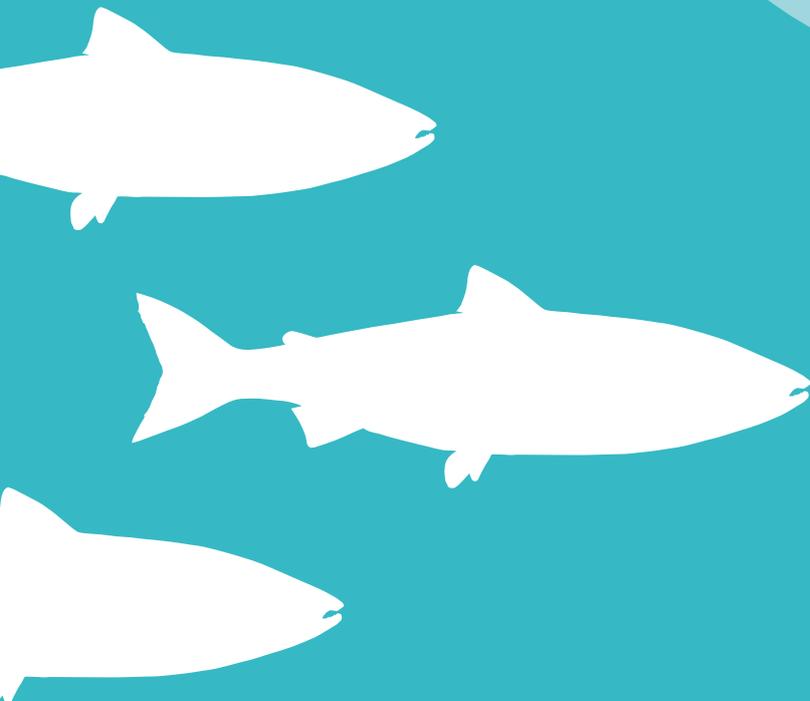


# Good Practices Manual

A simple guide on how to  
manage Lactococcosis in  
Trout farms





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## Aim of the manual

With this Manual we want to provide useful information on the management of fish disease caused by the bacteria *Lactococcus garvieae*, or very close bacteria such as *Lactococcus petauri*, in Rainbow trout.



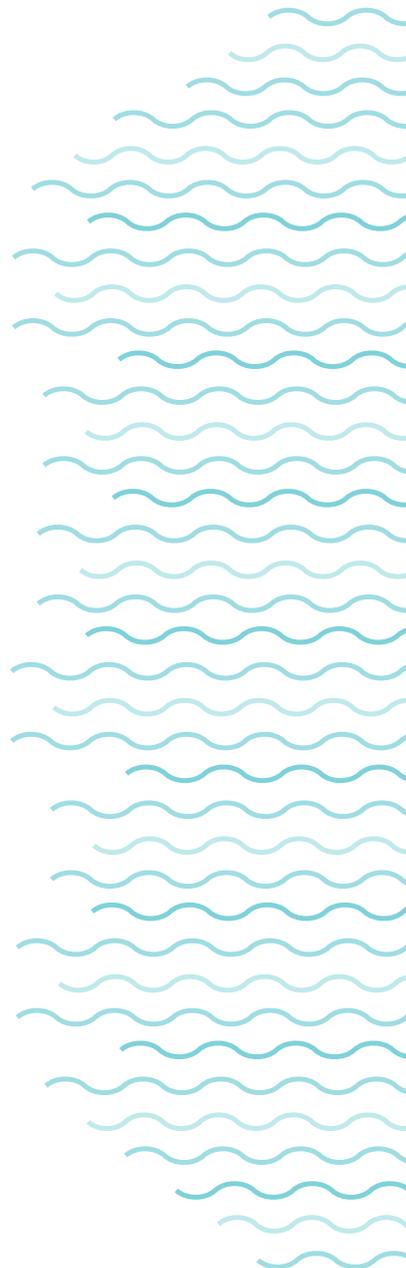


# Introduction

We are concerned that global climate change with increased summer temperatures can make Lactococcosis disease spread more and with a more severe impact in farms where the bacteria is already present.

