving keys or get one in Tulsa. You don't want to miss the unlocking of the lock.

Register on line today!

GREEN WATER

**From POND WATER CHEMISTRY
Norm Meck**

Although it is sometimes called an algae bloom, normally the names it is called are unprintable. For some, it seems to happen every Spring (also sometimes in the Fall). For others, it is almost a way of life.

A limited number of pond keepers have never or rarely experienced this "Wonder" of nature. It is said that the Koi thrive in it, but you cannot see them to tell if they are thriving or not. You have heard many reasons why your water turns green and tried assorted mechanical wizardry and various chemical concoctions to clear it, (which may or may not have been harmful to your Koi), but it is still green. There is a lot of "snake oil" out on the market to clear green water. Green water is caused by an excessively large number of tiny organisms in the water. Called phytoplankton, these minute plants are part of the algae family that has thousands of distinct species found in water (and ice) throughout the world. These organisms are very small, with the most common ones found in our ponds being around 15 microns (0.0006 inches) in diameter. All pond water contains large numbers of different kinds of these plants and other microorganisms. Water that appears to be crystal clear just doesn't

have as many. Some of the statements that follow are somewhat controversial, but they are based on several years of other algae. This enzyme appears to be effective against many species of string algae as well as the bloom algae. It does not seem to have as much effect on the string algae which is only partially submerged or within a high flow area, i.e. in a splashing brook or around a waterfall. This may have to do with contact time requirements. The short blackish-green mat algae found on the walls of a "healthy" pond is composed primarily of dead string algae which is also believed to be a result of control by the antibiotic. Further, this mat area may also be providing a portion of the enzyme as it is being broken down by the heterotroph bacteria.

This seems to explain what we see in our ponds much better than many of the traditional myths which I believe arise from invalid extrapolations and application of true scientific findings based on studies of large lakes and oceans. Most of these findings just simply do not apply to the essentially closed environment of an established, circulating Koi pond. We will discuss only two of the myths here. For more and a detailed description of the experiments leading to these conclusions, see my article in the Mar-Apr 1998 issue of KOI USA. **MYTH:** Pond algae blooms are primarily related to various nutrient concentrations in the water such as nitrate and/or phosphate.

FACT: There is no evidence to substantiate any relationship between nutrient levels and the inception or termination of the common algae blooms in most Koi ponds. Quite to the contrary, the measurable nutrient levels are normally so high, most actually show a slight increase after a heavy bloom subsides.

MYTH: Providing shade over the pond will prevent an algae bloom.

FACT: It is true that algae needs light to grow and reproduce. But what is interesting is the small amount of light that is actually required. Controlled experiments using reduction in sun light of 90% still show significant algae growth. There are many examples of ponds that are heavily shaded but quite green and just as many others with direct sun exposure that have no algae bloom problems at all. There have been positive results reported of completely covering a pond suffering from green water with an opaque plastic cover for 5-10 days. I'm not too sure what the Koi think about this but it is obviously not an acceptable permanent solution. I do recommend providing shade over a pond,

but more for temperature stability than for algae control. So, what is the solution? It seems to be simply a properly sized biologic converter and a proper flow rate of oxygenated water through it. The bioconverter must be large enough to support the heterotroph bacteria colonies which need considerably more space than just the nitrification bacterial colonies. This has led to two rules of thumb. The first is that the amount of water in the pond and filter system should be circulated through the bio-converter at least once per hour. Second is that a flow rate of approximately 150 gallons per hour per square foot of media should be used. As an example of a 1500 gallon pond, we should be moving 1500 gallons of water through the bioconverter each hour and the bionecessary for the smaller nitrification colonies. They do an excellent job of capturing the dead algae and other solids. During the frequent backwashing processes, however, the dead algae and much of the heterotroph bacterial colonies are removed from the system giving insufficient time for the enzyme to be produced. This is why ponds using these type filters almost always require an ultraviolet system to handle the green water problem. A properly sized UV system will do a good job on eradicating the bloom algae. It will not affect the string algae, only the phytoplankton that actually passes through the unit. There are also some indications that the UV radiation may destroy or at least weaken any enzyme action.

Ulcer Disease

Doc Johnson

<http://www.koivet.com>

Koi (*Cyprinus carpio*) have been kept as ornamental pets for over one thousand years. Today, the fish are more popular than ever, with hundreds of domestic Koi farms producing millions of specimens yearly. The market for Koi (and Garden ponds) is rapidly expanding, and the concept of water features in the yard, to include the Koi and Goldfish that often live in them, is approaching national "fad" status. Of greatest importance for the clinician to realize is the relative 'worth' of these 'ornamental' fishes. A single specimen can easily be worth, and insured for, over \$250,000. Imported specimens rarely sell for less than \$25 each, and most owners keep many more than one specimen in the pond. The significance of this to the clinician is that calls that involve Koi and ornamental goldfish are in earnest, and carry great reward, but perhaps unexpected liability as well. The veterinarian should not go into

these clinical settings un informed of the impact of Koi on the owners' pocket book, and for better or for worse, on yours! One of the most disastrous times of year for Koi owners is the springtime. This article attempts to detail the phenomenon of springtime losses and what the Veterinarian can do to intervene in this event. Ulcer Disease refers to a depressed condition experienced by the fish and the appearance of sores on the bodies of infected specimens. The sores are universally ventrally located, and are caused by several factors.

