# PROMICROBE

Microbes as positive actors for more sustainable aquaculture

## The Challenge

The project starts from the concept that the host microbial community (MC) is influenced by the host itself and by the microbial community of the system in which the host is living. It is anticipated that there is a reciprocal interaction between the different compartments of the system in every stage of the life cycle.

The strength and the nature of those interactions can depend on the life cycle stage. Apart from these horizontal interactions, it is anticipated that microbial communities evolve as the host grows or the system changes.

Aquaculture has developed very rapidly over the last 20 to 30 years. Surfacing problems have been solved mostly on an empirical basis. Considering the fact that aquatic organisms live in a matrix (namely the matrix water) that contains the feed as well as the excretion products, it can be anticipated that the environment must have a very strong influence on the microbial community composition, its activity and hence on the host.

In the past the aquaculture ecosystem (being considerable reduced in terms of complexity compared to natural ecosystems) and especially the microbial component has only to a limited degree been studied in a systematic way. However, such studies have been hampered by the lack of the appropriate tools.

## Project Objective

PROMICROBE suggests bringing together various European research groups that have contributed to some important methodological breakthroughs that can be used in the study of host/microbe interactions and can help to disentangle the complex interplay between the different components of the aquaculture ecosystem.

## Key Points

The project aims to find an answer to the following questions:

- How does the microbial community evolve as the host progresses through its life cycle?
- How stable is the microbial community in relation to perturbation caused by changes in environmental conditions and how resilient is the microbial community?
- What is the effect of micro-organisms on the host metabolism, its disease susceptibility and viability?
- Considering that some environmental factors (e.g. salinity, feed composition) have a major influence on the MC composition, to what

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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

microbial community, host, microbiota, experimental gnotobiotic larviculture

## Project Information

**Contract number:**
227197
**Contract type:**
Small or medium-scale focused research project
**Research area:**
KBBE-2008-1-2-04 Microbial control for more sustainable aquaculture
**Duration:**
48 months (01/02/2009 – 31/01/2013)
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SEVENTH FRAMEWORK PROGRAMME

degree is it possible to influence or steer the MC composition and activity?

- To what extent can microbes present in aquaculture rearing systems be (re-) used to retain organic wastes and nutrients, and thus reduce the impact on the environment?

## Key New Knowledge Expected

Fundamental information on microbial communities associated with aquaculture species that have different feeding preferences (namely Tilapia being herbivore, seabass and cod being more carnivore, with one of the differences between the later two being the optimal growth temperature) and how these microbial communities can interact beneficially with the host.

- Information on the evolution of the microbial community (MC) as the host develops from hatchling into juvenile and on the stability of the MC composition after a major disturbance.
- Information on the influence of important factors that are anticipated to have a major impact on the MC composition of the host and the system and its activity and the interplay with the host metabolism (host microbial interactions).
- Developing ways to profit from host microbial interactions by steering the MC composition and activity.
- Information on the influence of the system MC on the host, and the possibility to use the system-MC to minimize environmental impacts from aquaculture, while benefiting the cultured organisms.
- More knowledge based application of probiotics and prebiotics in larviculture

## Potential Impacts

***RTD:***

- Possibly reduce the impact on the environment by (re-) using microbes present in aquaculture rearing systems to retain organic wastes and nutrients. The outcome of this project will allow developing new experimental approaches to study innate immunity in fish larvae.

***KNOWLEDGE TRANSFER***

- The new concepts developed by the project could be translated into new or adapted protocols to rear aquaculture organisms in the larval/juvenile stage in a biological stable and economical efficient way.

## Related Publications/Projects

Dierckens, K., Rekecki, A., Laureau, S., Sorgeloos, P., Boon, N., Van den Broeck, W., Bossier, P., 2009. Development of a bacterial challenge test for gnotobiotic sea bass (Dicentrarchus labrax) larvae. Environmental Microbiology 11, 526-533.

Rekecki, A., Dierckens, K., Laureau, S., Boon, N., Bossier, P., Van den Broeck, W., 2009. Effect of germ-free rearing environment on gut development of larval sea bass (Dicentrarchus labrax L.). Aquaculture, 8-15.

Forberg T, Arukwe A, Vadstein ,O., 2011. Two strategies to unravel gene expression responses of host-microbe interactions in cod (Gadus morhua) larvae. Aquaculture Research 42, 664-676.

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