

# TargetFish - delivering improved vaccines

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**M**arine Scotland Science is taking part in a new 5-year EU funded project, TargetFish, <http://targetfish.eu/>, which aims to reduce the impact of fish disease on European aquaculture through the development of targeted vaccination strategies.

Development of new vaccines can be slow due to challenges such as sub-optimal delivery systems, a weak immune response to vaccines, and gaps in our knowledge of the immune response of fish.

The TargetFish project meets a large number of these challenges by bringing together expertise of 30 academic and industrial partners in fish pathology, immunology, biotechnology and vaccine development. Participating partners are listed in Table 1.

## COLLABORATION

Core to the application of scientific progress within the project is the 'Industry Liaison Partner' Tethys Aquaculture Ltd, a company founded by Professor Patrick Smith, who was one of the pioneers of fish vaccine development and who founded Aquaculture Vaccines Ltd (AVL), the first company to develop and commercialise fish vaccines in the early 1980s.

Tethys will act as an 'impact company' bridging academic research and industry. This will not only make industry aware of the results of the research, but will also enhance an easy transfer of scientific progress to a commercial product,

something which has often been lacking in past projects.

The first 'Industrial Forum', presenting plans and progress already made in TargetFish, will be a workshop held at the 13th Congress of the European Association of Fish Pathologists (EAFP) to be held in Tampere, Finland, on 2-5 September. For details see <http://eafp2013.fi/> or contact Patrick Smith ([patrick.tethysaquaculture@gmail.com](mailto:patrick.tethysaquaculture@gmail.com)).

The TargetFish project will

include the (study of) development of:

- improved antigens (parts of the vaccine against which an immune response is developed);
- new vaccine technologies, including studies into issues relating to consumer acceptance in Europe;
- vaccine delivery routes with a focus on oral and immersion delivery as these will increase ease of use, especially for smaller fish;

- specialised immune responses in the mucosal tissues, gill, gut and skin, targeted by oral and immersion vaccination;
- how traditional adjuvants (substances added to the vaccine to increase the immune response and duration) work, why they cause side-effects and how to minimise these;
- new types of adjuvants which are produced naturally by fish to attract immune cells or increase their numbers;
- identification of responses generated by vaccinated fish which can be used to indicate how effective the vaccine will be in the field, using low cost and animal-friendly assays;
- optimising vaccination strategies important for optimal performance under field conditions.

The diseases and host species addressed are shown in Figure 1.

Marine Scotland Science will use Salmon Alphavirus (SAV) as a model for development of a DNA vaccine (a non-infectious piece of pathogen DNA which enters host cells where it is converted by the host to proteins against which an immune response is generated). DNA vaccines have proved very effective at generating protection in fish. The distribution of the DNA vaccine in the fish and how long it remains before breaking down will also be investigated. Approaches to in-feed vaccination will include complete inactivated SAV virus encapsulated in biodegradable beads that are added to feed. These beads protect the pathogen antigens from breakdown by the digestive acids in the gut and are taken up by the gut wall, releasing the antigens in the mucosal tissues. Oral vaccines offer the opportunity to specifically target specialised immune responses in the mucosal tissues which may be bypassed

### Coordination and Academic participant

Wageningen University NL

### Academic participants

Aarhus University DK

University of Aberdeen UK

Marine Scotland UK

Friedrich Loeffler Institute DE

National Institute for Agronomic Research ES

University of Barcelona ES

Tuscia University IT

National Institute for Agronomic Research FR

Norwegian School of Veterinary Science NO

University of Stirling UK

Istituto Zooprofilattico Sperimentale delle Venezie IT

Copenhagen University DK

Veterinary Research Institute CZ

Hebrew University of Jerusalem IL

University of Murcia ES

### Private sector participants

Tethys Aquaculture Limited GR

PatoGen Analyses NO

Fishlab DK

Naxo EE

RidgewayBiologicals Limited UK

Rossi International DK

Ingeniatics Tecnologias ES

BigDNA UK

W42 Industrial Biotechnology GmbH DE

P.Christofilogiannis – I.Tavla O.E ("AQUARK") GR

CentroVet Ltd CL

Dansk akvakultur forening DK

BioMar A/S BM IND DK

Bioorganic Research and Services BNT ES

Table 1: list of partners contributing to TargetFish.