FACTORS INFLUENCING ULCER DISEASE IN KOI

~ Lack of nutritional support over the previous several months of winter. This translates into a lack of protein, carbohydrate and vitamin intake, particularly ascorbic acid intake, which has been linked to disease resistance in work done by Lovell. ~ Accumulation of detritus/mulm in the filter and on the pond bottom, which may also contribute to high nitrate concentrations in the pond. *Aeromonas* and *Pseudomonas* bacteria find such conditions most fortuitous for growth and spread.

~ Cold water suppresses the immune system of Koi, and the parasites that so often predispose fish to Ulcer disease may be active and efficient at temperatures below that which can support the Koi immune response.

~ Parasites such as Gyrodactylid flukes can carry *Aeromonas* bacteria on their haptens/hooks. When the parasite damages the integument of the fish, the bacteria can invade the subcutaneous tissues and cause Ulcer formation.

~ *Chilodonella* and *Costia*, among others, cause enough damage through their own activities, but they also create lesions that allow bacterial invasion. Their actions also place the fish under additional stress and can kill the fish with or without the invasion of ulcer-causing bacteria. More on parasites later.

THE PATHOGEN:

The pathogen is, usually, a single bacterial agent, however, it is a multi-factorial situation that permits and promotes mortality. *Aeromonas* bacteria are considered ubiquitous in freshwater environments. They gain entrance to the specimens through defects in the integument that may be either traumatic, or parasitic in origin. Additionally, it has been demonstrated that the bacteria can enter the fish through a damaged intestinal mucosa, as in cases of extreme cold, when the fishes' intestinal lining may be damaged, allowing a portal of entry for the pathogen.

Aeromonas bacteria should be suspected in

any case of apparent bacterial infection in warm water ornamental fishes, as it is over represented in cases of bacterial infection in these pet species.

Different considerations would be made in the instance of catfishes or tilapia raised in ponds for food. As gram-negative bacteria, they respond to many of the same drugs we use to treat these bacteria in small mammalian medicine.

Other bacteria that can cause similar lesions include:

- Aeromonas
- Flexibacter
- Flavobacterium
- Mycobacterium
- Pseudomonas

All of these, with the possible exception of Mycobacterial infections, tend to respond to the treatments itemized in the chart of injectable drugs.

EVALUATING CAUSATIVE/PROMOTING FACTORS:

One of the first things the clinician should do is test the water for a variety of accumulated metabolites including Ammonia, Nitrite and Nitrate. The pH of the system should be checked to be sure it is congruent with the needs of the fish. (A pH of 6.8 up to 8.0 is ideal.) Ammonia should be zero or almost immeasurably low. Nitrite should be zero as well. (Or nearly so.) Additional tests of some worth could include Dissolved Oxygen, should be greater than 6-7 p.p.m. A second consideration for the clinician is the presence or absence of parasites that might be causing integumentary damage to the case. As noted above, flukes (Ich, Costia, and Chilodonella) can present as causative sources for trauma. Use of a microscope is recommended before shotgun approaches are tried. Usually, the clinician can find a parasite under the scope at reasonable powers, e.g. 40-60 x combined magnification. Several parasites that may be encountered are well documented and illustrated in the book, <http://www.koivet.com/thebook.htm>, and are beyond the intended scope of this manuscript. However, I will offer this bit of personal advice: In almost every instance of parasitism, I recommend the use of sodium chloride, plain table salt, non iodized. There are indeed some parasites that resist this treatment and merit the use of other drugs, to include Formalin, Malachite green, Dimilin, Potassium Permanganate and copper. There will be formulary entries to detail the specific

uses, cautions, and dose-rates of these compounds. Specific resistance: Oodinium is resistant to Salt, and requires copper or formalin treatments. Care should be exercised using formalin in Oodinium cases as the integument of the fish is often very badly eroded by the pathogen, and absorption of the formalin may be enhanced, fatally so.

Copper could be used at levels approaching 0.2 p.p.m and recovery can be expected for those fish not too badly covered. Flukes often resist salt, and may require the application of Fenthion or Malathion at 0.25 to 0.50 p.p.m every 3 days to span a 14-21 day treatment period. Droncit (Praziquantel) may be used at 3 p.p.m for flukes, as well

as Formalin at 25-50 ppm with a water change after 120 minutes. Argulus, (Fish Lice) and Lerneia elegans (Anchor Worm) require the use of an organophosphate insecticide or Dimilin, a gyrase growth inhibitor, see Koivet index list.

