Bacteria fill key role for successful recirculating aquaculture farming

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Bioreactors utilize bacteria in the water purification process.In bioreactors, toxic ammonia excreted by fish is microbially converted to more harmless nitrate in the nitrification process.

"Although bioreactors are designed for the decomposition of nitrogen compounds, the main functions of bacteria in bioreactors were the decomposition of carbohydrates, amino acids and fats. The impact of bioreactors as a whole on water quality is thus much more diverse than previously thought. A diverse and stable bacterial community can maintain good water quality, not only in terms of nitrogen compounds, but also in organic matter," Jani Pulkkinen says.

Different types of bioreactors can trap solids from water or affect the gas balance, but different bioreactors also have different nitrification efficiencies, i.e. how fast ammonia can be converted to nitrate.

"The sizing and selection of bioreactor type should be done taking into account the characteristics of the entire water treatment system," says Pulkkinen.

The biological and mechanical solids removal capacity of bioreactors can compensate the properties of the rest of the water treatment system. By optimizing the entire water treatment system, the best possible water quality can be maintained for the well-being and growth of the fish, which enables cost-effective and environmentally friendly aquaculture.

The dissertation consisted of four publications using modern molecular microbiology methods. All studies were conducted in the experimental recirculating aquaculture facilities of the Natural Resources Institute Finland (Luke) Laukaa fish farm.The dissertation has been funded by Luke, the European Union and the Ministry of Agriculture and Forestry from the European Maritime and Fisheries Fund.

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