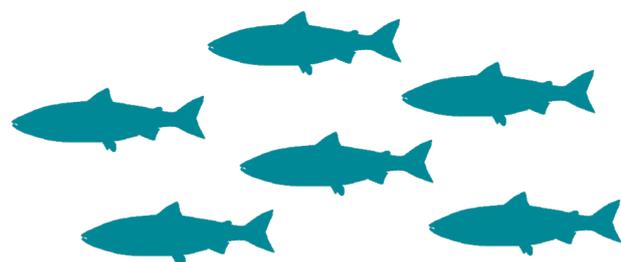
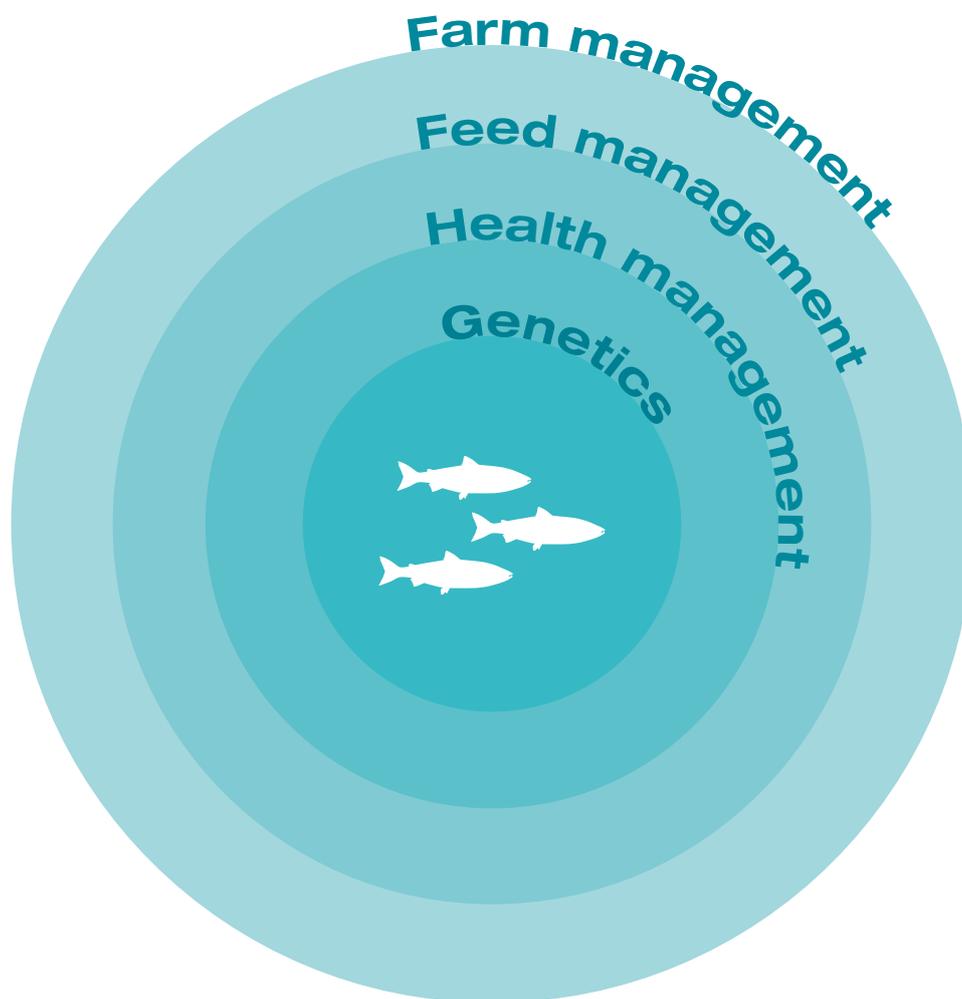
Currently the treatment for Lactococcosis involves the use of antibiotics, but to ensure its effectiveness in the coming years, we must minimise their use. Overuse of antibiotics accelerate antibiotic resistance, which means that the bacteria develop ability to survive the drugs designed to kill them. As a result, the medicines become ineffective, and infection persist in the fish and spread.

