

New Advances for Warmwater Aquaculture



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AQUAVAC™ GARVETIL™ vaccine safely reduces streptococcosis mortality in tilapia

- Key Points • Higher relative percent survival
- Two-step vaccination protocol easy to implement
- Palatable to fish • Mixing ratio

Key Points

- A large-scale controlled field trial with AQUAVAC™ GARVETIL™ vaccines was conducted on a commercial tilapia farm experiencing streptococcosis outbreaks.
- Small fry were immersion-vaccinated with AQUAVAC GARVETIL and half also received a booster of AQUAVAC GARVETIL ORAL.
- Mortality from streptococcosis was significantly reduced in those that received the two-step vaccination protocol, and the value of fish was increased to a level that exceeded the cost of vaccination by 4 times.

A large-scale field trial demonstrated that mortality from streptococcosis in tilapia can be significantly reduced with a two-step vaccination program consisting of AQUAVAC™ GARVETIL™ and AQUAVAC™ GARVETIL™ ORAL, said Dr. Mario Aguirre, of Intervet/Schering-Plough Animal Health, Venezuela.

The trial was conducted on a commercial farm in Central America that grows fish from 800 to 900 grams and markets to the United States. The farm had experienced outbreaks of the bacterial disease streptococcosis, a leading cause of economic loss for fish producers that results in significant mortality. The disease is characterized by a wide variety of signs ranging from scale loss and erratic behavior to hemorrhage of internal organs and an enlarged, dark spleen.

On the trial farm, where *Streptococcus iniae* and other streptococcus species were present, small fry averaging 1.3 grams in weight were immersed in a 60-second dip of AQUAVAC GARVETIL ; some of the fish also received a booster of AQUAVAC GARVETIL ORAL, which was administered in feed; and other fry were not vaccinated and served as controls. Each of these three groups consisted of four units containing about 7,500 fish, Aguirre said.

The immersion vaccine was administered in early May and the fish were transferred 7 days later from the hatchery to the nursery, when they weighed about 2.2 grams. Those receiving the oral booster were vaccinated in mid-July. In August, the fish were transferred to grow-out units and a natural streptococcus disease outbreak occurred, "resulting in both acute mortality and the chronic lesions associated with streptococcosis infections," he said.

Higher relative percent survival

Mortality in the group that received both the immersion and oral vaccines was only 4.28% compared to 7.28% for those that received only the immersion vaccine, and 8.6% for those receiving no vaccine, he said.

"The immersion plus oral booster vaccine program provided 50%

relative percent survival (RPS) protection, while the immersion vaccine alone provided a 15% RPS," Aguirre said (Figures 1 and 2).

The two-step vaccination program yielded an additional value in fish produced that was over 4 times greater than the cost of vaccination, he said.

The vaccination procedure using both immersion and oral vaccines is considered very safe, Aguirre emphasized. No immediate or long-term adverse effects were reported, mortality post-vaccination was low and no adverse behavior or performance was observed.

"The field trial shows that the two-step vaccination program with AQUAVAC GARVETIL and AQUAVAC GARVETIL ORAL is a valuable tool in combating streptococcosis outbreaks. The vaccine performed well and mortality from streptococcosis was well controlled," he said.

In a separate presentation on practical approaches to tilapia vaccination (see below), Aguirre said there are several other reasons to vaccinate in addition to reduced mortality, better performance and improved profitability. Improved fish health leads to better animal welfare, which reflects a better image for tilapia producers.

"Vaccination isn't an expense, it's an investment," he said.

Two-step vaccination protocol easy to implement

AQUAVAC GARVETIL vaccines have been designed to provide an easy method of protecting tilapia against streptococcosis, a rapidly emerging global disease problem, Aguirre said.

The vaccines contain both *Streptococcus iniae* and *Lactococcus garvieae* — the two principle strains of streptococcus found in warmwater aquaculture, which often result in a mixed infection syndrome, he said.

AQUAVAC GARVETIL is an immersion vaccine administered as a 60-second dip to fry as small as 1 gram in weight. The vaccine, which must be refrigerated at a temperature between 2° C to 8° C (36° F to 46° F), then kept on ice during field vaccination, is mixed at the ratio of 1 liter of vaccine to 9 liters of clean water. "You can raise the volume, but always maintain that ratio of 1 liter of vaccine to 9 liters of water. It's that simple," Aguirre said.

Fry are weighed and counted before vaccination, then are collected in a hand net and immersed in the solution, which should be oxygenated. "Don't overcrowd your net and allow the solution to circulate around the fish so they can easily breathe. They need to have good ventilation with no hyperventilation. We recommend an oxygen pump, which is common equipment in hatcheries," he said.

After immersion, fry are returned to the original facility, where they should be held for at least 5 days without further movement, challenge or stress, Aguirre said.