Once water quality has been tested and ensured, and parasites have been diagnosed and treatment is underway, the final consideration as a cause for Ulcer disease can be addressed: Namely, husbandry failures in the management of the fish. The clinician should note whether the pond and filter are clean and kept that way. Accumulated debris on the bottom contributes to deteriorating water quality and may support the growth of pathogens for fish. Some parasites, namely Epistylis, Scyphidia, Glossatella and Trichodina, seem to thrive in, and depend on, the presence of decaying debris in the immediate environment.

After addressing the super-imposed health problems and hazards faced by the fish, we can concentrate on the specific treatments of the Ulcers themselves, which, at its core, involves the administration of antibiotics. (See chart of injectable antimicrobials)

Ancillary treatments which used alone may not be effective, but combined with the antibiotic therapies can greatly influence the success of treatment, include: Raising system temperatures, large water changes and cleaning of the system filters and pond bottom, as well as the supplemental feeding of ascorbic acid enhanced feeds.

Other modalities include the administration of antibiotic fortified feeds, the swabbing of wounds created by the bacteria, and the topical application of anti microbial lotions such as Panolog. Injections, and the other, ancillary measures will be discussed below.

Injection of Antibiotics in Ornamental fish: Injection of antimicrobials in ornamental fish affords the most effective

means of providing the drugs to the fish. The intra peritoneal route, in particular, affords rapid and safe absorption of the drugs, and is the safest route. Injection of antibiotics should be stressed to the owner when the client wants the most rapid recovery of the fish, and when the fish is worth the necessary investment.

For injection, the fish is caught up, and placed in an appropriate-sized plastic bag. The water is then drained out of the bag, possibly through a hole cut in a corner. The fish is then rolled onto its back, and the needle is inserted into the peritoneal space through an injection site defined by the positions of the anus, and the paired anal fins. See diagram in www.koivet.com. A 25 Gauge needle and a tuberculin syringe can be recommended. The volume of the injection is deposited into the peritoneal space, and the needle quickly withdrawn.

A scale may be removed with each injection. I have seen no untoward reactions from this, and if the client is prepared for that to happen, it is not an uncomfortable event for you. Swabbing the wounds can be an important part of recovery: Swab solutions that have been used with success include:

- 1) Tincture of Iodine 2%
- 2) Tincture of Iodine 7% USP
- 3) Mercurochrome
- 4) Panolog

Care should be taken that caustic drugs be retained from running in under the gill cover, to prevent the gills from being cauterized, particularly the Iodine's. My personal preference is the Tincture 7%, which I use only once or twice, because over use can result in caustic burns, once the disinfecting and coagulative benefits have been had. The feeding of anti microbial fortified foods has great application in fishes that:

- 1) Will eat
- 2) Do not merit injection, but have been exposed to the bacteria and the predisposing factors of Ulcer disease epidemics.

Fortified foods may be obtained from the Pet Stores, several brands exist that contain effective drugs, yet perhaps in concentrations below the level that might be effective. Romet B feed may be obtained from several sources. Romet feed is simply a catfish or trout chow that has been fortified with Trimethoprim Sulfa, widely regarded as one of the best and safest antimicrobials for use in fish. tetracycline can also be formulated in feed, but unfortunately, many strains of Aeromonas bacteria are resistant to this drug. Feed the antibiotic enriched feed for 14 days at a minimum. Much longer schedules can be kept with no untoward

effect. Heat should not be under estimated in the saving of fish lives. These koi, as they languor in the cold, springtime pond, can be stimulated in terms of their own immune response if removed to a warmed holding vat. Be sure to recommend the vat be covered, to prevent the fish from jumping out. Temperatures should be raised to 74-78 degrees for best results, being sure to monitor the fish for signs of respiratory embarrassment, as the warmer water carries less dissolved oxygen, as a rule. Finally, supplementing the fish with extra ascorbic acid, by injection, or preferably in the diet, (grapefruit!) may be of utility in saving the fish lives. Lovell, (1968) showed that fish fed 150mg/kg ascorbic acid in the feed survived *Aeromonas* bacterial infection 34% better than their sufficient and deficient control study replicates. Sources of vitamin C in a readily consumed form include Turnip greens, Grapefruit, Spinach, tomatoes, and most dark green vegetables, including weighted and submerged broccoli heads. One can easily see, reading through this hopefully helpful treatise on a singular disease entity, how there is an intertwined set of factors to be understood. Surely, omission of any one component of this phenomenon can undermine the success of treatment entirely. Such is the case, for example, when water quality is ignored, despite the fact that injections have been dutifully started.

