



**Armstrong  
At  
Large**

by Rob Armstrong

**S**treptococcus iniae has been a problem for fish culturists around the world for many years. Thomas George, an aquaculture consultant with many years of international experience, has followed this problem very closely. He recently presented a comprehensive paper on the subject at the Aquaculture Association of Canada 1998 conference in Newfoundland.

S. iniae is a typical member of the Streptococcus genus. George notes that this bug was first isolated from a condition called "golf ball disease" of freshwater Amazon dolphins kept in United States aquaria. There had been previous suspected occurrences of S. iniae infection in rainbow trout and tilapia in Japan. However, the first confirmed outbreaks of disease were in rainbow trout and tilapia in Israel in 1986. Israeli scientists gave the microbe another name (S. shiloii), but this classification was subsequently revised based on the previous US identifica-

tion of S. iniae. Over 20 species of freshwater and marine fish, both wild and cultured, have been found to be susceptible to S. iniae infections. The most seri-

**FISH HEALTH:  
Trout and tilapia  
susceptible to  
streptococcus**

ously affected are yellowtail, striped bass, eel, tilapia, rainbow trout and turbot. The countries that have the most problems are Japan, Israel, US, Taiwan, South Africa and Spain. George estimates that global costs to aquaculture exceed US\$150 million annually. Most mortalities in the US occur in intensive closed-culture tilapia systems, and S. iniae affects tilapia more severely than any other fish species under these conditions.

The disease can be trans-

mitted directly between fish, with the result varying from superficial skin infection to an invasive systemic disease that can lead to mortality rates between 30 and 50%. Clinical signs of the systemic disease are erratic swimming, "pop eye," and hemorrhages at the base of fins and operculum. At post mortem, fish may have a swollen abdomen with a pale liver and spleen. A tentative diagnosis can be made on Gram stain of affected tissues with the organism identity subsequently confirmed by bacterial culture.

Disease outbreaks can be effectively controlled through antibacterial treatment, and tetracyclines or amoxicillin are standard clinical choices. However, no antibiotics have received full regulatory approval for use on tilapia in Canada or the US. George also notes that antibacterial treatments can cause problems for closed culture systems, and can lead to an increased prevalence of carrier fish that may serve as a reservoir for future outbreaks. Therefore, prevention is very important, and the chance of outbreaks can be reduced through the standard prescription of careful fish handling, water quality control and optimal stocking rates. No com-

mercial vaccines are available at present in North America, and more research is needed on the control of this infection in tilapia. George recommends that domestic producers quarantine imported tilapia seed

is an infection of tissues beneath the skin (cellulitis) combined with increasing white blood cell counts and fever. The infection generally responds well to antibacterial treatment and there is no disease risk from eating cooked fish, or from proper handling of live fish.

George recommends that people handling live fish for cooking should wear strong latex gloves; exercise caution; carefully clean all cooking surfaces; promptly treat any skin injuries with topical disinfectants; and consult a doctor regarding initiation of antibacterial treatment if an injury occurs.

This story took a more sensational twist when one of the doctors involved in treating human S. iniae infections in Toronto referred to the infection as "mad fish disease." This statement was

apparently based on the possibility that this bug can affect cranial tissues in fish. However, the fish disease is very different from the "mad cow disease" that affected both cattle and people in England. Still, the reference was enough to generate headlines in Toronto newspapers, although George reports there was no apparent long term impact on fish sales.



**Thomas George (r) and Thomas Losordo (l) of North Carolina State University sharing their optimism for intensive tilapia culture in North America at Aquaculture Canada '98.**

before stocking into their production systems.

This bug may have languished in the relative obscurity reserved for fish disease agents, except that in 1995 and 1996 Canadian doctors discovered that the infection can spread to people if careless handling of live or freshly dead fish leads to skin cuts permitting bacterial entry. The result