Lactococcus in the Mediterranean: from identification to prevention.

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2026

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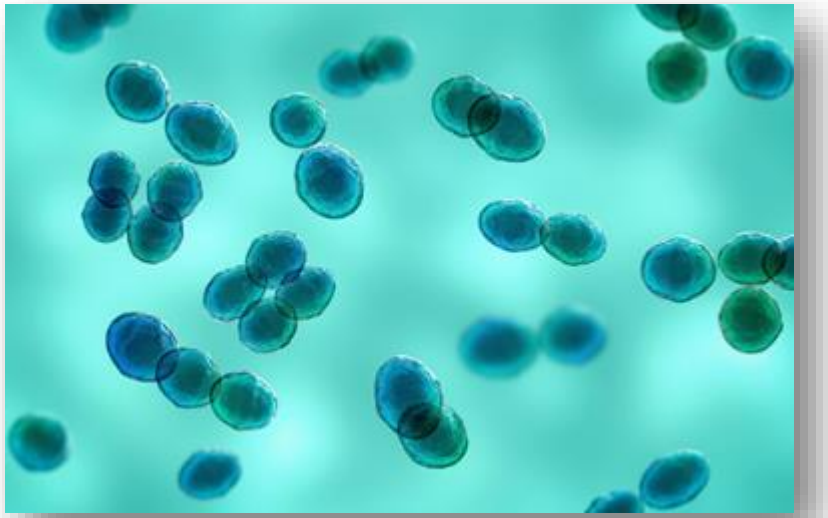
Why to talk about Lactococcosis in fish ?

LACTOCOCCOSIS

- Economic impact :
  - **above 80% mortality**
  - **Affects large fish (above 250 gr)**

- Different fish species (fresh water and marine)
- Warm water disease
  - > 18ºC Trout
  - > 25ºC Seabass

- **GLOBAL PREVALENCE**
- **EMERGENT DISEASE**

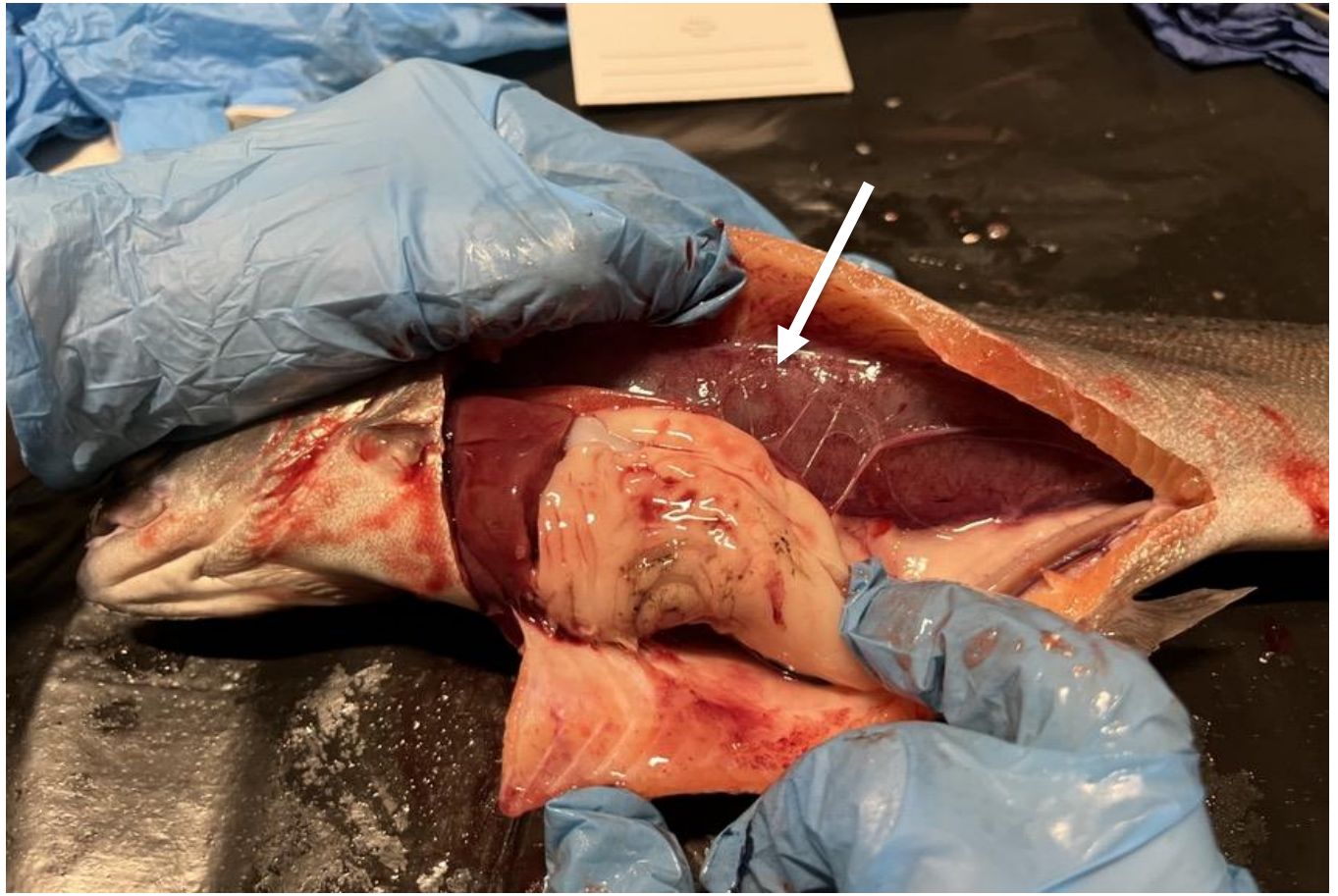


EXTERNAL CLINICAL SIGNS

- Darkening
- Lethargic

- Exophthalmia

INTERNAL CLINICAL SIGNS



TRANSMISSION

- **Water= vehicle of infection.** The transmission of the pathogen can occur between fish farmed in the upstream compartments of a system of canalizations, and fish located in downstream tanks.

- Rainbow trout sheds the agent in their **feces only 72 h after infection=**
  - **Rapid dissemination**

- Transmission through:
  - the entry of **new fish into the farm**
  - **from fish to fish**.

- Transmission **through migrating birds and other vectors** has been reported and is a cause for concern over dissemination into noninfected regions.