The fight against Lactococcosis should pass through alternative or complementary strategies to antibiotic therapy since the antibiotic erythromycin, the most commonly used antibiotic to treat Lactococcosis, is considered strategic for human health. On top of that, such a disease remains difficult to treat even with erythromycin, as relapses can rapidly occur after the end of a treatment.



Alternative strategies may be represented by:

- specific intraperitoneal vaccination
- functional feed aimed at supporting fish health
- management techniques to reduce stress
- if antibiotics are unavoidable never use antibiotics without testing resistance or sensitivity



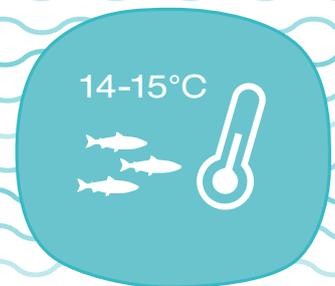
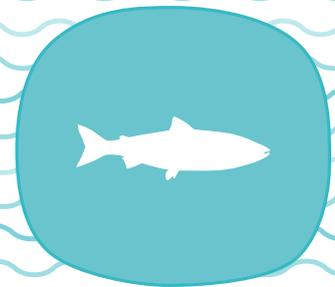


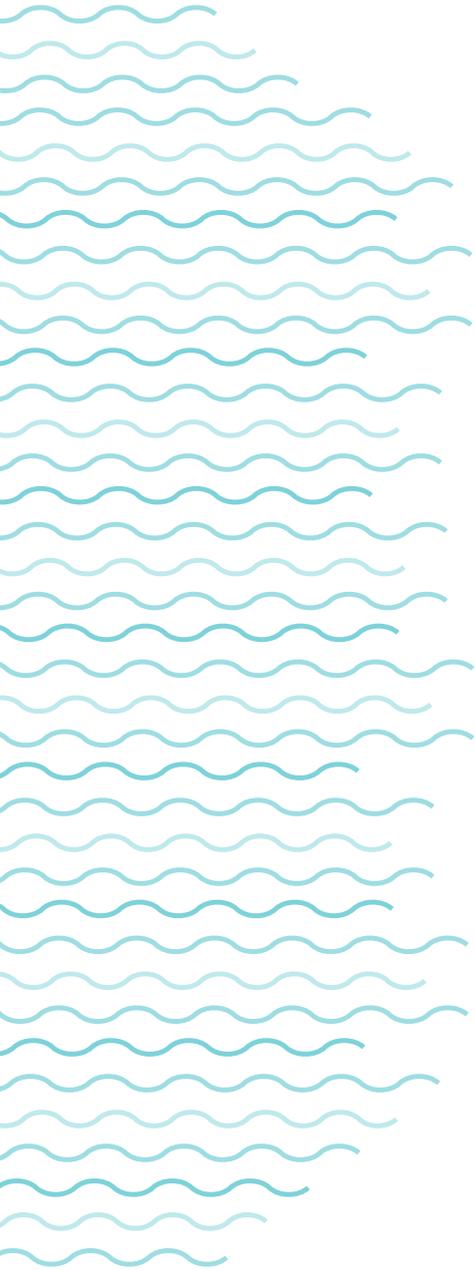
KNOW YOUR ENEMY:

# Lactococcosis

Lactococcosis is the term used to define a serious acute disease caused mainly by *Lactococcus garvieae*, which generally affects farmed Rainbow trout, especially during the summer period and at temperatures above 14-15°C. Based on field observations of natural outbreaks, it is clear that outbreaks are mainly observed in trout weighing more than 100 g.

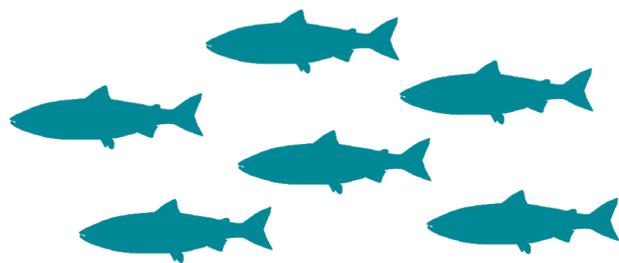
Other species of *Lactococcus* are emerging in fish: *L. garvieae* remains the main one in some countries, but *L. petauri* is spreading in other ones. *Lactococcus* causes issues in both saltwater and freshwater, cases of Lactococcosis have also been reported in marine fish.





