

Fish Vaccines in Tasmania

BACKGROUND

Vaccines play an important animal welfare role in preventing disease and helping to maintain healthy stock. The approach to vaccines and vaccination in fish is the same as that used for other food animals, pets and people.

Fish vaccines were first developed in the USA during the mid-1970s to prevent disease in farmed fish. Highly effective vaccines have been developed for bacteria and viruses and are used widely for fish farming around the world.

DPIPWE, with the salmonid aquaculture industry, has pioneered the development and use of fish vaccines in Australia. Vaccination is a key strategy in the sustainable production of farmed fish in Tasmania.

PURPOSE OF VACCINATION

Fish, just as any other animals, are susceptible to infectious diseases caused by naturally occurring viruses, bacteria or parasites. The effects of disease are more pronounced and can have greater impact when animals are kept together, such as in a pen.

Vaccination is a preventive measure intended to protect farmed animals from becoming diseased. This means that fish are vaccinated before they are at risk of becoming infected. Using effective vaccines can eliminate the need for antibiotics as a means of controlling disease.

HOW DO VACCINES WORK?

Vaccines contain either killed microorganisms or parts of microorganisms. When these are introduced to fish their immune system is activated. Fish, like other animals, have a well-developed immune system that protects them from disease. Vaccination trains the immune system to protect fish from disease. Fish have a full

repertoire of immune functions including antibodies, cell-mediated activity through to the production of interferons. All these components of the immune system are activated by vaccination and help protect the animal from disease.

Protective immunity develops 4-6 weeks after vaccination. For injection vaccines in Tasmania, protection is life-long.

HOW ARE VACCINES GIVEN IN FISH?

Most fish are vaccinated by injection. At the time of vaccination, fish are gently sedated and then a tenth of a millilitre (about the size of a drop of water) is injected into the body of the fish. There are times when smaller fish, 5-10g in size, need to be vaccinated. Injection is impractical for fish this small, so they are dipped in a bath of the vaccine for 30 seconds.

WHEN ARE FISH VACCINATED?

Most of the fish disease in Tasmania occurs at sea. Between 6-8 weeks before fish become smolt and are sent to sea, they are vaccinated. For hatchery diseases, fish are vaccinated once they are considered immune competent and able to benefit from vaccination, typically when they reach 5g.

CURRENTLY AVAILABLE VACCINES

Five vaccines have been developed and are in use by Tasmania's salmonid aquaculture industry.

Name	Target Disease	Situation
Anguillvac C®	Vibriosis	marine
Yersinivac B®	Yersiniosis	freshwater and marine
Tegovac®	Vibriosis, yersiniosis and marine aeromonad disease	marine
Corrovac®	Tasmanian salmonid rickettsiosis	marine
Certovac®	Salmon orthomyxoviral necrosis	marine

The five vaccines are given by injection; Yersinivac can also be used by dip vaccination.

DEVELOPMENT OF VACCINES

The fish vaccines used in Tasmania have been developed by the Centre for Aquatic Animal Health & Vaccines, DPIPWE, funded by Tasmania's salmonid aquaculture companies and the Fisheries Research & Development Corporation.

The vaccines are tailored for the diseases that affect Atlantic salmon and rainbow trout production in Tasmania. Development of vaccines locally ensures that they are effective for local conditions and diseases.

Vaccines currently under development include:

Microorganism	Type
Cutaneous erosion disease	Bacterium
Tasmania aquabirnavirus	Virus
Tasmanian Atlantic salmon aquareovirus	Virus

COMPOSITION OF VACCINES

The vaccines used in Tasmania have a low level of complexity with a minimal number of components. Two types of vaccine are used: either aqueous or oil supplemented formulations.

The active ingredients for both types of vaccine are killed bacteria or virus and formalin. The concentration of formalin is less than 0.5% v/v of the vaccine and is added to inactivate and preserve the pathogen structure.

Formalin, which is the gas formaldehyde dissolved in water, is biodegradable and occurs naturally at low levels in plants and animals, including fish, and is the result of normal metabolism. Formaldehyde is rapidly degraded and does not accumulate or form a residue. Use of formalin to inactivate and stabilise fish vaccines occurs worldwide and is approved for use in vaccines by the Australian Pesticides and Veterinary Medicines Authority (APVMA). Mercury based preservatives, such as

thiomersal, are **not** used in any of Tasmania's fish vaccines.

Some Tasmanian vaccines include an adjuvant in the form of an oil, the purpose of which is to act as a 'depot' for the vaccine and to stimulate the immune system of the fish. The overall effect of the oil is to prolong the protection given by the vaccine so that fish need only be vaccinated once. The adjuvant is specially formulated for use in fish vaccines and is made from vegetable oils. The adjuvant is approved for use in Tasmanian fish vaccines by the APVMA. It is also widely used for fish vaccines in other countries. Some vaccines for animals use alum (an aluminium salt) as an adjuvant. Alum is **not** used in any of Tasmania's fish vaccines.

REGULATION OF VACCINES

Vaccines for Tasmanian salmon and trout are manufactured in Australia. The production of vaccines is carefully controlled to meet the requirements of the national regulator, the APVMA. Manufacturing facilities for making vaccines are approved by the APVMA and regularly audited to ensure that vaccines are produced to the highest standard.

The APVMA also ensures that vaccines are safe for use in food animals such as fish. For a vaccine to be used with animals it requires approval from the APVMA. The oldest vaccine, Anguillvac-C[®] has been approved for use since 1988.

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