Palatable to fish

AQUAVAC GARVETIL ORAL, which is readily accepted by fish, can be administered as a stand-alone vaccine for previously unvaccinated tilapia, but for the two-step protocol recommended for streptococcus control, it is used as a booster to the immersion vaccine. The oral vaccine is mixed into feed and should be administered to primed fish within 3 months after initial vaccination, a program that has been shown to extend protection until harvest, he said.¹

Administration of the oral booster after primary vaccination, Aguirre noted, may vary a bit depending on the situation at individual farms, such as the size of the fish, time to market, harvest size and seriousness of the disease problem.

figure 1

| Vaccination | Mortality (%) | RPS (%) |
|--|---------------|-----------------|
| Unvaccinated controls | 8.6 | n/a |
| GARVETIL immersion prime only | 7.28 | 15 |
| GARVETIL immersion and GARVETIL ORAL booster | 4.28 | 50 p ≤ 0.005 |

Each group consisted of four units containing roughly 7500 fish. Fish were transferred to grow out site and experienced a natural challenge.
RPS = relative percent survival.

Figure 1: **Summary of mortality and protection results**
When both the immersion and oral vaccines were used, 50% protection against mortality was provided

figure 1

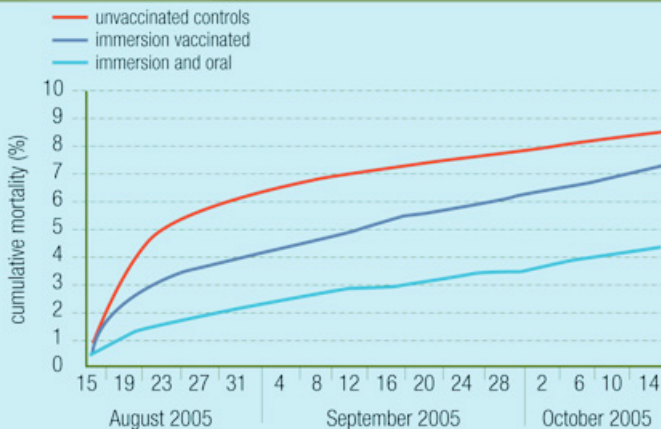


Figure 2: **Cumulative streptococcus mortality rates**
Cumulative mortality was lowest in the group that received both the immersion and oral vaccines during streptococcus outbreaks.

Mixing ratio

The oral vaccine can be diluted with fish oil and mixed with feed at the rate of 3% liquid-to-weight ratio. "We add the vaccine to feed in a clean cement mixer. This simple method provides good homogeneity of the vaccine in the feed after 5 minutes mixing time," he said.

From days 1 to 5 of oral vaccination, the oral vaccine is administered at the rate of 0.01 ml per fish per day; from days 6 to 10 fish receive feed without the vaccine, then from days 11 to 15, the same dosage of 0.01 ml per fish per day is administered, he said.

The oral vaccine, Aguirre added, features proprietary technology known as the AQUAVAC Antigen Protection Vehicle (APV), which safeguards antigens in the vaccine as they pass through the stomach and until they reach the hindgut, where they are absorbed and initiate an immune response (Figure 3).

While the immersion vaccine must be refrigerated then kept on ice in the field to preserve its effectiveness, the oral vaccine mixed with feed should be stored in a fresh, well-ventilated site, protected from sun exposure.

"The immersion vaccine initiates immunity against streptococcosis and the oral vaccine extends that protection, protecting juvenile tilapia from streptococcosis and minimizing producer losses from a devastating and costly disease," he said.

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ⁱ Data on file at Intervet/Schering-Plough Animal Health.

figure 2

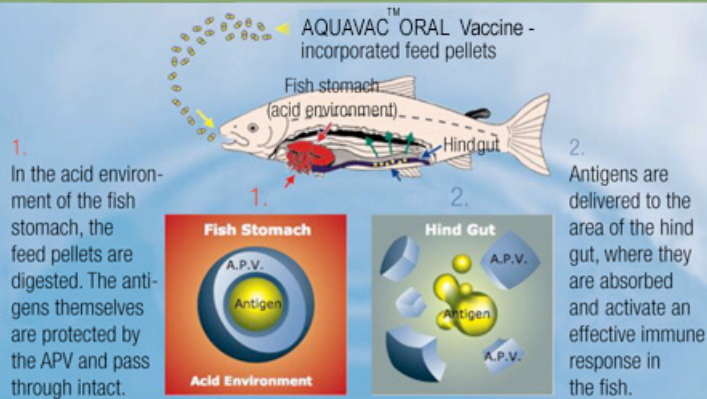


Figure 2: **AQUAVAC™ — Antigen Protection Vehicle (APV)**
AQUAVAC's unique Antigen Protection Vehicle protects antigens until they reach the hindgut.