*L.garvieae* is a spheroid bacterium that tests positive for Gram positive stain. It has high pathogenic power, expressed by the presence of a capsule and exotoxins. It causes a generalized infection (septicemia) that affects all organs, even crossing reaching the brain, thus causing the obvious swelling of the eyes (exophthalmos). The bacteria can hide from the immune system and cause inflammation of the nervous system. Infected fish may also show no signs of infection depending on several factors.

The disease has an acute onset and causes severe mortality, especially in high temperatures.





## KNOW YOUR ENEMY:

# How to recognise the disease



Typical visible signs in the farm, initially only in some individuals, are:

- darkening of the skin (hyper melanosis)
- bulging of the eyes (exophthalmos)
- breathing difficulties (hyperventilation)
- loss of appetite
- look tired (lethargy)
- loss of orientation and erratic swimming
- bleeding around the eye, at the base of the fins, the perianal region, the gill cover, and the mouth

The most frequent necropsy lesions are represented by:

- hemorrhages, particularly evident on the swim bladder and liver
- thickening of the swim bladder wall
- absence of food in the digestive tract
- increase of mucus in the digestive tract
- eye lesions





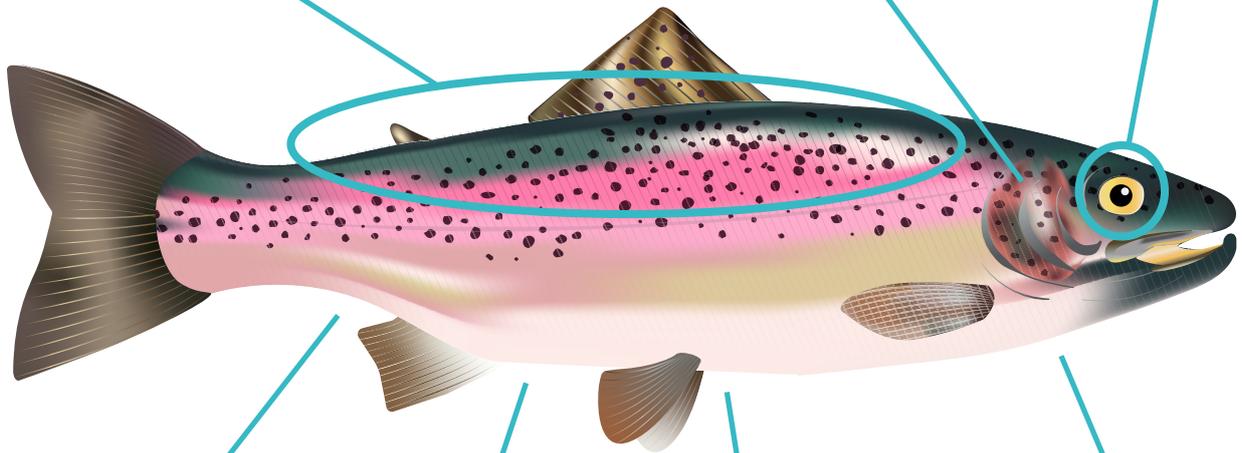
**HYPERVERTILATION**



**HYPER MELANOSIS**



**EXOPHTHALMOS**



**BLEEDING**



**LETHARGY**



**ERRATIC SWIMMING**



**INAPPETENCE**



KNOW YOUR ENEMY:

## How it spreads

The spread of the disease can occur through infected fish, both sick and healthy carriers, and contaminated water or equipment.