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The History of Lactococcosis

1983 JAPAN: “Enterococcus seriolicida”

Home › Current Microbiology › Article

Enterococcus seriolicida Is a Junior Synonym of *Lactococcus garvieae*, a Causative Agent of Septicemia and Meningoencephalitis in Fish

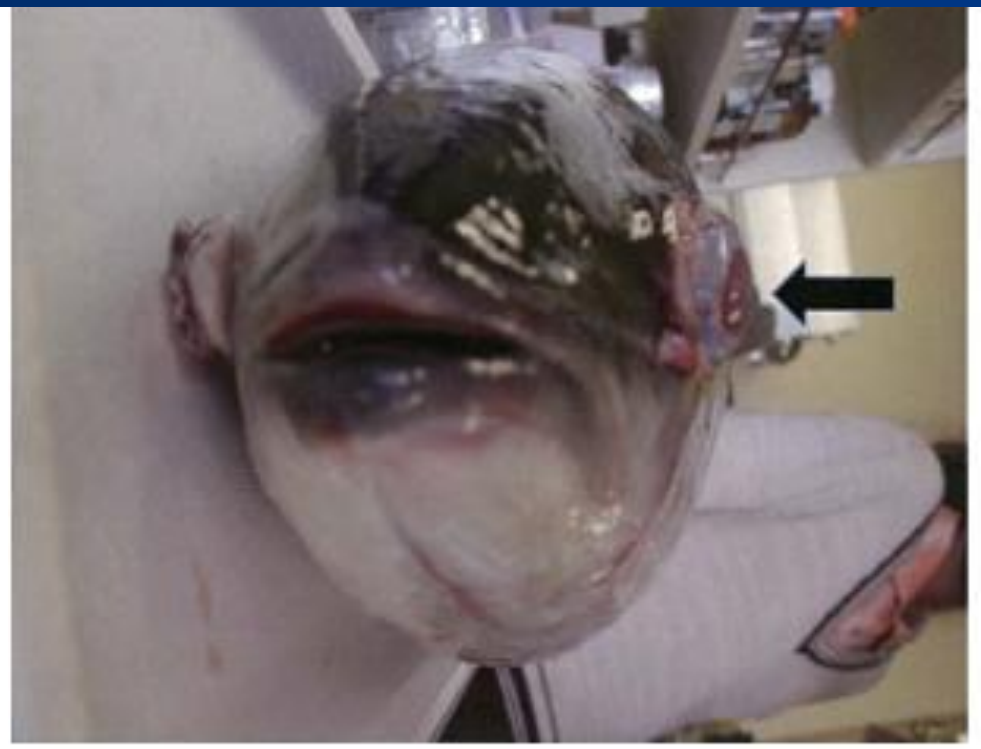
Published: February 1996

Volume 32, pages 85–88, (1996) Cite this article

Current Microbiology

Aims and scope →

Submit manuscript →



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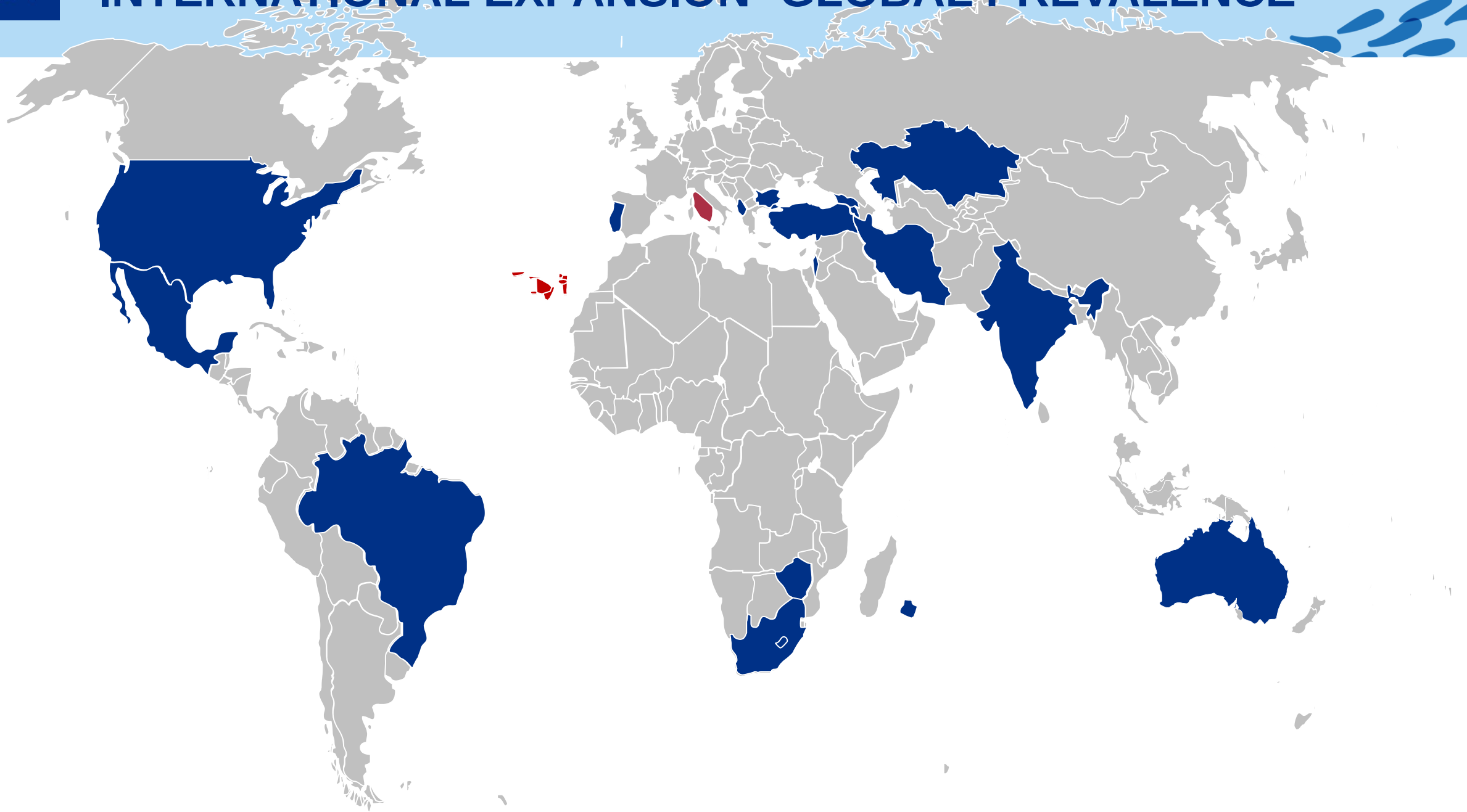
INTERNATIONAL EXPANSION- GLOBAL PREVALENCE



JUMP TO AMERICA IN 2020

The New York Times

CALIFORNIA TODAY

Strange Bacteria Are Attacking California's Trout Supply

Tuesday: When an infection was detected at a hatchery, officials, already under statewide shelter-in-place orders, moved to institute a lockdown of their own.

