IMAQUANIM

Improved immunity of aquaculture animals

The Challenge

The use of antibiotics in European aquaculture has decreased significantly in the past decade. This is attributed to the development of more efficient vaccines, better diagnosis of fish diseases and improved sanitary controls. Since antibiotics can have harmful effects on human health, a reduced reliance on antibiotics has been encouraged in the "Strategy for the Sustainable Development of Aquaculture in Europe". The development of new vaccines, with a resultant reduction in the prophylactic use of antibiotics, is considered to be a research priority.
The immune system of finfish and shellfish is not as well understood as it is for mammals and other higher vertebrates. Successful bacterial vaccines developed for salmon were based mostly on trial and error. However, despite years of research, a few vaccines have recently emerged for fish viruses. There are no current vaccines for fish parasites.

Project Objective

IMAQUANIM brought expertise together to develop technology to improve the disease immunity of Europe's major aquaculture species.

Key Points

- Disease immunity in Atlantic salmon, rainbow trout, sea bass, sea bream, carp, mussel and oyster was investigated.
- Tools – like gene arrays and antibodies – and assays to monitor molecules and cell populations that are key components of the immunological systems were developed for each species. This information was used as the basis of a better understanding of how fish acquire immunity to disease.
- Research on molluscs and oysters focused on their innate immune system.

Output Highlights

Disease models and Database
The work on disease models involved animal species infection/exposure experiments using selected bacterial, viral and parasite pathogens. Data provide results on disease susceptibility/immunity which can be used in the development of optimal strategies for disease prophylaxis through well established and well primed immune defence systems in the aquacultured animals. The project gathered a comprehensive collection of

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EATiP *Thematic Area of Relevance*

TA1: Product Quality, Consumer Safety and Health
TA2: Technology and Systems
TA3: Managing the Biological Lifecycle
TA4: Sustainable Feed Production
TA5: Integration with the Environment
TA6: Knowledge Management
TA7: Aquatic Animal Health and Welfare
TA8: Socio-Economics and Management

Key Words

Disease control, vaccines, disease monitoring, genetics and genomics

Project Information

Contract number:
7103
Contract type:
Integrated Project
Action line:
FOOD-2003-T6.4 Platform for improving the immunological status of livestock (including fish) for better disease protection
Duration:
66 months (01/04/2005 – 30/09/2010)
Coordinator:
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samples from challenge and vaccination and immunostimulation trials for present and future studies of immune response mechanisms.

Prototype Vaccines and immuno-stimulants
Vaccination and immuno-stimulation trials were performed in some species with selected available reference vaccines or killed pathogens. Reference and model vaccine reagents were collected and these will be used to provide knowledge about new strategies for vaccine development

New Molecular and functioning immunology database
In the area of molecular and functional immunology, new data on the function and behaviour of fish and shellfish immune system was collected. A number of new genes which encoded immunological key molecules were cloned for the involved host species. This new knowledge provides information on molecular reqirements for vaccines and immunostimulants for better efficiency.

Analytical Tools for typing and monitoring immune systems
In an effort to test and screen feed immuno-stimulants, the optimisation of a dose-response challenge model with Vibrio anguillarum in rainbow trout was undertaken. This work will prove useful for future health/immune monitoring in aquacultured fish. The project was responsible for optimising of ELISA and other assays for detection fish immunoglobulin. A salmonid and a mussel immune-gene array, sea trout and sea bass PCR array were developed.

The Full Report:
For a description of the research project, visit http://www.dtu.dk/sites/Imaquanim.aspx/

Next Steps – Suggested Actions/Follow On

RTD

- The knowledge gained during this basic research can be used to develop efficient vaccines and feed-based immuno-stimulants for finfish species, and for the genetic typing, immuno-competence monitoring and diagnostic surveillance for both finfish and shellfish.
- The project results can create a basis for the selective breeding of aquaculture animals that are immune to devastating infectious diseases.
- Results generated can provide a technological basis for qualified strategies to rapidly counteract outbreaks of known or new diseases in aquaculture fish.

Other

- By contributing to improved animal health, IMAQUANIM can lead to higher quality food products, free of antibiotic and chemical residues and to more environmentally sustainable and cost-efficient fish farming practices. Ultimately this will be of benefit to the consumer.