

Human vaccines to aid farmed fish

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Scientists will use compounds from human vaccines to improve vaccines for aquaculture fish stocks.

When aquaculturists raise fish in fish farms or sea cages it is necessary to vaccinate the fish to ensure that disease won't kill the stock.

Unfortunately, some of the vaccines have side effects that can give the fish serious disorders such as impaired growth or entangled organs. This can result in financial losses amounting to millions of Euros.

A Danish scientist is trying to improve fish vaccines and ensure they have fewer side effects.

He will do so by supplementing fish vaccines with some of the compounds found in vaccines for humans.

"This will be a definite improvement in the living conditions of the fish and at the same time have the potential to minimise losses for breeders," says Villumsen.

His research is funded by the Danish Council for Independent Research and he will spend the next three years trying to find a better vaccine.

"By then we will hopefully have a vaccine with few or no side-effects and which is better at protecting the fish from diseases than today's vaccines," says Kasper Rømer Villumsen, postdoc at the University of Copenhagen

Why fish are vaccinated

Fish farming is a giant industry in today's Denmark with a turnover measured in billions of euros a year.

For that reason, all threats to stock health are taken very seriously, as losses of just a few percent of the stock can mean an economic difference in the profit of many millions of Euros.

Bacterial and virus infections are highest on the list of these threats.

Infections have extremely good possibilities for spreading in fish farms as the fish are often live close together; one infected fish can turn into hundreds of infected fish within a very short time.

"In recent decades breeders have vaccinated their fish against a large number of the most common and most damaging viruses and bacteria, including through the use of injection vaccines," says Villumsen.

Problems with additives

The problem with the existing vaccines is their composition.

Besides being made up of parts of bacteria or viruses, injection vaccines typically contain mineral oils to

kick-start and strengthen the immune defence's reaction to the microorganisms.

But these mineral oils can result in problems for the fish, in particular in the abdominal cavity where they can result in discolouration of various organ surfaces and cause the organs to stick together.

In previous studies from Norway, the mineral oils have also been connected with autoimmune reactions in the fish and with lower growth.

While the mineral oils can be damaging to the fish, the consequences of an outbreak of disease can be far more serious -- which is why vaccines used today still contain mineral oils.

"So it's an obvious goal figure out how we can vaccinate fish without using the traditional additives -- and perhaps even make the vaccines more effective," says Villumsen.

Vaccines kickstart the immune defence's reaction

Villumsen is collaborating with Denmark's leading vaccine experts at the State Serum Institute (SSI).

The SSI's researchers have years of experience in making vaccines milder for the body and at the same time make them stronger and with greater protection against diseases.

This depends on the development of special compounds in the vaccine that are designed to kick-start the immune system's reaction. These compounds have been optimised through many years of research to minimise side effects and at the same time maximise the effect of the vaccination.

It is precisely these properties that Villumsen is attempting to transfer to the fish vaccines.

"The target is to replace the additives such as mineral oils with far more advanced substances that do not damage the fish," he says.

He hopes doing so will help strengthen the vaccine's protective properties against diseases.

Hoping for a vaccine in three years' time

During the three years that the research project is planned to last, Villumsen will work with SSI to develop a new fish vaccine against the bacterial disease furunculosis, which is one of the greatest threats among fish diseases.

Furunculosis is named after its ability to form boils under the skin of the fish, most often killing them as a result of the infection.

Villumsen hopes that in three years' time he will have a vaccine that can set new standards for vaccines for fish.

"The most important thing is making a vaccine that is both less damaging to the fish and at the same time protects them better against furunculosis," says Villumsen. "The research can also become a guideline for how we can make more effective and milder vaccines for fish."

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 [A fish being vaccinated. A Danish scientist is hoping to create better and safer fish vaccines. \(Photo: Ctorrear/Fundacion Ciencia Para la Vida\)](#) [10]

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Michael de Laine

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