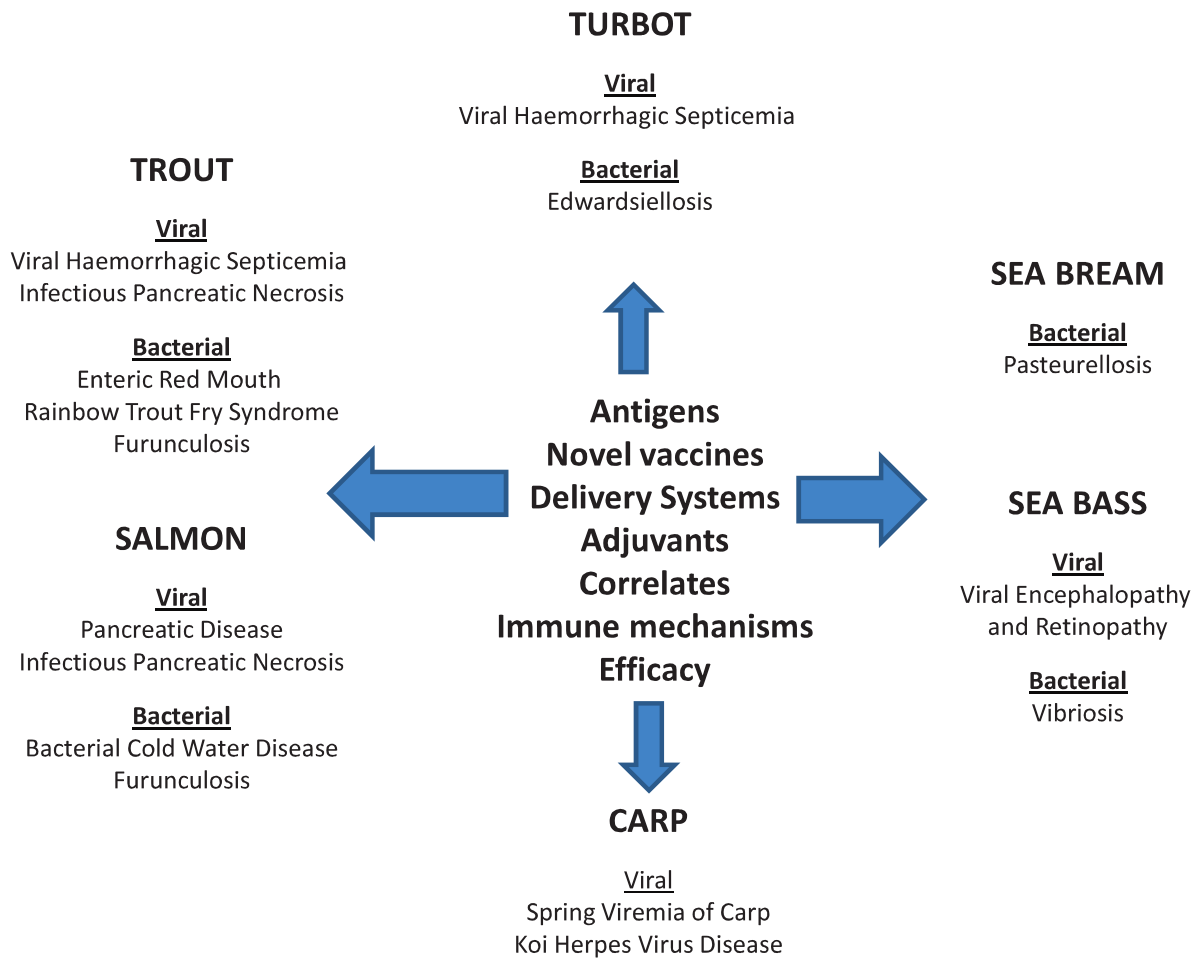


Figure 1: fish species and pathogens addressed within TargetFish

when using injection delivery.

For further details on project content please contact project co-ordinator Dr Geert Wiegertjes (targetfish.cbi@wur.nl).

TargetFish is funded by the European Commission under the 7th Framework Programme for Research and Technological Development (FP7) of the European Union (Grant Agreement 311993 TARGETFISH).

Dr Bertrand Collet has been working for the last 14 years on immunity to viruses in salmonids. He currently focuses on the interaction between viruses and the innate antiviral defence mechanisms and how this fundamental knowledge can be used to develop biotechnological in vitro systems to monitor disease progression and improve fish infectiology. He currently leads a project funded by the NC3Rs

to describe the disease progression and associated immune response on a single animal by non-lethal repeated blood sampling in salmonid fish (Bertrand. Collet@scotland.gsi.gov.uk).

Dr Catherine Collins is a member of the Aquaculture and Marine Environment team at Marine Scotland Science. She has worked in a number of different areas including diagnostics and environmental monitoring, as well as on host-pathogen interactions. She is currently co-ordinating Marine Scotland Science projects on sea lice and Amoebic Gill Disease (Catherine.Collins@scotland.gsi.gov.uk).

Professor Patrick Smith is an expert in fish vaccine development. He was the first to develop commercial vaccines for fish through his company Aquaculture Vaccines Ltd. He has acted as Global Director of New Business Development/Discovery for Intervet Schering Plough Animal Health (Now MSD Animal Health), and is currently

CEO of Tethys Aquaculture Limited, an aquatic animal health research impact organisation that aims to facilitate faster technology transfer in the field of aquatic animal health (patrick.tethysaquaculture@gmail.com).

Dr Geert Wiegertjes leads the Fish Health and Immunology unit of the Cell Biology & Immunology Group at Wageningen University. His research activities focus on aquatic animal health in general and on immunity to protozoan parasites and viruses of cyprinid fish, in particular. He is co-ordinator of TargetFish (targetfish.cbi@wur.nl). **FF**



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