Share full article

By Will McCarthy

Sept. 29, 2020

AQUACULTURE BRASIL

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Notícias

Cultivo de Peixes 09 de Setembro de 2022 Aquaculture Brasil

LACTOCOCOSE: DOENÇA EMERGENTE NA TILAPICULTURA BRASILEIRA

OUTBREAKS IN SEABASS 2023

First outbreak reported:

- Summer 2023
- **Gulf of Follonica (Italy) Mediterraneum**
- 2-3% mortality
- 23-25ºC

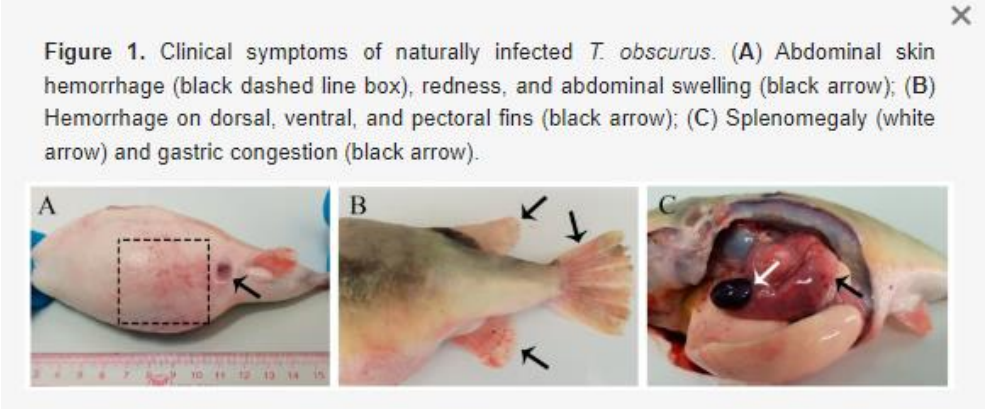
Canary Islands (Atlantic)

- **September /October 2023**
- 10-20% mortality
- Large Fish (above 350g)
- 21-22ºC

Other outbreaks in Italy and Med Spain (also seabream)

EMERGENT DISEASE

- Marine outbreaks controlled in Spain (vaccination)
- Outbreaks in farmed tuna in Malta
- Ongoing outbreaks in seabass and seabream in Italy
- Cases in pufferfish in China
- Cases in turbot in Turkey



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What about *Lactococcus petauri*?

NEW SPECIES- SAME PROBLEMS

- **From 1980´s until 2016:** *Lactococcus garvieae* was considered solely responsible for lactococcosis in fish.

- ***2017:*** L. petauri was proposed as a new species
  - Shares 99.9% genetic identity with *L. garvieae***.**
  - It was recognized as a pathogen in fish in 2020.

- Advances in molecular biology have revealed:
  - *Lactococcus petauri,* has been behind many outbreaks without being detected
  - *L. garvieae* and *L. petauri* **have coexisted historically.**
  - **Clincally identical**
  - **60.4% of isolates historically classified as *L. garvieae* are actually *L. petauri (trout)***

HIPRA´s LACTOCCOCUS STRAIN LIBRARY

FISH SPECIES	Origen	YEAR	ORIGINAL ID
TROUT	SouthAfrica	2021	GA
TROUT	SouthAfrica	2021	GA
TROUT	SouthAfrica	2021	GA
TROUT	SPAIN	1997	GA
TROUT	SPAIN	2011	GA
TROUT	SPAIN	2017	GA
TROUT	SPAIN	2022	GA
TROUT	SPAIN	2023	GA
TROUT	SPAIN	2024	GA
TROUT	GREECE	2022	GA
TROUT	ITALY	2018	GA
TROUT	ITALY	2021	GA
TROUT	ITALY	2023	GA
TROUT	ITALY	2021	GA

L. PETAURI

L. PETAURI

L. GARVIEAE

FISH SPECIES	Origen	YEAR	ORIGINAL ID
SEABASS	ITALY	2023	GA
SEABREAM	ITALY	2023	GA
SEABASS	SPAIN	2023	GA
SEABASS	SPAIN	2023	GA
SEABASS	SPAIN	2023	GA
SEABASS	SPAIN	2024	GA

L. GARVIEAE

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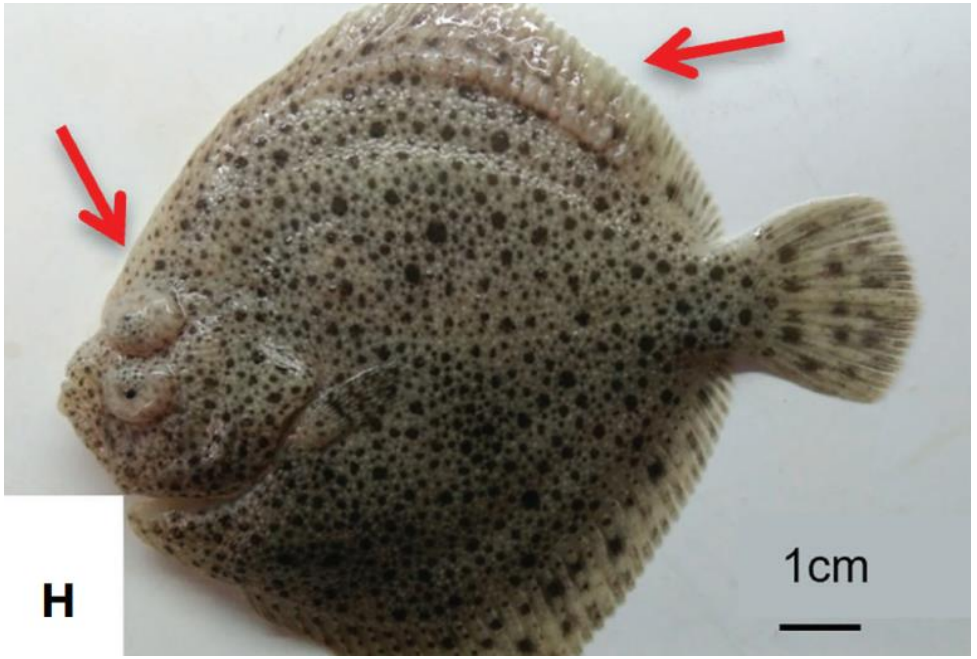
From identification to prevention:

Vaccination against LACTOCOCCOSIS works

VACCINATION AGAINST OTHER STREPTS.

TURBOT

Streptococcus parauberis in turbot.



