

Organic rainbow trout

– Does the diet composition influence the fish health?



By Hans-Christian Ingerslev, Inger Dalsgaard, Mette Boye and Lone Madsen, National Veterinary Institute, DTU, Denmark

Rainbow trout (*Oncorhynchus mykiss*) is the dominant fish species in Danish aquaculture and the production is yearly about 40.000 tons. Freshwater accounts for about 75% of the production, while the remaining comes from seawater. During the last few years an organic fish production has been initiated and the rates of farmed organic fish are continuously increasing. Antibiotic treatment is only allowed a limited number of times during the entire life of an organic fish and if more treatments are needed the fish must be sold with the status of being conventionally raised. Thus it is a challenge to prevent disease outbreaks, e.g. by feeding with diets providing optimal health for the fish by strengthening their immune system or the composition of the gut microbiota.



Photo: Fiskehuset Thisted ApS

Fish may become infected at all life-stages. At the fry stage it is especially two bacteria that are causing problems in the Danish aquaculture rearing systems; *Flavobacterium psychrophilum* and *Yersinia ruckeri*, which are the causative agents of 'rainbow trout fry syndrome' (RTFS) and 'enteric red mouth disease' (ERM). Today vaccines exist against ERM, but not against RTFS. However, even if vaccines did exist against both diseases the fish would

be at risk of experiencing disease outbreaks at the fry-stage, resulting in repeated antibiotic treatments and consequently the loss of the organic declaration. In order to produce organic fish fry it is necessary to obtain optimal conditions in order to prevent outbreaks of disease. One way to achieve this is to optimise the fish feed.

Fish feed may originate from different sources

Traditional fish feed for use in aquaculture is made from

oil and meal originating from marine wild-caught fish – usually sand eel, sprat or whiting. Due to world-wide limitations of marine fish stocks, which are caught for use in the production of fish-feed, the fish feed producers are to some degree replacing the marine content with plant ingredients. Previous experiments have shown that the intestinal mucosal layer in the fish is influenced by some plant sources. Hence, the consequences hereof on the immune system and

the survival in connection to challenge by RTFS and ERM are under examination in the Organic RDD-project OPTIFISH. Both marine and plant sources can be obtained as declared organic, and one of the aims in the project is to determine the optimal diet constitution for healthy rainbow trout fry.

Beneficial bacteria as additives in the feed

Another task in the project OPTIFISH is to study whether fish feed can be optimised by addition of



OPTIFISH is a corporative project with participation of universities and private companies. The project is headed by the National Veterinary Institute at DTU and the other partners are Faculty of Health and Medical Sciences, University of Copenhagen, BioMar A/S and Dansk Akvakultur (Danish Aquaculture Organization).



Photo: BioMar A/S



Photo: BioMar A/S

beneficial bacteria; the so-called probiotic bacteria.

Previous research has shown that the immune system of the fish is strengthened, which hopefully should improve the chance for survival in connection to infection or even better: prevent the disease from successfully infecting the fish. Probiotic bacteria may work in different ways, but one of the mechanisms of action is that the bacteria by growth and colonisation may create a layer on the surface of the intestine, preventing undesirable bacteria to enter the

host tissue.

Furthermore the presence of probiotic bacteria may inhibit the growth of undesirable, pathogenic bacteria due to the production of inhibitory substances like bacteriocins and lactic acid leading to decreased pH in the intestine. More specifically, OPTIFISH examines whether addition of probiotic bacteria to the fish feed influences the immune system and survival of the fish after challenge with the pathogenic bacteria leading to RTFS and ERM.

Do the intestinal bacteria of the fish affect its health?

Other aspects of the project are to characterise the intestinal bacterial communities of the fish in relation to the diet type and examine the influence on the immune system and role in connection to infection. In the project the fish are monitored from the very early life-stage (shortly after hatch of the egg) and for several months after having been fed with diets containing varying amounts of marine /plant content, probiotics, as well

as being of conventional or organic origin.

Together, the experiments in OPTIFISH should result in more knowledge about what is the optimal diet composition, which hopefully will lead to fewer outbreaks of disease, higher survival rates and a smaller consumption of antibiotics for organic rainbow trout fry.

More information

Read more about the Organic RDD project OPTIFISH at: http://www.icrofs.org/Pages/Research/organicrdd_optifish.html



Organic RDD is financed by the Ministry of Food, Agriculture and Fisheries and coordinated by ICROFS.