### INFECTED FISH

A sick fish continuously releases millions of bacteria into the environment, which can infect other fish in the same tank or in downstream tanks. In low temperatures the bacteria have the ability to infect the brain and eye, districts that are not normally reached by circulating antibodies, facilitate the onset of 'healthy carrier' status. The healthy carrier is infected but asymptomatic and can become ill when subjected to stress (thermal, managerial, physiological). This is the most frequent methods of introducing the pathogen. The bacteria can also spread from infected broodstock to their offsprings or from other species\*. Through the water from infected fish to healthy. Specially if the fish has lesions, or via the fecal-oral route.

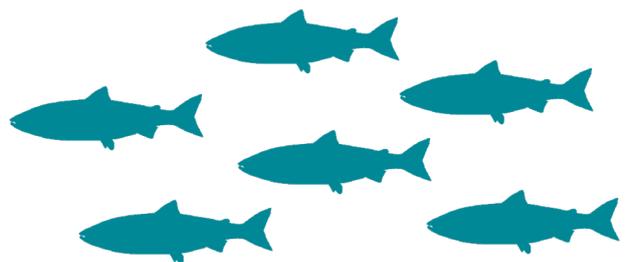
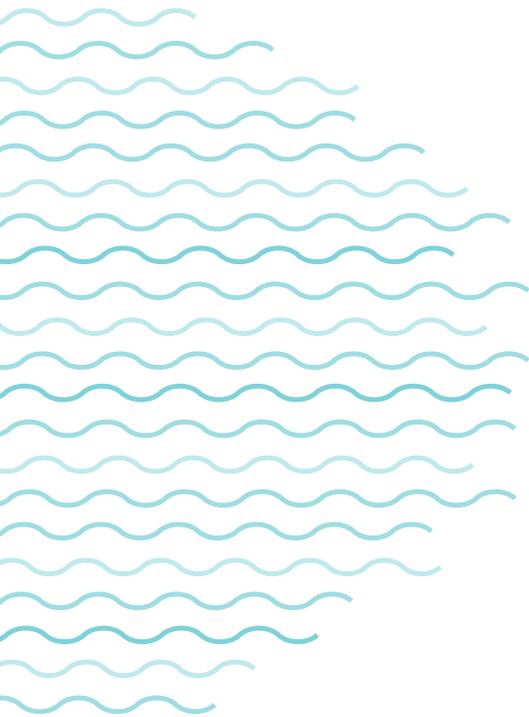
\*Khalil et al. *Aquaculture*, Vol. 580, Part 2, 2024, 740363, ISSN 0044-8486, <https://doi.org/10.1016/j.aquaculture.2023.740363>.



## CONTAMINATED WATER OR EQUIPMENT

Water contaminated by the secretions of sick fish acts as a vector to fish reared further downstream. Mud, silt, droppings, algae and moss on the bottom or walls of rearing ponds can provide shelter for the bacterium while waiting to encounter new individuals to infect.

Transport trucks that were not properly cleaned and disinfected can spread the bacteria. Nets, bucket and boots can also spread the bacteria, but in practice that is not so common\*.



\*Snyman et al. AHL Newsletter, 2020;24(4):15.  
<https://www.uoguelph.ca/ahl/lactococcosis-farmed-rainbow-trout>.



## How to fight Lactococcosis when it arises

Lactococcosis is a disease caused by a bacterium that can be treated by antibiotic therapy. But the severity of the disease is big and antibiotic is not sustainable in the long run due to risk of resistance. Moreover, there is a high risk of relapse after the end of treatment.

If antibiotics is the only option, it's crucial that the veterinarian choose the most suitable antibiotics. An antibiotic sensitivity test should always be carried out in order to select the correct antibiotics. The most sensitive antibiotics are normally oxytetracycline, doxycycline and erythromycin. Of these, only oxytetracycline has a registration for use in farmed fish, but it is not always effective in vivo. This is why there is a tendency to use other active ingredients 'by derogation', according to the rule of the authorization cascade. Erythromycin is the most widely used and historically effective molecule.

The growing spread of antibiotic resistance will lead in the years to come to the exclusion of use of certain antibiotics considered critically important for human health, including erythromycin. It will therefore become necessary to put all effort into preventing the disease. Furthermore, erythromycin isn't available in all countries either.





## How to prevent Lactococcosis

Disease prophylaxis, in light of the reduced use of antibiotics, becomes a key element of management strategies.

