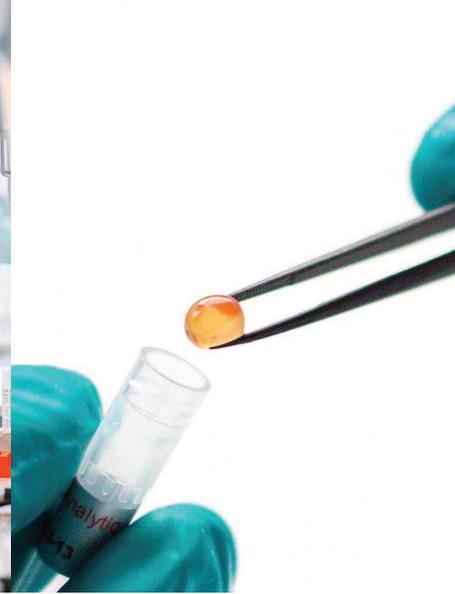


**PHARMAQ**  
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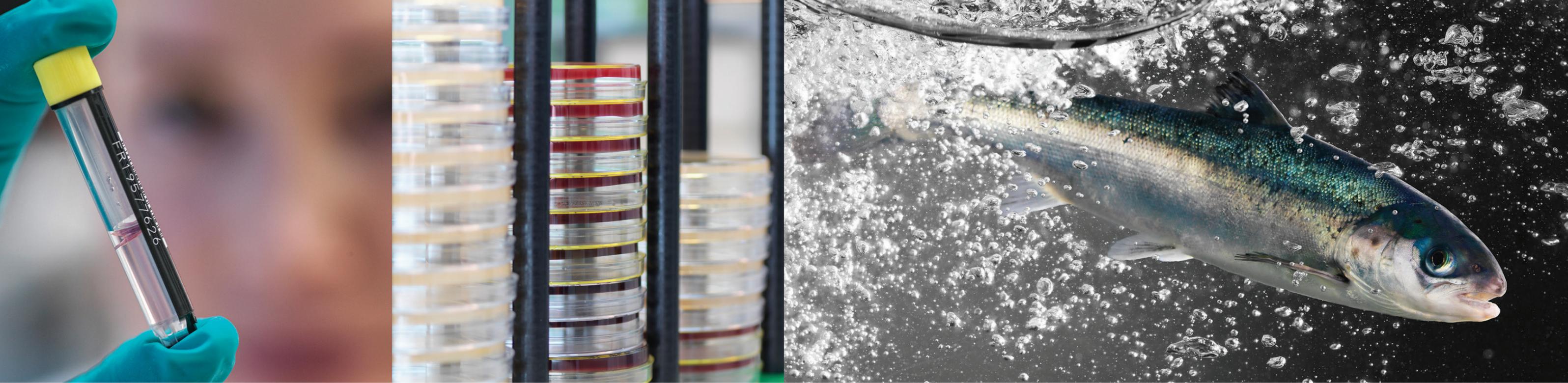


ANALYTICAL AND ADVISORY SERVICES

# Advancing care for fish



**zoetis**



# PHARMAQ

Analytiq

To nurture our world and humankind we work hard to advancing care for fish. We are proud to provide research-based targeted analysis and advice for better fish health and fish welfare. We operate from laboratories in Bergen, Oslo, Rørvik, Inverness, Galway and Puerto Montt and are part of Zoetis - a world-leading company in animal health. Our highly qualified personnel use modern methods to provide analysis for the detection of disease conditions, smoltification status, sex sorting and maturation monitoring, environmental services, veterinary services, as well as training and consultancy. The breadth of our services provides fish health personnel with the best possible knowledge base for managing the fish for which they are responsible.



## SmoltVision

SmoltVision is a Real-Time RT-PCR analysis tool that helps determine when young salmon enter smoltification (the process whereby juvenile salmon in freshwater prepare and adapt to a life in seawater), and thus the optimal timing for their transfer to sea.

SmoltVision measures the expression of three genes that play an important role in the gills of salmon during smoltification. By distinguishing between the genetic regulation of freshwater ATPase and seawater ATPase, the tool provides an early indication of what stage the fish is moving into prior to active enzyme being present in the gills.

SmoltVision is thus a predictor of physiological changes to come, rather than a reporter on them as they happen.

