Disease transmission

- The major routes of transmission appear to be via infected fish, contaminated water and feeding of trash fish. Although the disease causes mortality in fish as small as 10 g, fish are mostly susceptible above 100 g. The greatest losses occur in large fish close to market size. Outbreaks can occur all year round but are usually triggered by environmental stress to the fish, for example, due to overcrowding and changes in water quality.

- Most fish farmed in Asia are susceptible to this disease. A selection of these are listed below:

Common name	Latin name
Asian sea bass/barramundi	*Lates calcarifer*
Four-finger threadfin	*Eleutheronema tetradactylum*
Grouper	*Epinephelus* spp.
Japanese flounder	*Paralichthys olivaceus*
Pomfret	*Trachinotus* spp.
Seabream	*Rhabdosargus* spp.; *Sparus* spp.; *Plectorhynchus* spp.
Snapper	*Lutjanus* spp.
Tilapia	*Oreochromis* spp.
Yellow croaker	*Larimichthys polyactis*

External and internal signs

Abnormal swimming behaviour

Affected fish can be lethargic, exhibit a spiral motion or have disorientated swimming behaviour.

Eye lesions

Unilateral or bilateral exophthalmia ("popeye"), clouding of the cornea and eye haemorrhage are common clinical signs in infected fish.

Skin lesions

Darkened skin is common in infected fish. Discrete petechial haemorrhage may be present all over the body surface but especially at the bases of fins and tail.

Internal septicaemia

Spleen and kidney appear enlarged, the liver is haemorrhagic and ascites can be present in the abdominal cavity.

Norvax® Strep *Si*

- The first monovalent immersion and injection vaccine against *Streptococcus iniae*
- Proven high and long-lasting protection
- Safe for the fish, the vaccinator and the consumer
- An important Norvax® vaccine, targeted at an important warmwater disease
- Benefits sustainable and environmentally friendly aquaculture

Product information

COMPOSITION
Formalin-inactivated *Streptococcus iniae* antigen in an aqueous solution.

INDICATION
Aid in the protection against *Streptococcus iniae* infections in susceptible fish species.

DOSAGE AND ADMINISTRATION
The preferred method for vaccination is by intraperitoneal injection from 20 g and onwards.
If early protection is needed, fish can be vaccinated by dip immersion from 3 g and onwards. However, this alone is not sufficient to achieve a long duration of protection. Therefore, the fish should be re-vaccinated by intraperitoneal injection as soon as the size of the fish allows for this.

Vaccination by intraperitoneal injection:
Inject 0.1 ml vaccine at the ventral side of the fish, just behind the pectoral fin-tip.
Vaccination by dip immersion:
One litre of vaccine is mixed with 9 litres of seawater. Using a knot-less hand net, immerse 3 kg of fish into this vaccine solution for 30 seconds. Prepare a new vaccine solution after having vaccinated 100 kg of fish. Ensure good oxygenation or aeration during immersion vaccination. Maintain pH and temperature stable throughout.

ADVICE ON CORRECT ADMINISTRATION
The vaccine may be used in various fish species. However, its use should be undertaken with care and it is advisable to test the vaccine on a small number of fish prior to mass vaccination. Feed should be withheld from fish for a period of 1 day prior to vaccination. For injection, fish should be anaesthetised. Start feeding, at the earliest, 12 hours after vaccination. Avoid stress in the period prior to and after vaccination. Shake the bottle well before use. Sterile injection equipment should be used.

STORAGE AND HANDLING
Store at 2 to 8°C. Protect from light. Do not freeze. Use entire contents when first opened.

PRESENTATION
Sterile 250-ml polyethylene bottles. (Enough for 2,500 injection vaccination doses or to immersion vaccinate 5,000 5-g fish).

For correspondence, contact the Intervet office in your own country or:
Asia: Intervet Norbio Singapore Pte. Ltd. • Phone +65 6397 1121 • E-mail: info.aqualNS@intervet.com
Elsewhere: Intervet International bv • P.O. Box 31 • 5830 AA Boxmeer • The Netherlands
Phone: +31 485 587600 • Fax: +31 485 577333 • E-mail: info.aqua@intervet.com • www.intervet.com/AAH

Norvax® Strep *Si*

Vaccination - your future

Changing the health of Asian aquaculture

Intervet has 20 years of experience in fish vaccine development. Starting out with Norbio in Norway, Intervet has grown hand-in-hand with the fast-developing salmon industry. The first vaccine for farmed salmon was introduced in 1985. Today, the success of the salmon industry, and the total traceability and absence of antibiotics in farmed salmon in particular, has been achieved thanks to the widespread use of vaccines.
In 2000, Intervet set up a Research and Development centre in Singapore, entirely dedicated to the development of novel vaccines and other products for commercially farmed aquatic animal species in the region. This R&D centre, with its state-of-the-art facilities, is the first of its kind in Asia. Intervet is using the same level of technology and innovation for development of Asian-targeted products as for its salmon-targeted products. Top class research and forward thinking ensures that Intervet will continue to help the aquaculture industry grow and prosper. Intervet has the vision to know that the Asian aquaculture industry will adopt all the best that vaccination technology has to offer in the 21st century.

The Disease

Streptococcosis

- One of the most serious diseases of warmwater fish. It is present in both marine and freshwater environments and has a global distribution. Cumulative mortality can be as high as 70%.

Caused by *Streptococcus iniae*

- A Gram-positive, non-acid fast, non motile, oxidase positive, catalase negative, beta-haemolytic, coccus bacterium.