There are several actions a farm can implement to prevent Lactococcus. These include applying every precaution when handling fish, reducing stocking densities and, when possible, adding colder well water to surface water.



Sanitary measures of the water and sediment



Test fish and eggs by requiring health certificates even if it isn't a notifiable disease



Disinfecting surfaces and equipment if used in many ponds: disinfections means thorough cleaning of all surfaces and equipment followed by disinfection with disinfecting foam to remove biofilms and inactivate the bacteria

Vaccines are a key element in the disease prevention.

Immunisation by vaccines is the most effective prevention. It requires injecting a vaccine dose of inactivated bacteria, combined with a dose of adjuvant (immunostimulant) substance into the peritoneal cavity of fish kept fasted and properly anesthetized. There are products available with marketing authorization.

#### WHEN IS IT RECOMMENDED TO VACCINATE?

Vaccination should be typically carried out when the trout reach around 50 g in weight and the water temperature falls within the range of 12-14 °C.

#### WHAT IS THE EXPECTED DURATION OF PROTECTION AFTER VACCINATION?

3-4 months, but it can last longer if the fish are healthy when vaccinated. This is a limitation since the warm water period last longer. The vaccine effect may be reduced by stress, water shortage and other diseases.

#### WHO SHOULD PERFORM THE VACCINATION?

Trained personnel. Contact the vaccine company or your responsible veterinarian.

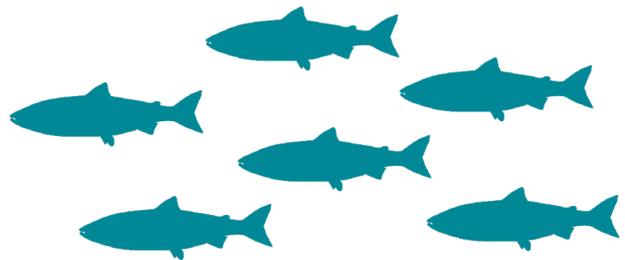
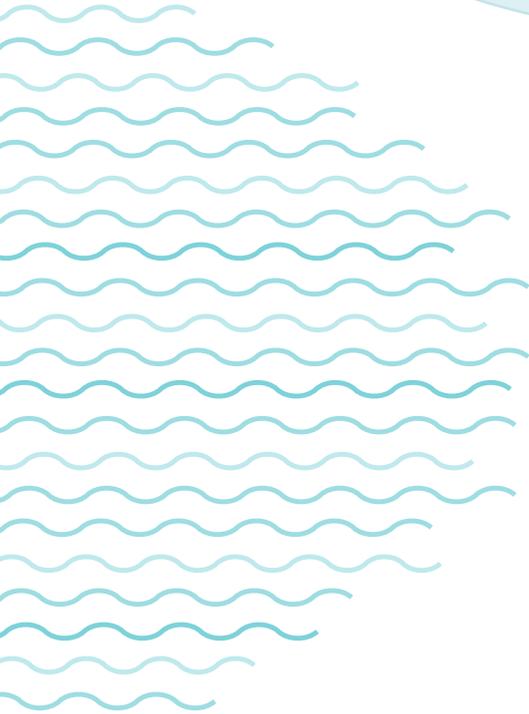
#### OTHER IMPORTANT THINGS TO BE AWARE OF:

It becomes strategic to monitor fish before, during and after vaccination, to be able to detect early signs of disease and intervene to limit damage. The fish should not be stressed before, during or after vaccination.





