

AQUACULTURE

Fish Health and Welfare

For further information on the Fish Health and Welfare Group, contact aquaculture@stir.ac.uk or tel +44 (0)1786 467874

“The main focus of this large multi-disciplinary group is the prevention and control of disease, involving scientists and veterinarians with expertise in pathology, immunology, parasitology, virology, bacteriology, epidemiology and welfare. Much of the research involves biotechnology and aspects of food security”

Aquatic Vaccine Unit: Research in the Aquatic Vaccine Unit focuses on fish disease control through the development of novel vaccines and rapid diagnostic tests (both molecular and antibody based). Many of the projects are in collaboration with industry and vaccines are currently being developed to control Rainbow Trout Fry Syndrome, Francisellosis, Sea lice and Amoebic Gill Disease.

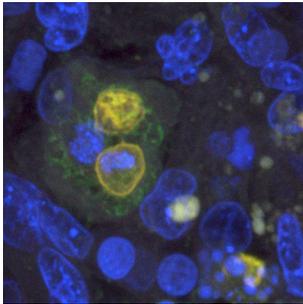
Our work also includes more fundamental immunology research, including elucidating mechanisms of mucosal immunity and the effects of dietary components, immunostimulants and probiotics on the immune system and fish health. Many of these projects hinge on the elucidation of host pathogen interactions. Microarray analysis is being increasingly used to investigate immune gene regulation during infection, following vaccination and immunomodulation by dietary components. Various new projects have also been initiated with regard to behavioural ecology, evolution and immunity. We work on a wide range of fish species and pathogens (bacterial, viral, parasitic and fungal).

Virology Group: The Virology Group has historically performed diagnostics using traditional cell culture assays. Current reorganisation and future aims include optimising virus culture of fish viruses by improving culture techniques using up to 70 available cell lines that have been collected over decades. We also have an interest in developing cell lines from molluscs and crustaceans.

We are continuing to develop rapid molecular detection assays for fish viruses and exploring their use in an aquaculture farm setting. For most viral diseases affecting fish, molluscs and crustaceans the use of modern point of care molecular assays in an aquaculture setting have not been explored. There is also a lack of clinical thresholds for the mostly ubiquitous viruses, which need to be determined in order to make the use of such tests efficient and reliable. A sound sequence dataset is the basis for molecular methods and therefore NGS methods will be developed to sequence existing and incoming virus isolates and samples. We are looking for co-operations to explore the evolution of fish viruses in the fish farm setting in order to find answers on how some viruses evade and brake through vaccine control.

Current research is focusing on Pancreas Disease (PD) with a view to improvement in vaccination, breeding programmes and nutritional modification. This disease caused by salmonid alphavirus (SAV) has become one of the main disease concerns for Atlantic salmon. The mechanisms responsible for viral tissue tropism and tissue pathology caused by the disease are not clearly described and this is also under investigation.

RESEARCH THAT SHAPES AND IMPROVES LIVES



The close ties between the Fish Health and Welfare Group and the aquaculture industry mean that the research often has applied aspects that lead to immediate benefits in the control and management of disease both in industrial and artisanal aquaculture and recreational fisheries. The Group collaborates with a range of academic and government institutions worldwide.

Bacteriology Group: The Bacteriology Group collaborates widely with academics and commercial organizations worldwide, to identify bacterial pathogens of significance that impact on the production of sustainable aquaculture. We take a comprehensive approach to understanding aquatic bacterial infections, which range from simple pathogen identification to classification of virulence factors associated with disease outbreaks and understanding zoonosis through molecular microbial epidemiology research. Our research has highlighted genetic antibiotic resistance mechanisms and identified novel pathogens associated with emerging disease conditions leading to production of efficacious vaccines. Characterising the composition and role of the fish microbiome during production is a key area of our research. More recently we have expanded our research capacity to investigate microbial safety of aquatic seafood, particularly concentrating on those organisms that cause foodborne illness in humans.

Alternative insect infection models for investigating mechanisms of pathogenicity and virulence factor discovery in bacterial fish pathogens are being developed in the group as an alternative to fish models. Research on novel bioactive natural marine products is also underway.

Parasitology Group: The Parasitology Group has a worldwide reputation for research and innovation in the field of aquatic parasitology. Its aims are to consider not only the interactions between parasite and host but also the wider environmental aspects of this relationship. This has led to a broad spectrum of research interests. At one end of this spectrum lie studies investigating parasite biology, morphology, physiology and host-parasite interactions including pathology, host defence mechanisms and host specificity. At the other end of the spectrum are studies investigating the epidemiology and macro-distribution of parasites, their population dynamics and their responses to environmental factors such as climatic, hydrodynamic and chemical parameters.

Sea lice (*Lepeophtheirus salmonis*) remain a major research focus with projects underway to develop a sea lice vaccine, an artificial skin model, and to investigate the factors affecting the susceptibility of Atlantic salmon to infection. There is also much interest in *Gyrodactylus salaris*, a parasite that has had a devastating impact on Norwegian Atlantic salmon populations, looking at the susceptibility of native salmonids, mathematical modelling and predicting the establishment and spread *G. salaris*, in the UK.

Population Health and Welfare: The Aquatic Population Health and Welfare group evolved from our research in aquatic animal epidemiology and welfare. We collaborate with staff from Aquaculture and other departments in Stirling and have active links with 28 academic and commercial organisations worldwide. The group uses population based models and analysis to answer a wide range of questions from applied control of specific diseases, through methods to monitor welfare to theoretical network modelling.

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