Distribution of *Streptococcus iniae* in the Asia - Pacific region

Area where S. iniae outbreak has been confirmed

Area where S. iniae is suspected

Disease prevention

Good health management

Good health management practices help to provide fish with their optimal farming environment, at least in that location, for their best possible growth and productivity. Control of diseases is optimised by:

- Selection of healthy fry
- Quarantine of incoming animals
- Appropriate stocking density
- Good husbandry techniques
- Sanitation
- Vaccination
- Regular changing of nets
- Optimized feeding and use of high quality dry feed (no trash fish)
- Disease monitoring
- Daily removal of dead and dying fish
- Daily recording of mortality and morbidity
- Responsible use of chemicals and drugs
- Proper control and biosecurity measures when diseases do occur

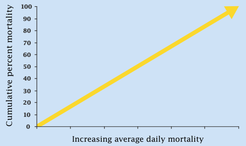
Disease treatment

Treatment of established bacterial infections with antibiotics has been extensively used for control. However, this approach is limited, since clinically infected fish do not eat well and, therefore, are difficult to treat. Also, a successful outcome is dependant on a rapid diagnosis and immediate treatment. Not all antibiotics can be used to treat all kind of diseases. For example, a lot of bacteria are resistant to most common antibiotics and no antibiotics are effective against viral infections. In addition, the use of antibiotics in food production should be minimized for the long-term health benefits of humans, animals and the environment.

Vaccination

Vaccines are preparations of inactivated antigens derived from pathogenic organisms that stimulate the immune system to increase the resistance to disease from subsequent infection by those pathogens. Vaccination does not replace other preventive measures but, when associated with appropriate farm management, it is the best strategy to prevent or ameliorate infectious diseases in aquaculture.

Relationship between daily mortality and cumulative percent mortality in non-vaccinated fish

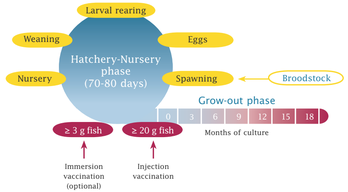


There is no such thing as low mortality. For example, in a cage starting with 2,500 fish, mortality of even four fish per day represents a cumulative mortality of 58.4% (1,460 fish) over a one-year period. If more than seven fish per day die, no fish will be left after one year.

Vaccination strategy

Norvax® Strep *Si* is a monovalent vaccine containing an inactivated strain of *Streptococcus iniae*. The vaccine induces protective immunity in warmwater fish of both marine and freshwater environments against streptococcosis caused by *Streptococcus iniae*. Streptococcosis will affect the fish in the grow-out facilities. Therefore, fish should be vaccinated before they are put into cages, pens or ponds.
If fish have to be transferred before reaching injection size (≥ 20 g), immersion vaccination should be done on smaller fish (≥ 3 g) one to two weeks before transfer. Then, when reaching injection size, fish should receive a booster vaccination by means of a single intraperitoneal injection that will protect them up to market size.

Example: Asian seabass vaccination strategy



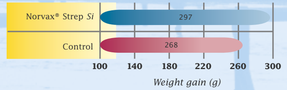
Safety

Norvax® Strep *Si* is a whole cell inactivated aqueous vaccine. The specific formulation used in Norvax® Strep *Si* has proven to be effective and safe, both in laboratory and field trials.

In all GLP laboratory trials, relative to controls, both single and double dose immersion vaccination and intraperitoneal injection vaccination gave no abnormal behaviour, systemic or local reactions, growth delays or mortality.

In field trials conducted under normal commercial conditions, no mortality was observed immediately after either immersion or injection vaccination, no local reactions were observed one month after injection vaccination and there was no adverse effect on weight gain.

Weight gain obtained 35 weeks after initial immersion vaccination of 3-g fish



Help sustain your future - vaccinate your fish

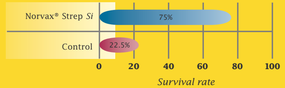
Fish vaccinated	Fish not vaccinated
○ Greater production	○ Reduced production and margins
○ Healthier fish, healthier seafood	○ Increased use of antibiotics, often too late and giving residue concerns
○ Greater profits	○ Difficult to plan production and sales
○ Protect your investment	○ Poorer quality fish product
○ Sustain your future and give peace of mind	

Efficacy

The efficacy and protective ability of Norvax® Strep *Si* has been extensively tested in Asian seabass in various laboratory experiments and field trials. The duration of protection was proven to be at least 12 weeks in laboratory studies and 35 weeks in field trials.

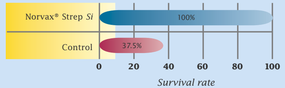
Efficacy of immersion vaccination

The efficacy of immunity following immersion vaccination of Asian seabass with the recommended dose of Norvax® Strep *Si* was investigated by means of challenge experiments. A total of 50 5-g fish were vaccinated with Norvax® Strep *Si* while untreated contemporary fish were used as controls. Three weeks after vaccination, the fish were challenged in a bath immersion using a virulent strain of *Streptococcus iniae*. Statistically significant higher survival was obtained in vaccinated fish (75%) compared with controls (22.5%). The relative percent survival (RPS)* was 68%.



Efficacy of injection vaccination

A field trial was conducted with Asian seabass under normal farming conditions. Fish (40 g) were injection vaccinated with the recommended dose of Norvax® Strep *Si*. The efficacy following injection vaccination was investigated by means of a challenge experiment. Six weeks after vaccination, 80 fish were challenged by intraperitoneal injection using a virulent strain of *Streptococcus iniae*. Statistically significant higher survival was obtained in vaccinated fish (100%) compared with controls (37.5%). The RPS was 100%.



*RPS = 1 - (% mortality in vaccinated group/% mortality in control group) x 100