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Safety and efficacy of an inactivated vaccine against *Lactococcus garvieae* in rainbow trout (*Oncorhynchus mykiss*)

Vendrell D, Balcázar JL, Ruiz-Zarzuela I, de Blas I, Gironés O, Múzquiz JL
Preventive Veterinary Medicine. 2007; 80:222-9

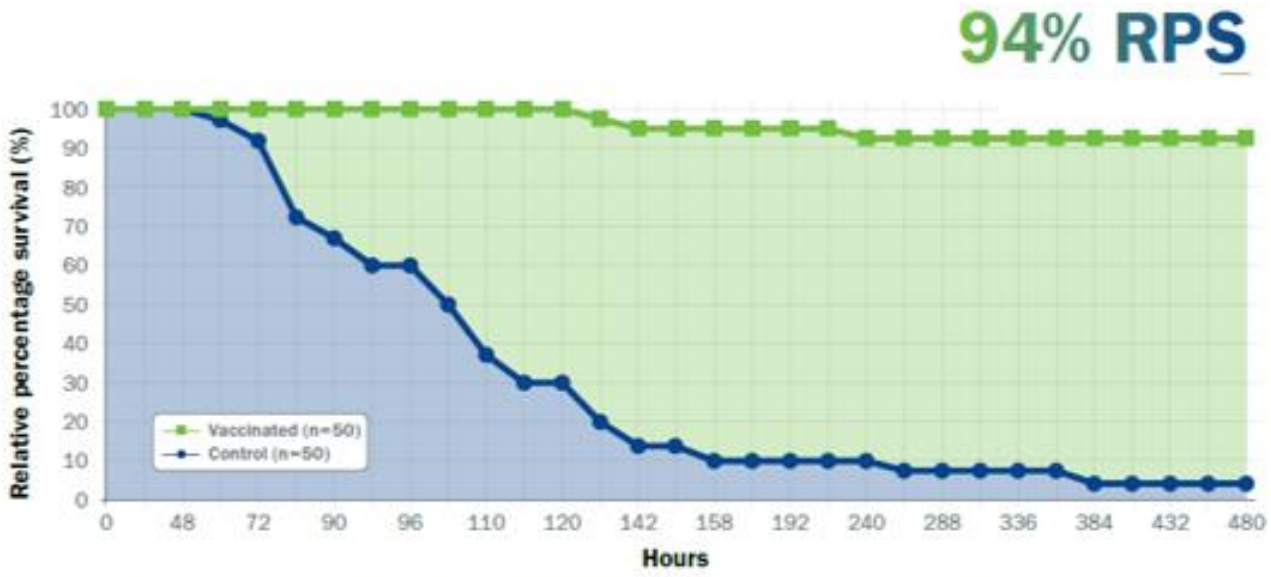
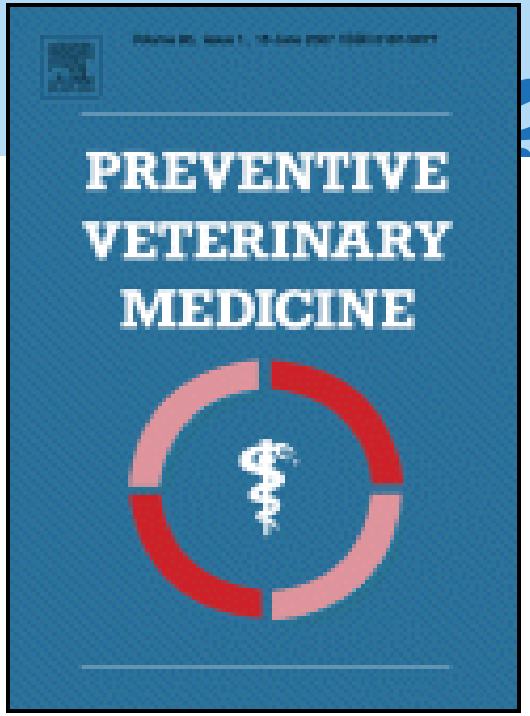


Fig. 1.
Mortality of rainbow trout during an infection-challenge experiment initiated 1 month after intraperitoneal vaccination against *L. garvieae* (D. Vendrell et al. Preventive Veterinary Medicine 80 (2007) 222–229.)



Field : outbreaks of disease in vaccinated fish

Different serotypes?
Lack of crossprotection?

STUDY AIMS

To assess **the cross-protection efficacy of a commercial vaccine** against diverse strains of *Lactococcus garvieae* in rainbow trout across **different geographic locations.**

Early 2023

HIPRA

AQUA FARM

ainst geographically different strains of lactococcus garvieae in rainbow trout *(Oncorhynchus mykiss)*

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Introduction

ICTHIOVAC® LG is a vaccine designed to protect rainbow trout from 20g onwards, against *Lactococcus garvieae* (LG).
Lactococcus garvieae, a pathogen with a significant impact on various fish species, exhibits a global presence with diverse strains highlighting a possible discernible variation in virulence.
This study was designed to assess the cross-protection efficacy of ICTHIOVAC® LG against diverse strains of *Lactococcus garvieae* in rainbow trout across different geographic locations.

Materials and methods

Unvaccinated rainbow trout (*Oncorhynchus mykiss*) of 20 g were purchased from a high health status commercial source. These were housed in an experimental facility and grown up to 25.5 g. Animals were allocated in tanks of 200 l of freshwater at 15 ± 1 ºC during the vaccination period and 18 ± 1 ºC during the period following the experimental infections. Animals were divided into 8 groups of 30 animals each and 1 sentinel group of 15 animals (unvaccinated / unchallenged).

Following anaesthesia and in accordance with the manufacturer's specifications, ICTHIOVAC® LG was intraperitoneally administered at a dose of 0.1 ml per fish. Twenty-eight days post-vaccination, the animals underwent intraperitoneal challenge at an average weight of 28.05 g. Clinical signs and mortality were followed twice a day for 21 days post infection. The Relative Percentage of Survival (RPS) was calculated for each tested vaccine. The statistical comparison between groups were performed by chi-square with Yate's correction implemented in SPSS® (IBM). The significance level was set 5%. Moreover, clinical signs were compared using the estimation of the area under the curve (AUC).

Results

The vaccinated groups exhibited a statistically significant ($p<0.05$) reduction in mortality compared to the placebo groups at the conclusion of the trial, as illustrated in Figure 1.

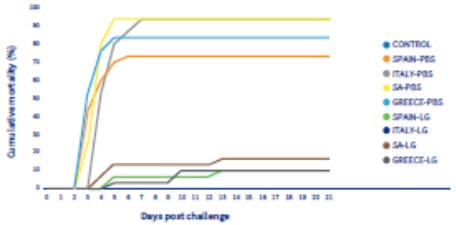


Fig 1. Cumulative mortality produced by different strains of LG infection after vaccination. Differences between control group and vaccinated group is significant ($p<0.05$) in all the challenges.

These findings substantiate that all vaccinated groups achieved a relative percent survival (RPS) exceeding 85 %, as detailed in Table 1.

Group	Strain	Dose CFU/ml	Mortality PBS	Mortality ICTHIOVAC® LG	RPS
A	LG-4440 (Spain)	3.72 x 10⁸	29/30 (96.7%)	3/30 (10.0%)	90.9%
B	LG-8558 (Italy)	2.12 x 10⁸	28/30 (93.3%)	0/30 (0.0%)	100%
C	LG-9619 (South Africa)	2.77 x 10⁸	28/30 (93.3%)	5/30 (16.6%)	85.7%
D	LG-9664 (Greece)	3.48 x 10⁸	25/30 (83.3%)	3/30 (10.0%)	96.0%

Table 1. Treatments administration dose and results

Considering the administered doses of the various challenge strains (Table 1), it is apparent that the Italy strain is likely the most virulent in comparison to the other strains. This inference is drawn from the observation that a lower concentration was required to achieve equivalent mortality rates.

