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Health & Welfare
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Study shows oxytetracycline controls streptococcus in tilapia

Responsible Seafood Advocate logo
1 December 2002 Ahmed M. Darwish, DVM, Ph.D. Bill R. Griffin, Ph.D.

Once fish refuse feed, oral antibiotic therapy will be ineffective

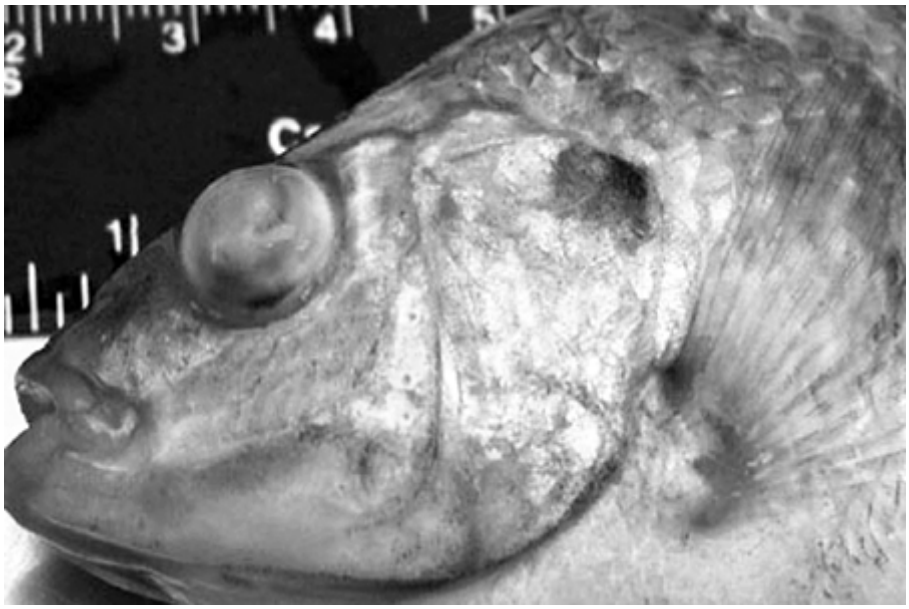

Fig. 1: This blue tilapia shows corneal opacity and exophthalmia three weeks after infection with *S. iniae*.

Streptococcus spp. are Gram-positive, nonmotile, catalase-negative cocci that are fermentative in glucose and do not form spores. Streptococcosis, the disease they cause, affects more than 20 species of fish. It causes great economic losses and represents a real danger to warmwater aquaculture, particularly intensively cultured tilapia.

The United States Food and Drug Administration (FDA) has approved the antibacterials oxytetracycline and Romet (a 1:5 combination of ormethoprim and sulfadimethoxine) to combat streptococcosis in aquaculture, but their use is limited to channel catfish and salmonid species. For species like tilapia, expanding FDA approval of existing antibacterials to include additional species may be more promising than seeking approval of new drugs to fight streptococcosis.

One of the requirements in the drug approval process in the United States is efficacy studies. The objectives of a recent study by the authors were to determine the *in vitro* sensitivity of *S. iniae* to oxytetracycline and the efficacy of oxytetracycline in controlling mortality in blue tilapia (*Tilapia aurea*) infected with *S. iniae*.

Experimental trials

Studies of the minimum inhibitory concentration of oxytetracycline against multiple *S. iniae* isolates indicated general sensitivity at concentrations of 0.25 to 0.50 milligrams per milliliter. In two trials, oxytetracycline was incorporated into the experimental diet fed to experimentally infected fish.

Fish received oxytetracycline at 25, 50, 75 and 100 mg active ingredient per kilogram body weight per day for 14 days. The positive control treatment consisted of nonmedicated fish challenged with *S. iniae*, while the negative control treatment consisted of nonchallenged and nonmedicated fish. Each treatment had four tanks with 15 fish in each tank.