In addition to fresh and seawater ATPase, SmoltVision also monitors the expression of a gene which can reveal underlying factors that may affect the smoltification process, such as disease, gill parasites and problems with water quality. The same samples used in Smoltvision analysis can also be used to screen for pathogens – thereby saving you time and the need to take additional samples.

The SmoltVision services are offered from our laboratories in Bergen, Rørvik and Puerto Montt, and through collaborator laboratory in Canada.



## Real-Time RT-PCR

We use Real-Time RT-PCR, a molecular tool, to detect known viruses, bacteria and parasites in your samples. Molecular data of this type is often used in combination with histological investigations and microbiology. Together, these data aid in the risk assessment of pathogen spread and determination of the presence of house strains. Accurate and timely data on gill and heart health can be very useful in informing decisions about planning treatments. Continual monitoring of stock health facilitates early interventions should they be required.

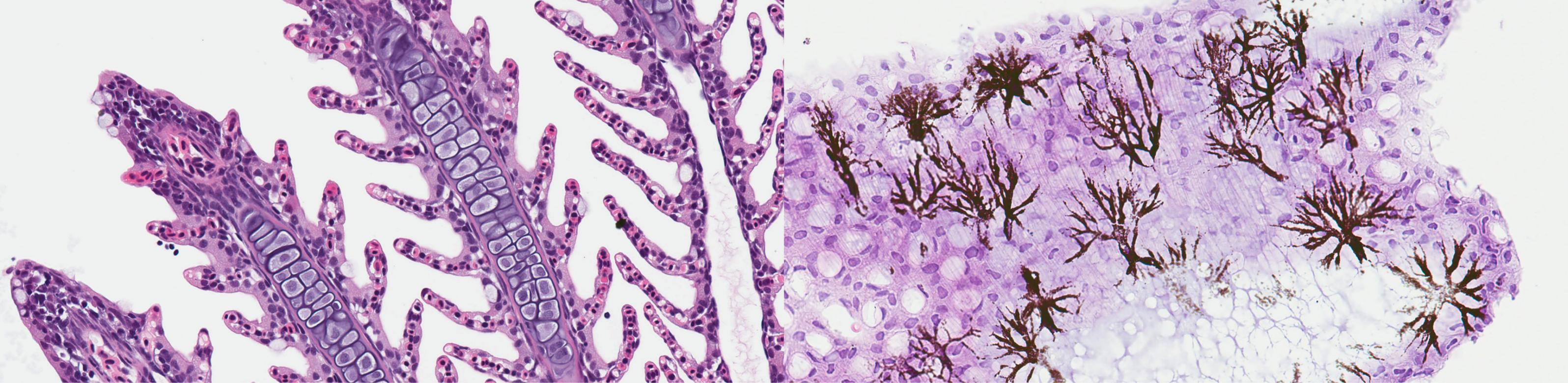
We provide Real-Time RT-PCR analyses for all known salmon, rainbow trout and lumpfish pathogens. In addition, we have developed assays for key pathogens known to infect sea bass, sea bream and tilapia. We are also constantly adding to our suite of analyses in response to and in cooperation with customers and their requirements.

The Real-Time RT-PCR services are offered from all our locations.

## Microbiology

At the microbiology laboratory we apply classical microbiology and molecular techniques for identification of the most common bacterial pathogens of farmed fish. Our services also include antimicrobial susceptibility testing, as well as water- and environmental analyses for monitoring of microbiota at RAS-facilities and flow through systems.

The full service spectrum is offered from our location in Bergen, Norway, and parts of the service are offered from the other locations.



# Histopathology

We are proud to offer histopathology, the microscopic examination of disease-related changes in thin tissue sections.

The method is considered to be a cornerstone of fish diagnostics. These days, histopathology is often combined with innovative Real-Time RT-PCR and microbiology in order to ascertain the cause and impact of diseases in the fish.

## Why use histopathology?

Health challenges in the aquaculture industry can often be multifactorial. By examining the tissue response of the fish in combination with detection of possible infectious agents – we can better understand the aetiology of the condition under investigation.

This method can be used to detect both infectious and non-infectious diseases. Additionally, we can assess the degree and duration of potential tissue damage. For some diseases, such as heart- and muscle inflammation (HSMI) and cardiomyopathy syndrome (CMS), histopathology is the most useful method for assessment of extent of tissue damage and diagnosis. Histopathology is also pivotal for detecting emerging diseases.