UNDERSTANDING AND MANAGING THE SYNERGISTIC EFFECTS OF STRESS

Ben Plonski Laguna Koi Ponds

" Disease, per se, is not an entity or an end in itself Disease is the end result of an interaction between a noxious stimulus and a biological system, and to understand disease is to understand all aspects of the biology of the species... (Modestly Thomas, 1972) We all know the excitement of bringing home a new koi . Having searched through so many koi you finally find that special one which tickles your fancy. Floating his transport bag in your pond, the other koi come to say Hi and give him a nudge. You let him into the pond and stand back to admire your beautiful collection of koi. What a sight; all seems well, so you confidently say goodnight. A couple of weeks pass with apparently no trouble and then one day you notice a couple of the koi aren't acting right. Passing it off as "no big deal" you throw in some food and they are mildly interested; hmm, they seem OK, oh well , they'll perk up. Next day, 2 or 3 of them are hanging over by the water fall and a couple more are sitting on the bottom.

Prodding your favorite Sanke with a net he is obviously in big trouble and a feeling of panic ' sets in. " What could I have done wrong?", you think. " Is the water all right?" You test for ammonia and nitrite and pH, cause that's what your dealer always tells you to do. "They test good ! What else !? It must have been that new koi ! Dad gum it!, that guy sold me a sick fish; now what am I gonna do?" Unfortunately, this story is not too uncommon. New koi are often a source of infection to the entire pond. The events leading to the dis-ease in your pond are very likely synergistic in effect. When many small stressors combine together, the total effect on the koi is greater than the sum of the effects taken independently. This is why limiting every possible stressor is so important, because they all add up. Fortunately, with a little applied knowledge this serious scenario can be prevented. Yes koi and goldfish are very strong fish and considered hardy ; but, come on, they can only take so much. Every fish has his limit to handling stress. This is a word we hear a lot..., "stress", sometimes too much. These are some definitions of stress that I took from one of my fish books. " Stress is the sum of all the physiological responses by which an animal tries to maintain or reestablish a normal metabolism in the face of a physical or chemical force (stressor). " (Selye 1950) And " Stress is a state produced by an environmental or other factor (stressor) which extends the adaptive responses of an animal beyond the normal range or which disturbs the normal functioning to such an extent that the chances of survival are significantly reduced." (Brett 1958) Stress is now usually taken to mean the stressor itself, like "temperature stress". Koi have to respond to changes in their world with certain physiological reactions. These corrective adjustments to stressful situations can actually make koi weak. They can only respond to one or two "stressors" at a time and they can't take any more. Their metabolism weakens and their immune system is compromised.

Jet Lag

Consider what a new koi has to go through before he gets to your pond. Let's backtrack a bit, to the koi farm. OK, your sanke gets netted out of his huge mud pond where he has been happily for 4 to 6 months, and undergoes all kinds of handling in the nets and then some hand sorting for quality, gets thrown into cement tanks which are overcrowded and often dirty, medication is dumped on him to keep things in check and he might get a pellet or two for food. Along comes the transhipper or dealer, who must catch him along with other koi in a net again, bag them, transport to his facilities which may or may not be healthy. They go into another crowded vat with a different temperature and some more medicine dumped on them. Foreign koi will then be

starved for 7 to 10 days before they are renetted, bagged with maybe 20 or 30 other koi for a long 20 to 30 hour flight overseas. In the bag, the oxygen level falls and carbon dioxide increases; the pH drops and the ammonia level goes through the roof. The dealer picks them up at the airport after inspection by Fish and Game and Customs. Off they go to his shop, where they must adjust again to his temperature and water conditions. While they try to regain their senses, they may be exposed to ammonia or nitrite or pH changes. Often low oxygen levels and lowered temperatures weaken the koi further. Here, they await purchase by you .

Hopefully, the dealer is on top of his water conditions and initiates some preventive medicinal therapy. Hopefully, the dealer monitors his water quality and gives these poor koi a chance to settle down. Know this; koi need at least 2 to 4 weeks of rest and excellent water quality to regain their strength from this traumatic experience, to say the least. Purchase a koi before he has had time to recover and you are asking for trouble.

Adding Insult to Injury

As can be seen from Table 1, environmental stressors and excessive handling really impairs a koi's ability to fight parasites or pathogenic bacteria. The process of netting and handling can bruise and tear the skin which opens sites for infection. Damage to the protective slime and skin barrier probably accounts for more cases of "hole in the side" than we may like to admit. Excessive handling is one of the most harmful of all "stressors" in my opinion. Of course an accumulation of waste products and the accompanying low oxygen and low pH are debilitating. A koi pond is basically a recirculating toilet. Pathogens thrive in these conditions. You must maintain adequate filtration and aeration and make sufficient monthly water changes to reduce waste accumulations.

Water temperature plays an important role in dis-ease response of koi. Koi are not a cold water species; Their immune system functions best with water temperatures approaching 76 degrees F. A lowering of temperature more than 5 degrees in 24 hours can shut down a koi's defense system in no time.

