

creasing the number of emergent tomites.

Water temperature has a tremendous influence on how fast the life cycle for "Ich" (Figure 1) is completed. At warm temperatures (75-79°F), the life cycle is completed in about 48 hours, which means that chemical treatments should be applied every other day. At cooler temperatures the life cycle is prolonged and treatments should be spaced further apart. For example, at a water temperature of 60°F, treatments should be spaced 4 or 5 days apart. In warm water, a minimum of three treatments applied 2 to 3 days apart is required. In cooler water, a minimum of five treatments should be applied 3 to 5 days apart. Treatments should never be discontinued until all mortality from "Ich" has stopped. Fish should be closely watched during recovery; the weakened fish may be susceptible to a secondary bacterial infection. The choice of chemical used to treat "Ich" will be based upon water quality conditions, species of fish to be treated, and the type of system fish are housed in. In general, copper sulfate, formalin, and potassium permanganate are all effective against "Ich" when applied at the correct concentration in a repetitive manner as described above.

## Special considerations for treatment of food fish

Most channel catfish, raised in the southeast, are reared in ponds. For these fish, the treatment of choice for "Ich" is copper sulfate. The chemical is effective and relatively inexpensive, an important consideration when large volumes of water are treated. The disadvantage of copper sulfate is that it is extremely toxic, particularly in water of low alkalinity. **NEVER** use copper sulfate without testing the total alkalinity of the water, carefully measuring the dimensions of the pond to be treated, and weighing the amount of chemical to be applied.

The concentration of copper sulfate to apply is often calculated by determining the total alkalinity of the water and dividing that number by 100. For example, if the total alkalinity of the pond is 100 mg/L, then  $100/100 = 1$  mg/L copper sulfate. Do not use copper sulfate if the total alkalinity is less than 50 mg/L. If you have never used copper sulfate, contact an IFAS extension aquaculture specialist for assistance. Use of copper sulfate may lead to severe oxygen depletions, therefore, emergency aeration should always be available. Use of copper sulfate during hot weather, or when algae blooms

are dense, is strongly discouraged. Remember, if you do not know the alkalinity of your water and can not measure it then **DO NOT USE COPPER SULFATE**.

If you are unable to use copper in your pond because of low alkalinity, lack of aeration, or you are not comfortable using it, potassium permanganate can be used instead. The primary disadvantage of potassium permanganate is its high cost. However, it is equally effective and safer to use than copper sulfate. Potassium permanganate can be applied at a concentration of 2 mg/L which will result in a purple-pink color of the water. If the water turns yellow or brown in less than 8 to 10 hours, then the treatment should be repeated. Usually, a maximum of three applications (2 mg/L each) is recommended during any one treatment (maximum concentration of 6 mg/L).

If fish are maintained indoors in a tank system, formalin can be used to treat "Ich". Formalin is not the ideal treatment for ponds, but works nicely in tanks with vigorous aeration. Formalin should not be run through a biofilter, however, as it will kill the bacteria in the filter and ammonia levels may increase to lethal levels. A short-term bath of 250 mg/L for 30 to 60 minutes can be followed by a water change. Cleaning the tank will also decrease the number of parasites. When applying a concentrated treatment such as formalin, **NEVER** leave the fish in the treated water longer than recommended, and **NEVER** leave them unattended. Sick fish may be unable to tolerate a full treatment. If they appear stressed or try to jump out of the tank, flush the chemical from the system immediately. A long term bath of formalin can be used in a tank system at a concentration of 15 mg/L and does not need to be flushed out.

Salt can also be used to control "Ich" infections in small volumes of water. This is not practical in ponds because even a light salt solution of 0.01% (100 mg/L), would require large quantities of salt (272 lbs/acre-foot). In small volumes (i.e. tanks or vats), however, salt can be useful. Fish can be dipped in a 3% (30,000 mg/L) solution for thirty seconds to several minutes, or they can be treated in a prolonged bath at a lower concentration (0.05% = 500 mg/L). Salt at low concentrations (0.01 to 0.05% solution) is an excellent means of controlling "Ich" in recirculating systems without harming the biofilter. An ultraviolet filter is recommended as an aid in preventing the spread of the parasite in a recirculating system.