By combining Real-Time RT-PCR, microbiology and histopathology, we can not only assess the impact of the disease, but also increase the likelihood of establishing the cause.

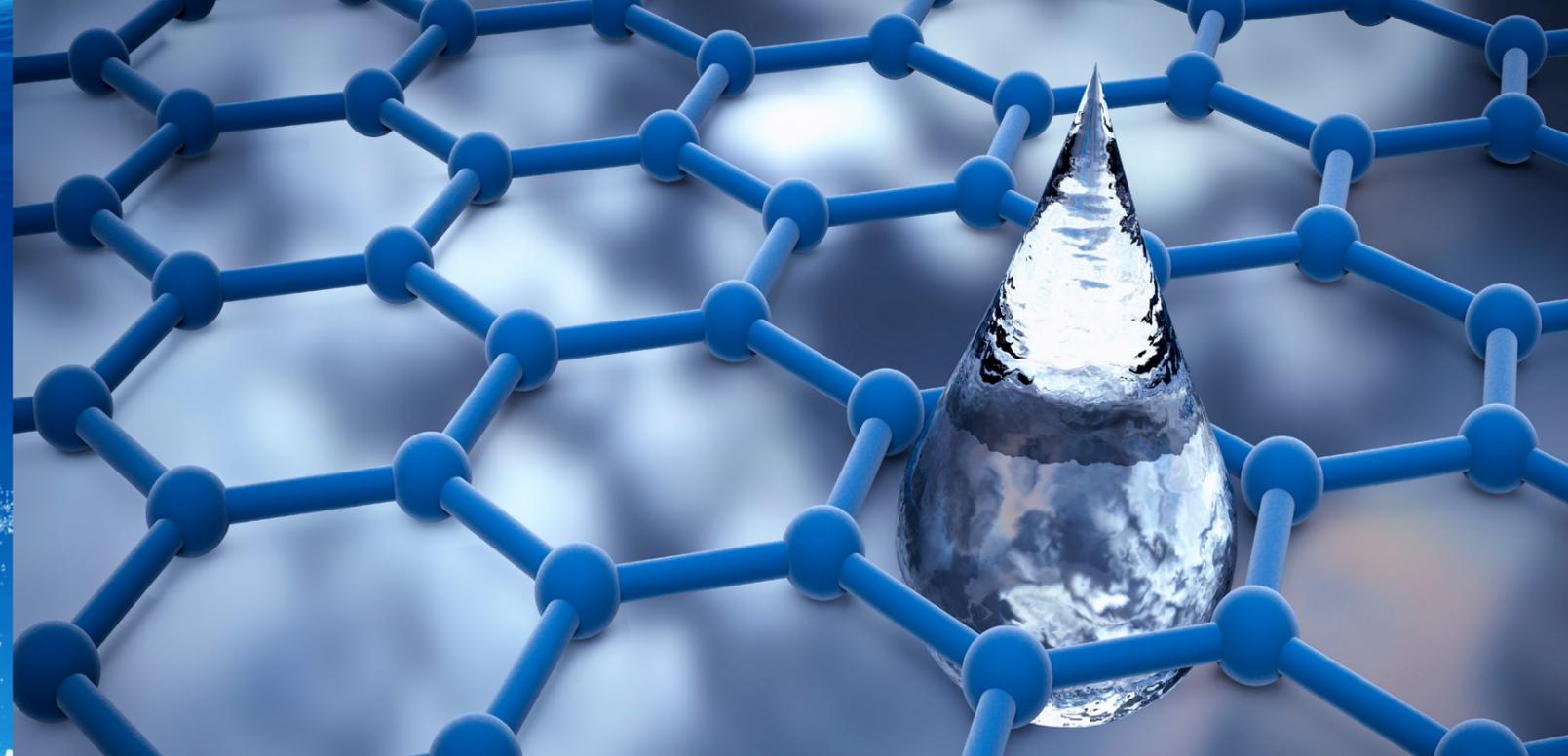
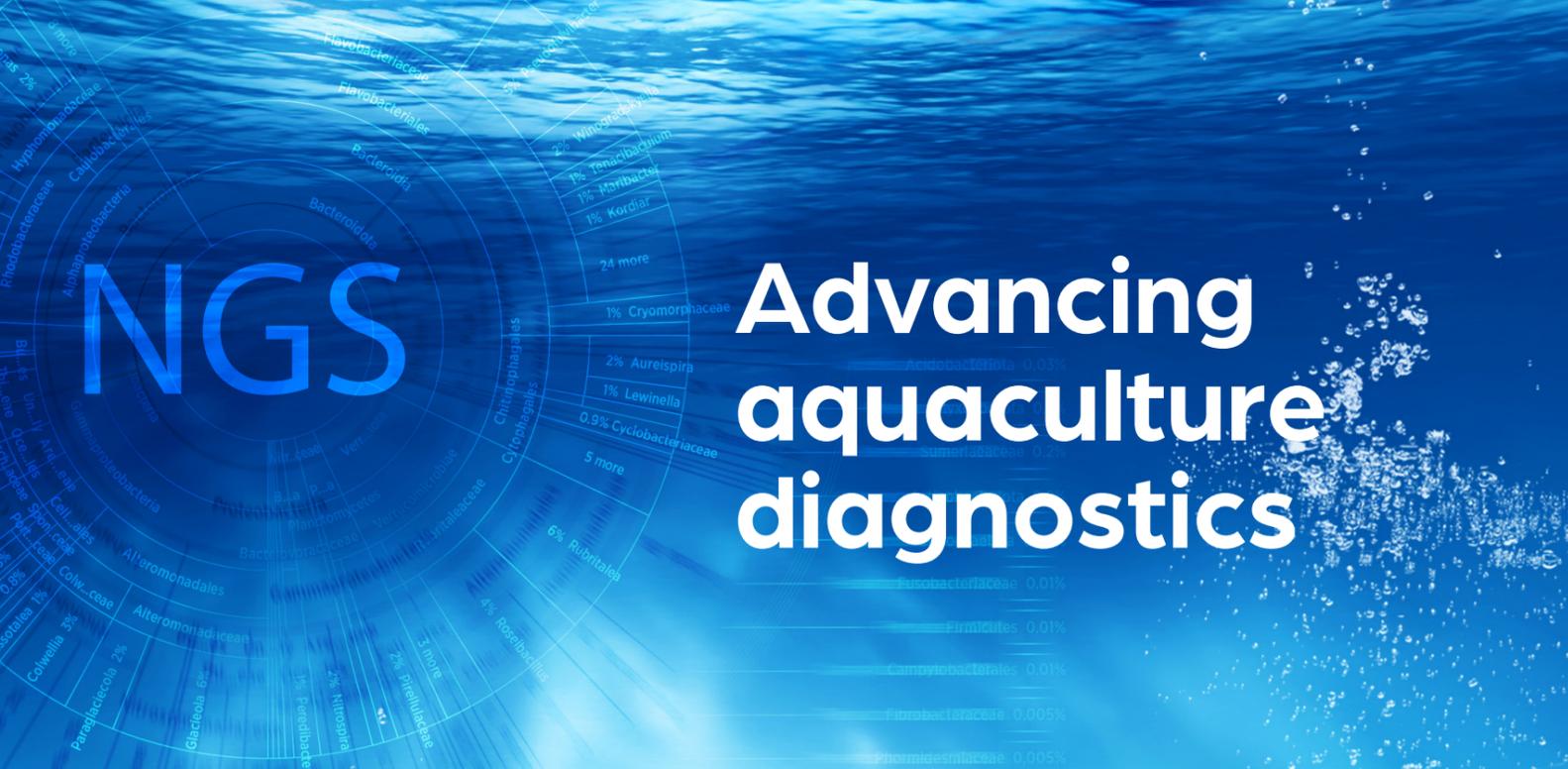
Histopathological assessment of heart and gill tissue, in advance of treatments, can be a very useful tool in determining how well a stock is likely to tolerate the intervention, so informing the manager as to whether to go ahead or delay the operation.