Koi's Adaptive Response

When koi are exposed to any kind of stressor, the adrenal glands release adrenaline and corticosteroid hormones. These hormones initiate the fight or flight reaction and increases cellular energy levels. Unfortunately, these same hormones also depress the activity of the immune system. Furthermore, when koi are subject to stress, their osmoregulatory system is impaired. Osmotic control of internal blood salts and freshwater through the gills is reduced. Internal salts can be lost to the point where the koi's cellular metabolism is

threatened and any further immunological response is highly unlikely. Koi may require weeks of recuperation before their natural system is under control again. Thus, any stress, if continued long enough, will reduce the koi's resistance to disease. Parasites or bacteria which are always present will become problematic adding additional stress. Once a pathogenic invasion occurs, we can expect one of three koi vs. pathogen interactions:

- 1) Pathogen proliferates beyond the control of the koi's defenses and the koi dies. The accumulated stressors were beyond the koi's ability to recover.
- 2) The pathogen persists at an above normal level but no dis-ease is evident; the koi exists as a "carrier". The extent of the environmental stressors was not excessive and the koi's immunity is only mildly compromised. Further stressors during the carrier state will more than likely lead to an increase in pathogens and increase the disease state.
- 3) The koi's immunity remains intact or is acquired and the pathogen is basically "in check" at a very low level which can be considered normal and healthy. The environmental stressors are minimal or nonexistent,

the koi is strong and the pathogen population is of no concern. But remember, the pathogens are still there.

Potential Pathogen Population
The importance of maintaining excellent water quality becomes evident in regards to these 3 reactions. High water quality with low waste content equals strong koi and a low pathogenic population. Even the inevitable occasional stressor (handling, temperature fluctuation, etc.) can be dealt with by the koi without incidence. Poor water quality with high waste content equals weak koi and a high pathogenic population. Pathogens thrive in dirty pond water, koi do not. Putting it simply, pathogens by their nature, feed on organic material. After all, the koi's skin is organic. A pond with a high waste load will contain a high potential pathogen population.

So yes, stress and poor water quality are the culprits in making koi sick. We have seen that stress is an accumulative thing. Koi can deal with a mild stressor here and there, but when the stressor is continuous or multiple, the koi cannot adjust. What follows the stress is the onslaught of endemic parasites and pathogenic bacteria to a weakened koi. Parasites and pathogenic bacteria are a part of life. They are always present. We cannot eliminate them. What we can do is learn to live with them in a healthy manner. Knowing this as a fact we can plan ahead to provide conditions which increase the koi's strength. Fish have had to deal with these pathogens before mankind existed. Some how we can accept the fact that our dogs and cats get fleas and ticks or our roses get

aphids. Well, koi also have parasites and pathogenic bacteria, period.

The Koi In The Plastic Bubble

Please consider this carefully for existing populations of koi. Koi which have been established in a pond for years I call, " The koi in the plastic bubble". Remember that movie about the boy who did not have any immunity to the diseases of the outside world and had to be confined to his house? Well, old established koi populations are the same way. They become very healthy and resistant to the pathogens in their little world. They are stable and can resist mild stressors without any problem of infections. Their filter is totally gross and is rarely cleaned. No problem! You say you haven't changed the water in how long? No problem! They were originally 20 small koi and now they are 20 very large koi. No problem! With confidence you go down and buy a new koi on sale and BOOM. You got problems! Indeed, this situation is one of the often overlooked potentials for disaster. Isolated populations of koi simply cannot respond immunologically to new "bugs". Likewise, a new koi cannot take the additional stress of being introduced to a dirty, poorly managed pond. Of course, a very clean and well managed koi pond will be less adversely affected than a dirty overcrowded one. The koi will have a fighting chance. Usually, koi afflicted with this problem will be lying down on the bottom of the pond. Often the new koi are just fine, it's the older ones which become sick: The best cure for this problem is a very high salt solution in the pond at 0.5% to 0.7% for 3 to 5 weeks. In addition to the salt, treat pond with formalin/malachite green every 3 to 4 days for 2 weeks. Furthermore, we must consider the past history of our existin g population of koi. Do not add new koi to an existing population that has just recovered from some infection or water quality problem. Give the existing population time to stabilize, at least one month. Also, I think it is a good idea to wait at least one month between additions of new koi, to perpetuate stability. There is a saying in aquatic animal husbandry, " Nothing good ever happens fast". So, apply a dose of patience sometimes.

To The Rescue

You might have a healthy pond, but your new koi is weak. Newly purchased koi are faced with many "stressors". The degree of stress will determine whether they can adapt and recover. So we must provide some kind of aid to help him and the established koi to adjust and settle down so that their own immune system can become strong and protect them. Our main objective is that : All our actions or medications should be aimed at producing a strong koi. Usually all we are concerned with is killing the pathogens with little regard to the natural environment of the pond or on the koi's skin. This sets us up for worse problems down the road. Certainly, we can control these pathogens with proper

knowledge and preventive techniques and above all, a workable filtration system.