Furthermore, general clinical signs were noted throughout the challenge period, and a discernible reduction in these signs was observed in the vaccinated groups (Fig. 2).

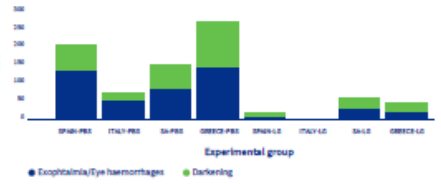


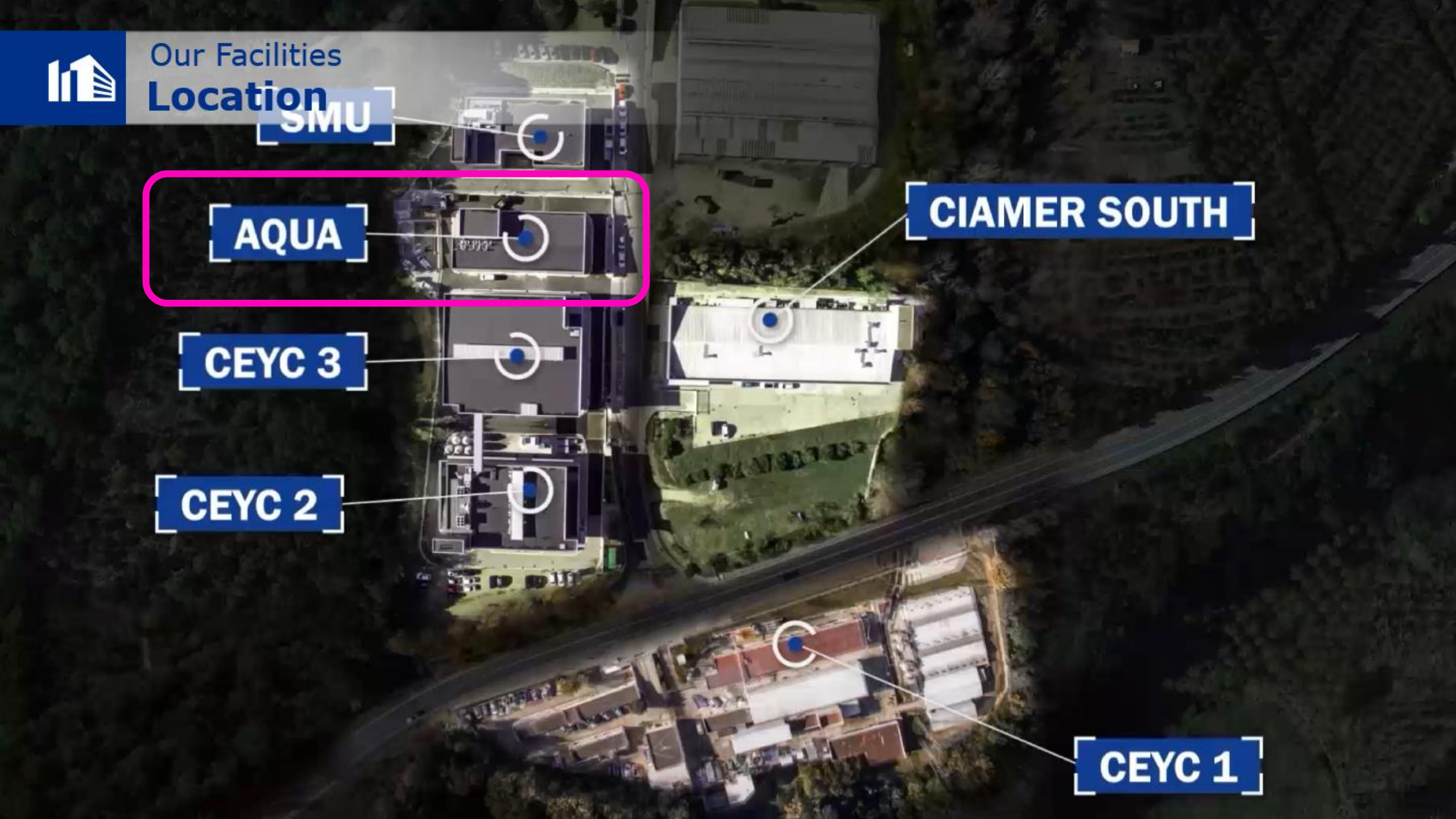
Fig 2. Clinical signs produced by the infection with LG. The AUC quantify the clinical sign observed in each group throughout the entire post infection period. Bolded numbers indicate the proportional reduction of the AUC compared to group 1.

Discussion and conclusions

This study demonstrated that ICTHIOVAC® LG reduces mortality against all the used LG strains, despite they were isolated from different origins such as Italy, Spain, Greece, and South Africa. Notably, the RPS observed in all challenges was higher than 85%. In addition, and very importantly, ICTHIOVAC® LG reduces the clinical signs in all vaccinated groups.

In conclusion, these findings have practical implications for aquaculture health management, emphasizing the vaccine's potential as a versatile control tool against *Lactococcus garvieae* outbreaks in diverse geographic settings.

