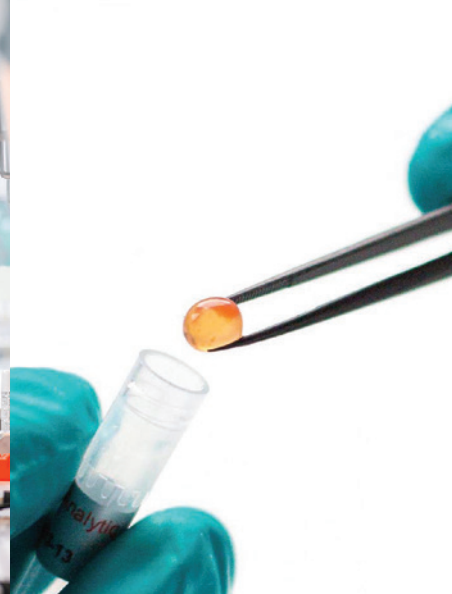
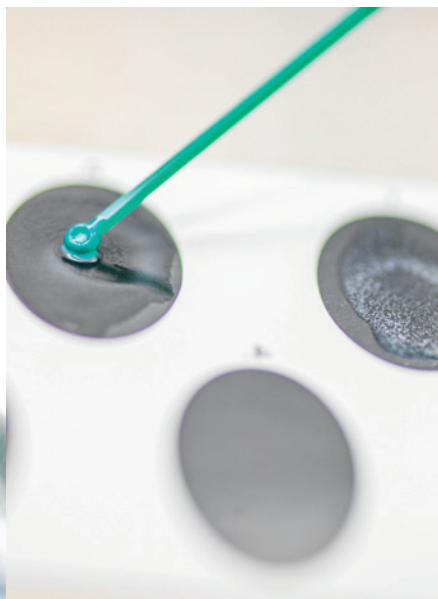
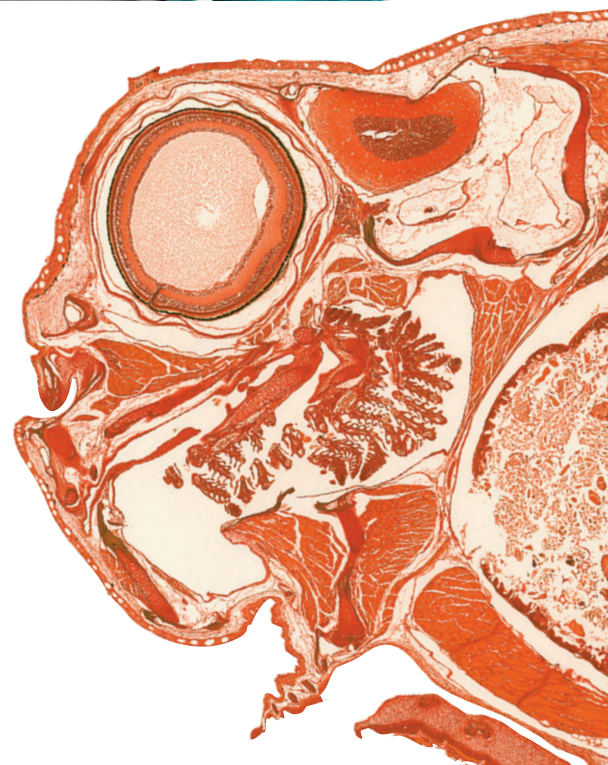


PHARMAQ
Analytiq



ANALYTICAL AND ADVISORY SERVICES FOR BETTER FISH HEALTH AND WELFARE



zoetis



PHARMAQ

Analytiq

PHARMAQ Analytiq is a knowledge based company that provides research-based targeted analysis and advice for better fish health and fish welfare. PHARMAQ Analytiq operates from laboratories in Bergen, Oslo, Rørvik, Inverness, Galway and Puerto Montt and is 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 all our locations.



REAL-TIME RT-PCR

PHARMAQ Analytiq uses 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.

PHARMAQ Analytiq provides 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.