Water Quality and Filtration

Check your water chemistry; check your filter. A dirty filter loaded with sludge is one of the main breeding grounds for pathogens. Biofilters produce a sticky sludgy slime and will become increasingly anaerobic even with a good prefilter. Anaerobic areas in a biofilter actually contribute to bacterial infections. Furthermore, we are growing a tremendous amount of bacteria in a bio filter, and the question arises, " Just how much bacteria do we really need?" We are growing good bacteria and pathogenic bacteria in our filters. This is just how mother nature works with her natural checks and balances. The bacteria keep growing and the bacterial count in the water and filter can become excessive. A filter which clogs easily and restricts flow will surely require more diligent cleaning to ensure that a healthy population of good bacteria are present. Some of the newer filtration designs promote easy cleaning with a resultant lower pathogen count. I want to make a comment on our filter designs of the past. Originally all we were concerned with was having clear water and no ammonia or nitrite. A compacted type of filter material like gravel or foam did this job for us and we were happy. Of course we thought everything was working and simply chose to forget about cleaning the filter. Then, problems eventually arose due to the compacting and channeling nature of these materials so we vigorously cleaned the filter and our water turned green. We tested for ammonia and it reads zero. So we attached an ultraviolet sterilizer and again all seemed well so we neglected the filter again. Hey, as long, as the water is clear and the fish seem OK we should leave well enough alone; right? Now it has become evident that all is not well with a neglected filter. We were all told that a biofilter can compete with pea soup algae and keep our water clear without a UN. A bacterial filter does two things. First, the process of mineralization which breaks down organics by the action of heterotrophic bacteria into inorganic ammonia. Secondly, the process of nitrification which converts the ammonia by the action of autotrophic bacteria into nitrite and nitrate. An important fact to remember is that organic type bacteria compete for space with the nitrifying bacteria. Yes, we do need both types of bacteria to have a well conditioned filter. However, the organic type bacteria usually outweigh the nitrifiers immensely. Ammonia build up in an established pond is often a result of a filter overloaded with organics being converted to ammonia. The filter plugs up and less actual filter surface area is being used. The bacteria which digests organic matter has the potential to clear a pond of green water. However, the filter can only digest so much before it plugs up. A thorough cleaning can wash away the

bacteria and enzymes which "eat" green water. So, we are stuck between cleaning the filter too much and not enough. This becomes an extra job when our filters are too small.

When we rely on the biofilter to digest the organic filth and control green water, we are creating a time bomb of a bacterial explosion. Pathogenic bacteria are of the same varieties which digest organic waste. Naturally, the greater the organic waste in the filter, the greater the number of pathogenic varieties. In this day and age of understanding we are much better off using an ultraviolet sterilizer to control pea soup and use a loose fill type filter material to control ammonia and small quantities of organic waste. The vast majority of solids should be washed away frequently and water changes increased to reduce dissolved organic and inorganic substances. Simple. No fancy equipment, no fancy chemicals. This is not to say that gravel or foam filters are no good. They just need more frequent and vigorous cleaning to relieve the pond of excess bacteria and waste. Some of the inherent problems of a compacted type of filter material can be cured by simply increasing the flow of water through it to increase usable surface area and oxygen.

NH3 and N02

Ammonia and nitrite really do physical damage and impair a koi's basic immune system. Maintain zero ammonia and nitrite. A good well managed biofilter with a mechanical prefilter will provide this. Drain or wash your prefilter frequently to wash away accumulated organic waste (Once a week is good; once a day is better). A large biofilter itself may only need cleaning 6 or more times a year depending on the design, the organic load, and frequency of prefilter cleaning.

N03 and Water Changes

Nitrates (N03) are best kept under 50 ppm with monthly water changes (less than 20 ppm would be better). I think the importance of a low nitrate is underestimated. After all, in nature nitrates rarely exceed 1 ppm. Nitrate levels are a good indicator of other dissolved waste product accumulations and is a good guide for managing overall water quality. Remember, a high waste content also means a high bacterial population, good and bad. The numbers of koi most people keep are totally beyond anything nature ever intended. Large water changes are really the only way to offset this imbalance. Water changes dilute the pathogens and the organic soup they thrive in. Professional fish breeders around the world realize this and utilize a constant inflow of new water and an overflow of old water by as much as 5% to 10% of the pond volume daily. This amounts to over 150% a month. Use caution with this technique if you are using city tap water with chlorine or chloramines as these will have to be

neutralized. I recommend daily input of 2% daily for city water folk, This is 60% monthly. Chloramines are less of a problem because of the large dilution factor. On a more practical level make routine partial water changes and use your nitrate test kit to maintain levels below 50 ppm; under 20 ppm is best. Many Japanese dealers report levels near 3 and 4 ppm. You may have to increase the quantity or the frequency of the water changed compared to your current regimen. As far as the koi are concerned, small frequent water changes are a lot more stable than infrequent large ones. Your koi's health and color and the pond's appearance will be your reward.

