

Aquaculture, sustainability and sequencing technology: water microbiome analysis.

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Aquaculture plays a crucial role in the food industry, since it copes with the increase of population in the world, and the decrease of fish resources. For this reason, we need a continuous implementations and scientific research that improves fish growth and health and minimize environmental impact. Novel feed formulations seem to be the new frontier we can exploit: novel feed optimizes quality with new available sources, essential amino acids and other micronutrients, reducing production costs and environmental impact.

Environmental impact can be measured using quality indexes, nevertheless, water ecosystem in aquaculture plant is still understudied, with its strict and constant relations with fish. We focused on water quality with a global and multilevel approach, since this is a key element to analyse the impacts of different feed formulations on the environment and to ensure fish health. The analyses were carried out in an experimental aquaculture plant of *O. mykiss*, where insect feed formulations were tested. The physico-chemical parameters of water, such as pH, nitrate, nitrite, total nitrogen, ammoniacal nitrogen and total phosphorus, were measured. The analysis of water microbiome using High-Throughput DNA Sequencing techniques combined with classical microbiological tests was integrated in our experimental study. We observed that a peculiar ecosystem characterizes the aquaculture experimental plant analyzed. *Proteobacteria* and *Bacteroidetes* are the most represented *phyla* in the entire sampling, their presence is not a surprise as they are bacteria often found in aquaculture waters. We compared biofilm and water samples, finding significant differences considering microbial communities. Results showed that the microbial community did not change according to the different feed formulations tested, but depending on sampling date. These findings highlight how little we know about the complex interactions occurring among diet, microbes and host fish: these interactions involves fish health, fish microbiome and water microbiome, indicating the strict relation between fish and water microbiome, almost unexplored. In the near future, we are going to standardize the method in at the industrial scale.