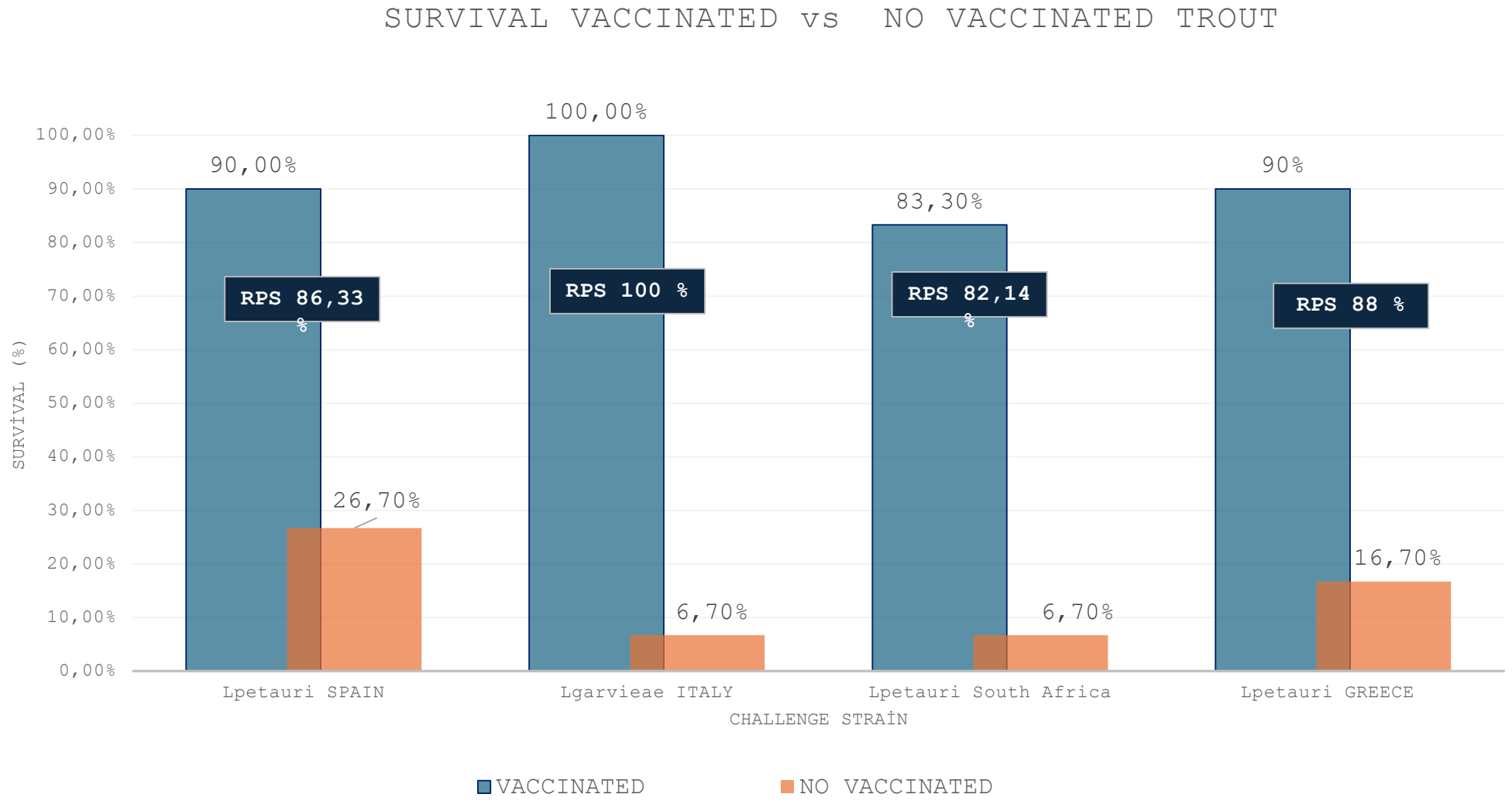
STUDY DESIGN


Our Facilities
Location
SMU
AQUA
CEYC 3
CEYC 2
CIAMER SOUTH
CEYC 1

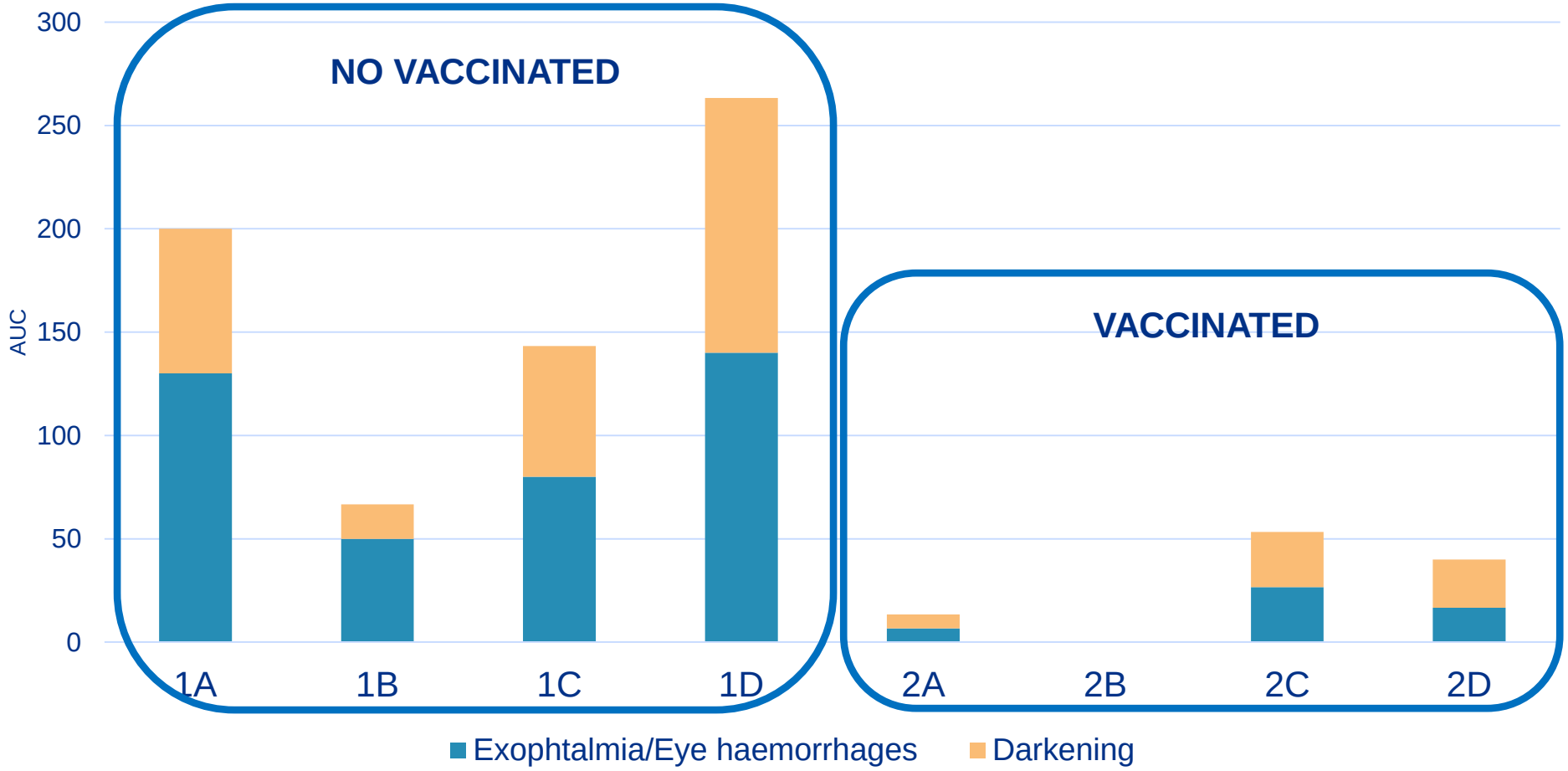
EXPERIMENTAL GROUPS

Group	Vaccination program	No. Animals	Subgroup	Challenge program	Animals
1	No vaccinated	120	1.A	Spanish strain (PETAURI)	30
			1.B	Italian strain (GARVIEAE)	30
			1.C	African strain (PETAURI *)	30
			1.D	Greek strain (PETAURI)	30
2	Registered vaccine (19,8 gr)	120	2.A	Spanish strain (PETAURI)	30
			2.B	Italian strain (GARVIEAE)	30
			2.C	African strain (PETAURI *)	30
			2.D	African strain (PETAURI *)	30