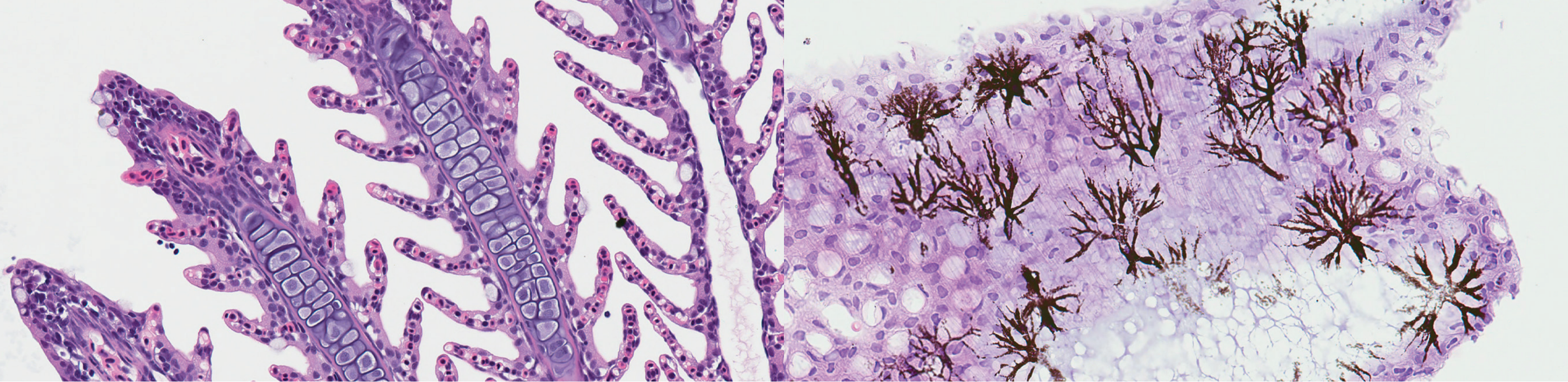
The REAL-TIME RT-PCR services are offered from all our locations.

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.

We also intend to expand our services to include modern NGS technology that can perform rapid and comprehensive characterisation of genes and genomes from bacteria that are relevant in diagnostics. This includes services such as full genome sequencing of bacteria, for affinity determinations, tracing of disease pathways, and characterisation of new, emerging, bacterial pathogens arising in the aquaculture sector. Furthermore, we want to sequence and monitor the microflora present in fish farm environments in order to increase our understanding of how the composition of, and variation in, microbiota profiles impact on fish health and welfare.

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



HISTOPATHOLOGY

PHARMAQ Analytiq offers 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 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, PHARMAQ Analytiq 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

PHARMAQ Analytiq has 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.



ENVIRONMENTAL SERVICES

Our experts at PHARMAQ Analytiq offer a wide range of statutory surveys, such as Marine Benthic, Hydrographic and Visual. These surveys can accurately monitor physico-chemical conditions and biodiversity; thereby assessing the impact of existing aquaculture operations, or the potential location of new farm sites. Our experts carry out both statutory surveys and surveys designed to meet customer specific requirements.

Sediment Health Check - PHARMAQ Analytiq offers seabed health-checks designed to determine and monitor the condition of the seabed at various stages of the production process. This may provide an early warning for areas where mitigation may be necessary.

Comprehensive Laboratory Analysis - Our state-of-the-art laboratory can process both marine and freshwater benthic faunal samples collected by our field surveyors or provided by the client. Sample analyses and data produced by us conform to SEPA guidelines. We participate in the NMBAQC scheme for marine invertebrate identification and our SOPs, health and safety procedures, staff training, and internal audits ensure consistent high quality.

CONSULTANCY SERVICES

We provide advice on survey design, report interpretation, sediment health and mitigation in both unique and routine projects. We also advise on regulatory, planning and compliance issues. Consultancy services include, assisting with all aspects of aquaculture, from farm scoping and license applications to SEPA and ASC compliance, EIAs and environmental auditing, providing advice on environmental legislation, liaising with regulatory bodies on behalf of clients, biomass reviews, offering advice on site remediation.

The Environmental Services are offered from our location in Inverness, Scotland.

PRIMARY VETERINARY SERVICES

On the frontline, our aquatic veterinary practice has been central to PHARMAQ Analytiq since its inception 20 years ago. Our expert team provides core veterinary support to aquaculture producers, performing routine and investigatory site visits across all farmed species and production systems. We bring a strong focus on preventative fish health, having been involved in the development of the veterinary health planning (VHP) process for Atlantic Salmon. This is mandatory for the welfare and quality certification schemes in the aquaculture industry, such as RSPCA Assured, Global Gap and Label Rouge.



RAPID RESPONSE AND DIAGNOSTICS

PHARMAQ Analytiq provide rapid response when required. With our diagnostic histopathology, bacteriology and PCR service fully in-house, we can quickly interpret and discuss the significance of test results based on detailed knowledge of the farms.