O2

Provide and test for high oxygen, at least 7 to 8 ppm. When koi are new or adapting to some stressor, they will need maximum aeration and it is just best to provide this continuously.

pH

Koi do best at a pH between 6.8 and 7.8. Buffering compounds and water changes will help stabilize pH near 7.4 to 7.8. I have seen apparently healthy koi in pH as high as 8.5; however their colors are poor. A pH over 8.5 is too high. A pH below 6.5 is too low for the nitrifying bacteria in the filter; not to mention the koi. Controlling algae growth in the pond also helps stabilize the pH. Excess algae can raise pH over 8.5. Liner ponds tend to drop in pH quickly with insufficient water changes. Liner ponds require frequent pH tests and would do well with routine additions of a buffer compound. Cement ponds tend to be high in alkalinity and usually maintain a high pH around 7.5 to 8.5. As cement ponds age the pH will become less alkaline.

Temperature

Koi prefer a temperature around 74 to 76 degrees F. They are strong and comfortable at this temperature. A decent and stable temperature is extremely important in maintaining healthy koi. Temperature stability is maintained in larger deeper ponds with some shade. Koi are very sensitive to a drop in temperature more than 5 degrees F. Koi lose immunity and vigor when temperatures are below 60 degrees F. Pathogens are slow to grow in cold water. When the water warms up in spring to between 60 and 72 degrees the pathogens start growing quickly but the koi is still weak. Maintain excellent water quality at this time of year and really be careful with quantity and quality of food given. Koi cannot grow new skin tissue when the water is below 65 degrees. The fish is swimming around with an open wound, however slight, which will become infected if the water or filter conditions are dirty. I have seen koi with skin abrasions show no signs of infection until the water actually warmed up over 60 degrees. These infected and weak koi can carry the infection with them even when the

water warms up into the high 70's. The goal is to catch even slight skin abrasions early; clean the wound; eliminate parasites; put the koi into warm clean water (76-80 degrees) at 0.5% salt so the skin can grow back before infection starts. This is especially important for new koi purchased in the winter and spring, since new koi are usually physically damaged from shipping and handling. Koi are the most disease resistant in late summer and early fall since the water has been warm long enough to make the koi strong.

Objects

Keep sharp objects out of the pond when possible. Your existing pond conditions should have smooth walls and few if any protrusions into or over the pond

Handling

Do not handle your koi needlessly and never lift them from the water in a net. Use a large clear plastic bag or a koi tub to move or inspect koi. A clear plastic bag with just enough water in it to hold up to the light will magnify the koi and reveal any damage without hurting the koi.

Population control

Do not overcrowd or overfeed. Do not add koi to a pond that is already overcrowded or is dirty with sludge. Your filter system, your maintenance schedule, your water changes, feeding practice, oxygen levels and emergency number of koi per pond. Less koi is always better than more koi. Zero koi equals zero problems.

Food

Do not starve your koi and feed them variety with fruits and vegetables. Fresh green vegetables and citrus fruits should compliment koi pellets regularly. Frequent small feedings of pellets are better than large single feedings. Color enhancers like spirulina and shrimp should only be fed in the warm summer months to help reduce digestive problems and skin diseases like Hikku. Most brands of koi pellet are good as long as they are fresh and used within 3 months.

Protect the Mucous

Most of the aforementioned factors affect the integrity and quality of the mucous on the koi's skin. The mucous is the koi's first line of defense against pathogens. Over handling and over medication will strip the mucous off. The mucous has natural protective secretions and good bacteria which can be removed easily. I have seen koi which were over medicated that basically ran out of mucous. Their skin was dry and rough to the touch. Use medications thoughtfully and get the fish back into clean water conditions.

Source of Koi

Buy koi only from reputable sources. Be sure you know the health history of the koi, such as length of quarantine or time at facility, what if any medications have been given. Note the condition of all the other koi in the dealers pond and the apparent condition

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of the pond water. Do not be overly anxious to get the newest koi before they have had time to recuperate. This is a good way to throw your money away. Don't think you are going to be the lucky one.

Quarantine and Preventive Treatment

Set up a quarantine pond large enough to comfortably house your largest koi, say 300 gals. Provide a permanent biofilter and oxygen source; a heater is also helpful. Separate new koi or old sick ones away from the main pond. This removes a source of infection (carrier state) from the main population. This is the same reason we stay home from work or school when we are sick, so we don't spread it to everyone else. In the quarantine tank you can monitor them closely and give them the special attention or medications they need.

Salt, Heat Therapy and Other Medications

Although we try our best to maintain healthy conditions and select healthy koi, somehow some still seem to get sick. Boy, doesn't that just yank your chain? Oh, the trials and tribulations! Maintaining pristine water conditions will lessen the likelihood of certain diseases and support quicker recovery when medications do become necessary. Sometimes we have to help weak koi over the hump with some type of medication. I am not going into the endless list of therapeutics. But I do feel a need to mention a few with regards to our main objective which is: All our actions or medications should be aimed at producing a strong koi.