Results

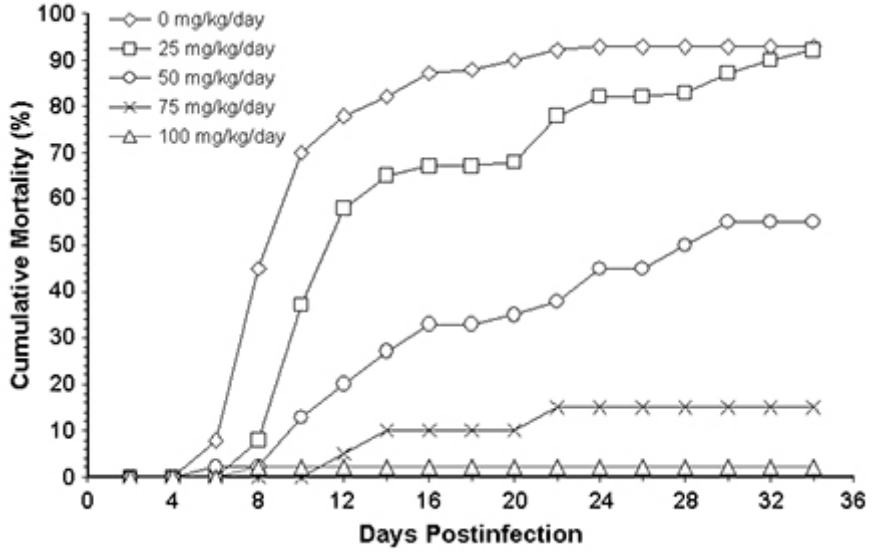

Fig. 2: Cumulative mortality of blue tilapia infected by waterborne exposure to *Streptococcus* iniae after scraping and fed diets with oxytetracycline for 14 days.

No clinical signs or gross pathology were observed in the negative control treatment. Such signs were observed primarily in the challenged, nonmedicated fish and medicated fish that died when challenged.

The diseased fish exhibited lethargy and a reduction or cessation of feeding beginning five to six days after infection. The fish swam in circles, in random directions, and on their sides with their bodies arched. Externally, diseased fish had dark skin pigmentation, abdominal distention, hemorrhages, erythema, and eye lesions consisting of bilateral or unilateral exophthalmia, corneal opacity, and complete disintegration of the lens (Fig. 1).

Internally, there was accumulation of abdominal fluid, and the animals' livers, kidneys, gonads, and gastrointestinal tracts had hemorrhages. The infection was systemic, as shown by the positive isolation of the *S. iniae* from the brains, kidneys and eyes during the first 22 days postinfection.

The 50-mg oxytetracycline treatment significantly increased the survival of the infected tilapia from 7 percent in the infected nonmedicated group to 45 percent (Table 1). The 75- and 100-mg oxytetracycline treatments had

survival rates of 85 and 98 percent, respectively – significantly higher than the 50-mg treatment (Fig. 2). There was no significant difference between the 75- and 100-mg treatments and the uninfected, nonmedicated treatment.

Darwish, Survival of tilapia infected with S. iniae, Table 1

Oxytetracycline Dose (mg/kg weight/day)	Survival (%)
0	7.0 ± 0^{c}
25	8.5 ± 1.5^{c}
50	45 ± 8.7^{b}
75	84.7 ± 5^{a}
100	98.2 ± 1.7^{a}
Control	100 ± 0^{a}

Table 1. Survival of tilapia infected with S. iniae and fed diets with oxytetracycline. Different letters indicate significance ($P < 0.05$).

Survivors from the 100-mg oxytetracycline treatment were not found to be carriers of the infection, whereas the bacterium was recovered from 10 percentof the survivors from the 75-mg oxytetracycline treatment.

Conclusion

In trials, oxytetracycline was efficacious in treating *S. iniae* infection in tilapia, but the reluctance of fish to feed five to six days post-infection emphasizes the critical importance of monitoring and early intervention with oral administration of antibiotics. Once fish start refusing feed, oral antibiotic therapy will be ineffective in reducing fish losses.

Although oxytetracycline appears to be an effective treatment, controlled field trials, target animal safety and tissue residue studies will be required by the FDA to consider its approval.

(Editor's Note: This article was originally published in the December 2002 print edition of the Global Aquaculture Advocate.*)*

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