While no commercially available stock currently shows resistance to this pathogen, trout with enhanced disease resistance could be a promising medium-term solution. Several research groups are actively investigating this approach, and therefore it is likely that fish farmers will have access to strains genetically selected for Lactococcosis resistance in the coming years. This approach, combined with vaccination and optimized feed, could offer a synergistic defense strategy.\*

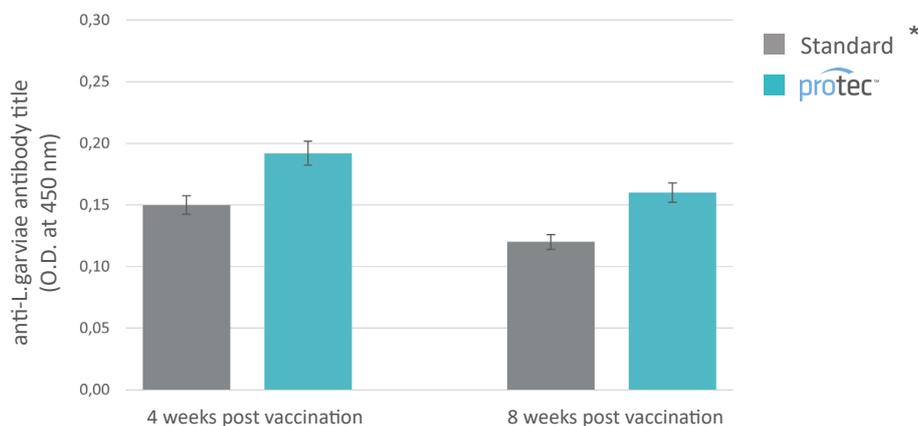
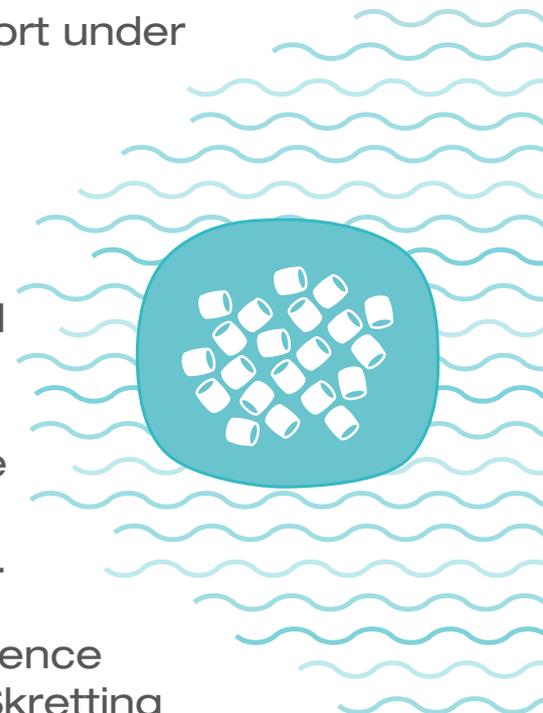


# An holist approach: NUTRITION

Nutrition is an essential component of any comprehensive strategy to support fish health and welfare. Precision nutrition ensures fish requirements are always covered so the animals are in the best possible conditions. In addition, functional feeds are available to provide fish with specific nutritional support under challenging conditions.

Temperature exceeding the comfort range is a stressful factor for fish, negatively impacting their welfare and their ability to face challenges. Functional nutrition can support fish under these unfavorable environmental conditions. Skretting recommends Optiline HT above 18°C to restore gut functionality, improve antioxidant status and oxygen availability.

Vaccination is a stressful event for fish, hence functional nutrition can support as well. Skretting recommends Protec from 30 days before vaccination to 15 days after, to improve immune response.



\*Bulfon et al. *Veterinary Immunology and Immunopathology*, Vol. 213, 2019, 109885, ISSN 0165-2427, <https://doi.org/10.1016/j.vetimm.2019.109885>.



## Summary

- The disease is severe and spread fast.
- Prevention is better than cure for Lactococcosis: include it in your farming management.  
Vaccines and disinfection measures are keys to prevention. Intraperitoneal vaccination is at present
- the most effective method to control Lactococcosis. The fish also have to be healthy when it's vaccinated.
- Cleaning and disinfection of surfaces and equipment is essential.
- Contact your veterinarian when you see the first symptoms of the disease.  
Genetic research is ongoing to develop trout with
- enhanced resistance to Lactococcosis, potentially available in the coming years.
- Feed advice: Use functional feeds like Protec and Optiline HT to support fish under stressful conditions.

With this Manual we aim to accelerate initiatives that reduce aquaculture's dependence on antibiotics through best practices and a proactive approach to health.