Salt

Rock salt is well known to be one of the most beneficial stress reducers for koi. Remember when we discussed how a stressed koi loses some of its ability to osmoregulate properly across the gills? Rock salt at 0.3% to 0.6% can prevent the loss of internal body salts during stress. The koi is closer to what is called an isotonic solution. The koi does not have to expend as much energy recovering these lost salts on top of his already weakened condition. This helps us achieve our main objective. Also, for some reason, koi seem to be able to handle cold water better and I always keep these levels of salt in my ponds during the winter and spring. Furthermore salt at these levels retards or kills many ectoparasites. There is also reason to believe that these levels of salt help koi overcome bacterial infections. How many of you have gone for a swim in the ocean with cuts on your fingers, and found the cuts to be exceptionally cleaner after the swim? Don't we also gargle with salt water when we have a sore throat? Salt is definitely a good thing, however, you need to apply a little knowledge before using it. Dosage: 2.5 pounds per 100 gals. equals 0.3%. This is minimum dose. 5 pounds per 100 gals. equals 0.6%. This is maximum dose. Achieve these dosages gradually in the

pond over a 2 to 3 day period. Remove excess algae or aquatic plants before using this dose. Salt will kill these and cause pollution and oxygen depletion. Never use salt during a planktonic algae bloom. Maintain these levels of salt for the duration of the koi's dis-ease by using a pond salt tester or a digital meter for best results. Regular water changes will gradually reduce salt levels over a month or two. There is no need to maintain these salt levels permanently in my opinion. Alternatively, if you only have one or two koi which seem to need treatment you may give them a salt bath in a separate tub with 5 gals of pond water and 1 pound of rock salt. This produces a 2% solution. Bathe the koi for only 5 to 10 minutes. Use a plastic bag to transfer the koi to and from the bath so as not to damage skin and mucous, Potassium Permanganate. This chemical has been used for decades to help control ectoparasites and pathogenic bacterial problems. PP is particularly helpful in controlling resistant strains of flukes and trichodina. PP is an oxidizing agent. This means it basically burns or oxidizes materials that it comes in contact with. PP is non-selective, it will oxidize waste products, algae and pathogens in the water.

It cleans the water and actually improves water quality. Permanganate can also burn the good bacteria in your filter and the koi's gills if improperly administered. This is where problems occur with excessive use of PP. Koi cannot live in sterile conditions. The good bacteria on the skin of the koi and the surfaces of the pond actually compete for space with pathogenic types. PP can obliterate your natural environment and the koi's good skin bacteria thus leaving a wide open invitation to very fast growing pathogenic types of bacteria. This is a typical case of chronic over medication leading to worse problems. If you need to use potassium permanganate, use it wisely and quickly and get out of there. Know your pond volume within 5%-10%. For flukes treat at 2.5 ppm every 2 - 3 days until the color remains purple for 7 hours. This should only require a few treatments if your water is clean. For trichodina infestations treat at 1.5 ppm every 2 - 3 days maintaining a purple color for only 2 hours. By the way trichodina loves dirty ponds and filters.

Fluke-Tabs

These were developed to control resistant strains of flukes and work quite well if applied twice, with doses applied a week apart. Again, know your pond volume within 10%. The up side to Fluke-Tabs is that they do less damage to the environment's good bugs than the potassium permanganate. The down side is their cost to treat larger ponds. Given the less damaging side effects, I would suggest that Fluke-Tabs extra cost over PP was money saved.

Formalin / Malachite

This old stand by is still very useful for some microscopic parasites like Ich, costia,

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chilodinella, epistylus; and fungus problems and some external bacterial problems like early symptom fin rot. The formalin part of this mixture can damage the environment if over used. Malachite Green is a known carcinogen. However, correct dosages will overcome many disease problems and is especially useful for new koi or koi coming home from a show. Know your pond volume and treat at least twice with 3 to 4 days between treatments. The Ich parasite will require up to 4 or 5 treatments to kill the life cycle. To save the pond environment from overuse, do not use any of these chemicals as a general prophylactic. Rather, always use them discriminately when you purchase new koi or bring koi from a show.



Kawarigo Korum

Up Coming Events

April 24, 2005

Constance Richardson

May 7 & 8, 2005

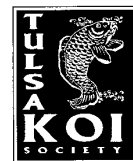
Annual Pond Tour

May 22, 2005

Faye & Winton Hall

June 17, 2005

Simon & Millie Burghheimer



June 23 -26, 2005

24th Annual AKCA Seminar Tulsa
Oklahoma

July 24, 2005

Mountain View Koi Fish & Aquatic Plants

August 28, 2005

Dennis & Kathy Leonard

September 25, 2005

Noel & Debbie Shaw

October 23, 2005

Ken & Mary Struck

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