CROSS PROTECTION RESULTS



CLINICAL SIGNS



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To assess **the cross-protection efficacy of a commercial vaccine** against *Lactococcus garvieae* in SEABASS

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22nd International Conference on Diseases of Fish and Shellfish 2025

CROSS-SPECIES PROTECTION: A COMERCIAL TROUT VACCINE PROTECTS *DICENTRARCHUS LABRAX*, EUROPEAN SEABASS, AGAINST *LACTOCOCCUS GARVIEAE* STRAINS ISOLATED FROM SEAWATER OUTBREAKS

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INTRODUCTION

Lactococcus garvieae can infect a wide range of farmed and wild fish species, in both fresh and salt water. Recent outbreaks in European seabass (*Dicentrarchus labrax*) farmed in Italy (Salogni et al., 2024) and Spain have raised concerns due to the lack of registered vaccines for this species and limited data on the efficacy of autogenous vaccines.

The objective of this study was to evaluate the efficacy of an inactivated vaccine indicated for trout in protecting seabass against an experimental challenge with *Lactococcus garvieae* (LG).

MATERIALS & METHODS

Seabass fingerlings, averaging 16.11 g, were housed in a controlled saltwater recirculation system maintained at 24 ºC. The fish were randomly divided into 2 groups of 50 each. One group was vaccinated with ICTHIOVAC® LG, a commercial adjuvanted vaccine indicated for trout. The other group (PLACEBO) was injected with PBS. Both treatments were administered by an intraperitoneal injection previous anaesthesia and with a dose of 0.1 ml. LG isolated from an outbreak in seabass in Spain was used for the study. The challenge was performed 28 days post vaccination by intraperitoneal injection of 1.35×10^8 CFU, previous anaesthesia. The health status of the fish was monitored for 21 days. The comparison between the two groups survival curves was performed by Gehan-Breslow-Wilcoxon test (GraphPad).

RESULTS

The infection of the PLACEBO group with LG produced 89.90% of mortality which was mainly observed between 1 and 9 days post infection. In contrast, ICTHIOVAC® LG showed 27.08 % of mortality corresponding to a Relative Percentage of Survival of 69.84 %. The differences between the survival curves of the two groups were statistically significant (Gehan-Breslow-Wilcoxon test; $p<0.05$) (Fig. 1).

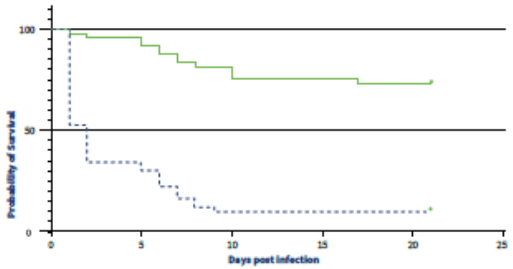


Figure 1. Survival curve (Kaplan-Meier) after infection. The dotted line represents PLACEBO group (n=49) and the continuous line represents ICTHIOVAC® LG vaccinated group (n=48).

DISCUSSION AND CONCLUSIONS

The results of the PLACEBO group indicated that LG was able to infect seabass under experimental conditions reproducing a mortality superior to the minimum percentage required by the European Pharmacopoeia to validate vaccines efficacy testing (60 %). LG infection has been reported in field in both juvenile and adults; moreover, the disease has been previously reproduced experimentally by other authors (Akali et al. 2022). However, this is the first study demonstrating experimentally the ability of LG to infect juvenile seabass.

The studied vaccine demonstrated to reduce the mortality caused by LG in seabass. To our knowledge, this is the first study providing such evidence in seabass. ICTHIOVAC® LG is a vaccine registered in specific European countries which offers several advantages over autogenous vaccines in terms of availability and quality controls. Notably, the vaccine demonstrated protective efficacy even under elevated water temperatures during the vaccination period, suggesting its suitability for use in challenging fish rearing conditions.

The LG strain used for the infection was isolated from an outbreak detected recently in seabass. Given the fact that the vaccine is based on trout-derived strains, its efficacy in seabass indicates that cross-species transmission has not led to antigenic variation in *Lactococcus garvieae* that would compromise vaccine effectiveness.

REFERENCIAS

Akali, T.; Çiğdem, Ü.; Göken, Z. Pathological aspects of experimental infection of Lactococcus garvieae in European Sea Bass (Dicentrarchus labrax L.): Clinical, hematological, and histopathological parameters. Aquat. Res. 2022, 5, 219–229.

Salogni, C.; Bertasio, C.; Accini, A.; Gibelli, L.R.; Pigoli, C.; Susini, F.; Podavini, E.; Scali, F.; Varisco, G.; Alborali, G.L. The Characterisation of Lactococcus garvieae Isolated in an Outbreak of Septicaemic Disease in Farmed Sea Bass (Dicentrarchus labrax, Linnaues 1758) in Italy. Pathogens 2024, 13, 49. https://doi.org/10.3390/pathogens13010049.