Our veterinary practice is accredited by the RCVS Practice Standards Assurance Scheme, which audits our practice to ensure the highest standards of clinical care and the Veterinary Services are offered from our locations in Inverness, Scotland and Galway, Ireland.

CONSULTANCY AND TRAINING

PHARMAQ Analytiq provides first class aquaculture health consultancy and training to the industry. Our consultants collaborate with in-house health teams in order to provide investigatory or strategic advice on health, welfare, performance and quality issues.

Our Consultancy Services include; Strategic advice on all aspects of fish health management, Investigation of health or performance issues, Third-party fish health inspection, Assisting with due diligence, Literature reviews, Clinical trial monitoring, Training and Development.

Our team of experts offer both practical training courses and classroom-based training. The practical training courses provide a unique opportunity for hands-on learning from highly skilled professionals. These are either based in a laboratory or delivered on-site on aquaculture farms. Our classroom-based training can be delivered in the location that is the most convenient for your company. Both training courses focus on real-time challenges in the fish farming industry.

Alongside aquaculture producers principally operating in the salmon and trout sectors, we also offer experienced health and welfare advice across all cultured species including research fish.

The Consultancy and Training Services are offered from our locations in Inverness, Scotland and Galway, Ireland.

CLINICAL PATHOLOGY

Our clinical pathology services include haematology, blood biochemistry, and hormonal analysis, which can be important tools in the monitoring the health of fish populations

HAEMATOLOGY

- Complete blood count (Hematocrit, hemoglobin, MCV, MCHC, leukogram, thrombocytes, blood smear reading)
- Descriptive blood count (blood smear reading)
- Scoring of Inclusion bodies

BLOOD BIOCHEMISTRY

- Complete biochemical profile
- Liver function evaluation
- Evaluation of renal-branchial function
- Deformity profile

HORMONAL ANALYSIS

- Melatonin (Photoperiod Evaluation)
- 11-Keto-Testosterone
- Vitellogenin

The clinical pathology services are offered from our location in Puerto Montt, Chile.

ULTRASOUND

PHARMAQ Analytiq provide a complete range of diagnostic ultrasound services for producers.

BROODSTOCK PROGRAMMES

For broodstock programmes, our technicians can perform non-lethal sex determination and monitoring of reproductive status in salmonids and other species of commercial interest. This is supported by our in-house suite of reproductive hormone and other blood chemistry analysis.

DETECTION OF EARLY MATURITY

Early maturation in the seawater production phase can harm the profitability of the cycle. Our technicians can provide a full ultrasound monitoring plan to allow early detection of maturity occurring, and allow producers to tailor harvesting or photoperiod plans accordingly.

Our approach can be supplemented with a complete suite of reproductive hormone analysis and expert-led evaluation and histological scoring of gonadal tissue.

Monitoring for maturation can be particularly important in RAS growout and our team have technical experience in land-based systems.

CLINICAL ULTRASOUND

Ultrasonography can also be applied to the investigation of a number of clinical issues, including the investigation and characterisation of eye disorders such as cataracts, corneal opacities and others. Please contact us to discuss your requirements.

Our ultrasound and reproductive services are offered from Puerto Montt, Chile.



RESEARCH AND DEVELOPMENT

PHARMAQ Analytiq has a strong focus in our services being based on knowledge through science. Our solutions should be for the benefit of our customers and with a view to continuously be able to offer improved solutions.

PHARMAQ Analytiq has a wide range of services and highly educated staff with fish health and diagnostic backgrounds. This makes us natural participants in research and development projects in aquaculture, both as a partner and service provider. If you have special challenges that you want to better understand, feel free to contact us.

As part of Zoetis, PHARMAQ Analytiq is also part of a global research environment that aims to promote innovation, anticipate and meet the needs of veterinarians, livestock producers and breeders worldwide. This solid foundation and breadth of expertise and experience in animal health means that we are uniquely positioned to create new insights and solve future challenges in preventive health and welfare, through continuous innovation and development of new knowledge platforms and tools. For more information, please visit: zoetis.com/_locale-assets/pdf/partnering_with_zoetis_2018.pdf.

SUSTAINABILITY IN AQUACULTURE

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 throughout 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 organisation 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** illness occurring; **DETECT** challenges early and; **TREAT** illness 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 optimising 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.

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WE MAKE AQUACULTURE PROGRESS

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