## Benefit from an experienced team

We are fortunate to employ a world-leading team of veterinary pathologists globally. Our team has a broad experience and expertise in fish pathology.

In our state-of-the-art histopathology lab, as well as performing routine histology we also have expertise in specialist staining techniques, as well as immunohistochemistry.

The histopathology services are offered from all our locations.



# Next Generation Sequencing (NGS)

## Managing microbiota is key to fish health

An increasing degree of salmonid production (both smolt and downstream production) relies on closed- or semi-closed production in water recirculation facilities.

Control of water quality is crucial to maintain stable production conditions. Little to no information regarding the microbiota in the water is known, but it is expected that it plays a vital role in affecting fish health, and welfare.

In cases of complex, and multi-factorial health challenges, where the direct cause is unknown or uncertain, current diagnostic tools often fall short.

## Introducing

New and innovative tools for accurate and in-depth aquaculture diagnostics, based on sequencing technology and the unique Next Generation Sequencing platform (NGS)

**Accurate and in-depth aquaculture diagnostics, for insights that lead to more accurate fish health strategies**

APPLIED USE

### 1 The environment

- Identify relative levels (%) of top 10 occurring bacterial species from intake water
- Identify relative levels (%) of different nitrifying bacteria from biofilter samples
- Accurately identify bacteria using water samples taken from the tank

APPLIED USE

### 2 The host

- Characterise and identify skin ulcer and gill flora associated with different production systems, including fish types, water flora, water chemistry, temperature, salinity, A.S.O.
- Identify relative levels (%) of bacteria, from swabs collected from fish

APPLIED USE

### 3 Large scale analysis

- Access full genome sequencing, for large scale analysis



# Contributing to a safe and sustainable food supply

## Proud contributor to safe and healthy seafood

Fish remains the most consumed animal source of protein worldwide. We firmly believe in further growth of the global aquaculture industry. A decline in the capture of wild fish and the increasing human global demand for food is creating a gap in the supply of seafood. This gap can be bridged by commercial aquaculture. Healthcare spending is expected to increase as productivity of fish farming becomes more efficient to address the rising global demand for protein. Fish health management tools are key for a sustainable and profitable industrialization and growth in aquaculture.

A broad range of tools and solutions are necessary to keep fish healthy through out the life cycle. Investment in R&D creating innovations are key to success. We have a continuous focus on bringing new and innovative products to the market, to support our customers in building a sustainable and profitable fish farming industry.

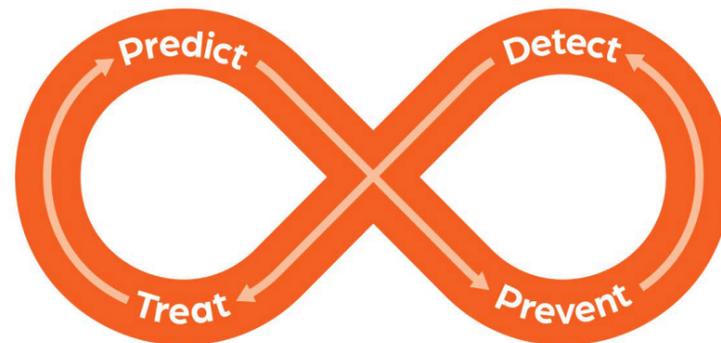
## Innovations with purpose

Our innovative drive is based on the aquaculture industry's need to produce sustainable, safe and healthy seafood. We are a dynamic and innovative organization and take pride in supplying premium products and value added services to our global customers.

## Innovations across the continuum of care

We are committed to help fish farmers and veterinarians to keep fish stocks healthy.

Our broad R&D capabilities place us in a unique position to serve their needs throughout the entire continuum of fish healthcare.



We can help to **Predict** challenges before they take effect; **Prevent** disease occurring; **Detect** challenges early and; **Treat** disease swiftly and effectively.

## Predict

We can apply targeted research and effective analyses to help veterinarians and producers predict and prepare for new challenges.

## Prevent

As the global leaders in vaccines, our innovative products help to safeguard fish health sustainably and safely, reducing the need for antibiotic and chemical use. Our range of specialist vaccination machinery delivers greater efficiency through precision vaccination, in-depth data collection and fish sorting, improving fish welfare and optimizing vaccination success.

## Detect

Our enhanced analysis and advisory services provide valuable insights into disease status and fish health, allowing veterinarians and producers to respond swiftly and appropriately to immediate and imminent challenges.

## Treat

To respond to challenges throughout the lifecycle, we provide everything needed to restore fish health with effective, safe and sustainable therapeutics.



PHARMAQ  
Analytiq

# We make aquaculture progress

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