STUDY DESIGN

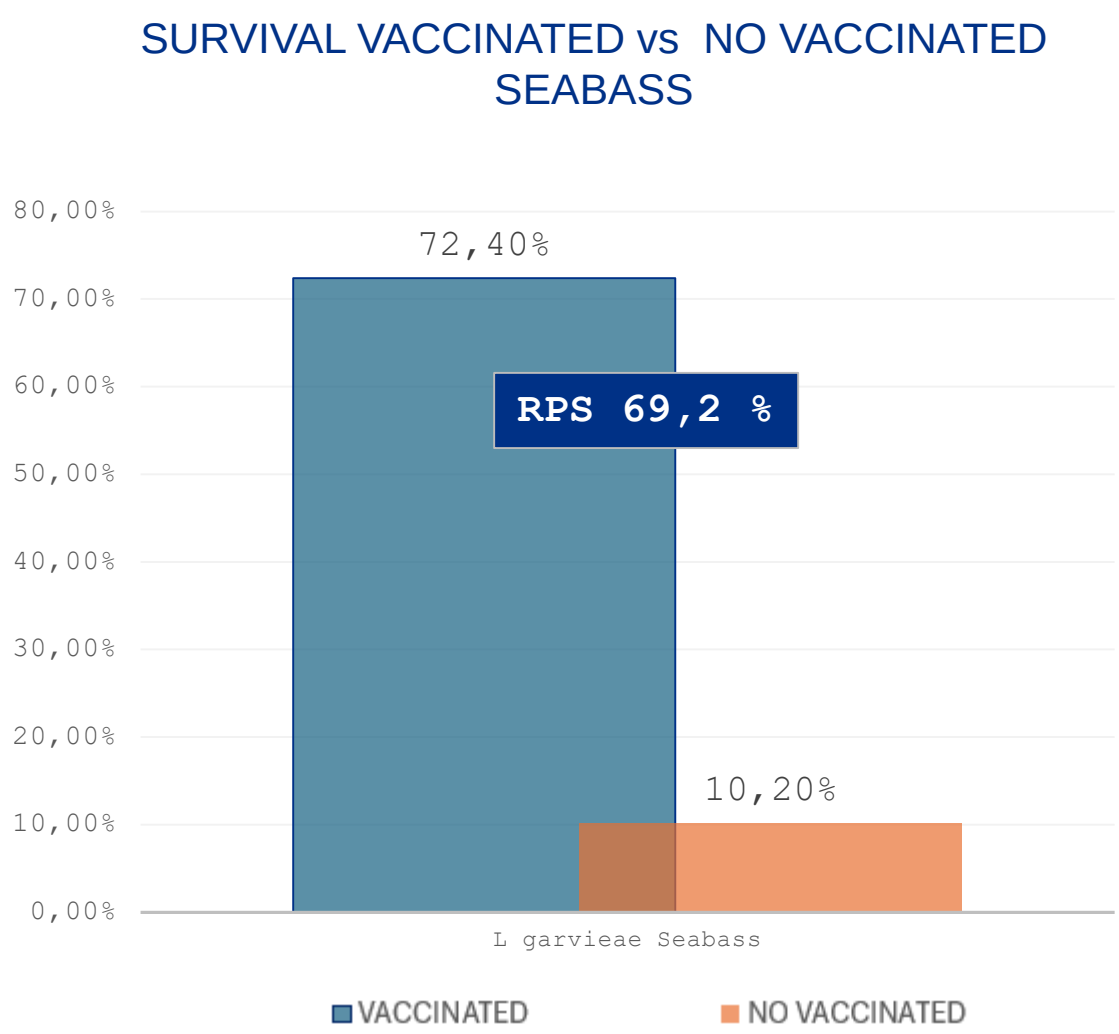
Group	Nº fish	Vaccination plan	Challenge
A	50	VACCINATED with Registered product for trout	Lactococcus garvieae 9949
B	50	NO VACCINATED	
C	19	VACCINATED with Registered product	PBS

Fish:
Seabass 16.11 ± 1.83 g at vaccination

Water temperature: 25 ºC

Challenge:
28 days post vaccination; 23.2-26.46 g
LG strain: B9949 (Seabass outbreak in Spain, 2023)
Dose: $1.35x10^8$ CFU/fish ($1.35x10^9$ CFU/ml)
Intraperitoneal route

CHALLENGE RESULTS



Conclusions:

- EMERGENT: Lactococcocis has expanded in the las 6 years
- Potentially can affect any fish species
- Lactococcus garvieae and petauri have similar clinical signs
- **Prevention is possible**
- Available comercial vaccine offers **cross protection** against *L. garvieae* and *L. petauri* isolated from:
    - Different geographical areas/ countries
    - Different fish species

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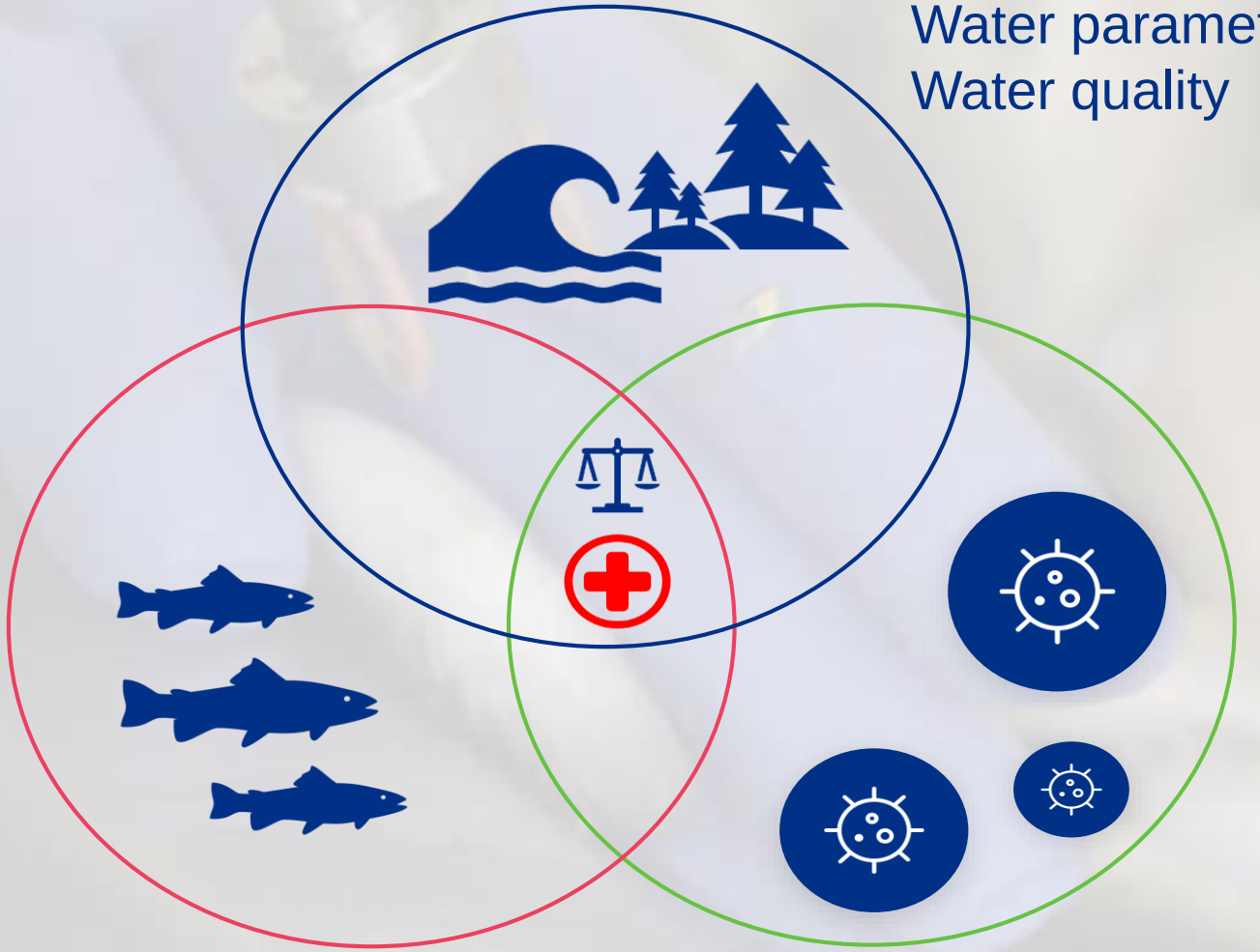
HEALTH, PREVENTION AND BALANCE

Water parameters
Water quality

Genetics
Welfare
Nutrition
Management
VACCINATION



Biosecurity

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THANKS