

Sustainability in aquaculture: Evonik turns salmon, shrimp, and more into vegetarians

- Aquafarms to eventually operate without fishmeal and fish oil
- Intense research for more sustainability
- Growing world population will need an additional 50 million metric tons of fish per year by 2030

Essen, Germany. Evonik scientists' long-term intention is to turn salmon, shrimp, and other marine animals into vegetarians. They are thus playing an important role in protecting marine resources. To that end, they are looking to replace the fishmeal and fish oil produced from wild-caught fish that is used in feeds. Farmed fish play a key role in providing healthy nutrition for the world's population. "Thanks to modern fish farming concepts and our amino-acid products, it is already possible to achieve significant reductions in the proportion of fishmeal used in feeds. Now we're working on sustainable alternatives to fish oil," explains Christoph Kobler, who heads the Sustainable Healthy Nutrition Product Line at Evonik. Evonik is one of the world's leading providers of amino acids and amino-acid derivatives for modern animal nutrition. The company sees itself as a technological leader in this field, and is expanding its product portfolio accordingly to encompass healthy and sustainable animal nutrition.

According to estimates from the UN Food and Agriculture Organization (FAO), some 147 million metric tons of fish were consumed throughout the world in 2014—over half of which was the product of aquaculture. And demand is rising: in order to be able to feed the growing global population, another 50 million metric tons will be needed by 2030. Because the oceans are already overfished and the fish catches are stagnating, the UN organization believes that this additional demand can only be met through aquaculture.

Certain fish and crustaceans raised on aquafarms—such as salmon, trout, and black tiger shrimp—are actually carnivores or omnivores. As such, feeds for these animals include fishmeal. Fishmeal contains important amino acids that the animals need to grow. Some three-quarters of the fishmeal and fish oil produced

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Economic press contact

Silke Linneweber

Corporate Press

Phone +49 201 177-3389

Fax +49 201 177-3030

silke.linneweber@evonik.com

Specialized press contact

Jürgen Krauter

Vice President Communications/
Nutrition & Care

Phone +49 6181 59-6847

Fax +49 6181 59-76847

juergen.krauter@evonik.com

Evonik Industries AG

Rellinghauser Straße 1-11

45128 Essen

Germany

Phone +49 201 177-01

Telefax +49 201 177-3475

www.evonik.com

Supervisory Board

Dr. Werner Müller, Chairman

Executive Board

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Christian Kullmann, Deputy Chairman

Dr. Ralph Sven Kaufmann

Thomas Wessel

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Essen local court

Commercial registry B 19474

VAT ID no. DE 811160003

worldwide are channeled into aquaculture, representing a major strain on marine resources.

In order to turn salmon, shrimp, and other aquatic species into vegetarians—and protect the oceans in the process—it is not enough to substitute fishmeal, an animal source of protein, with soy or another plant-based source. The resulting feeds would not contain the right composition or amount of amino acids such as methionine to meet the animals' needs. Because their ability to utilize their food would then not be optimal, the animals would have to consume more protein overall and, as a result, would excrete nitrogen-containing metabolites unused. As a consequence, this would waste scarce resources and pollute the water with animal waste beyond what is necessary.

Evonik researchers began looking for a solution to this problem nearly ten years ago, developing special amino acids and amino-acid derivatives for fish and crustaceans aimed at making fishmeal largely unnecessary in aquaculture in the future. The underlying principle is to selectively add amino acids such as methionine and lysine to vegetable-based feeds, improving them to the point where salmon and other marine animals can make optimum use of vegetable proteins as well. The most important task here has been to develop products tailored to the needs of individual fish species. Take salmon, for instance: In 2008, 40 percent of salmon feed was made up of fishmeal, but this figure has since come down to an average of just 10 to 15 percent. Feed manufacturers are already working at full steam to introduce feed concepts that can completely do without fishmeal.

Now, after intensive research, there are plans to transfer this success to shrimp. The challenge here is that the feeding behavior and digestive systems of crustaceans like shrimp are entirely different from those of fish. Whereas salmon are predatory fish that snatch up their food the moment it enters the water, shrimp eat their food very slowly from the seabed. As a result, highly water-soluble components leach out of the feed pellets before the shrimp can eat them. In addition, the supplemented methionine has to be present at a certain time—right when amino acids become available from the protein digestion process.

Only Evonik researchers have managed to develop an improved source of methionine that shrimp can consume and metabolize at the right time and in the right amount. This new dipeptide consists of two methionine molecules and does not dissolve readily in water, which prevents it from leaching out of the feed as quickly. The shrimps themselves have to cleave the molecule, and this makes the methionine available for protein synthesis at the same time as the other products of digestion. The company is currently putting its first production facility for the new product into operation in Antwerp (Belgium).

The company's researchers are now working on replacing fish oil, the second important animal product in fish feed. "This would mean it would be possible to entirely eliminate the use of marine resources like fishmeal and fish oil in the production of fish feed," said Kobler. Evonik is working with DSM Nutritional Products Ltd. of Kaiseraugst (Switzerland) to develop an algae-based omega-3 fatty acid product for use in animal feeds. Like people, animals also need a certain amount of this essential, long-chained polyunsaturated fatty acid in their food in order to sustain healthy growth. In aquaculture, this nutrient has largely come from the fish oil contained in feeds. DSM and Evonik intend to use sustainable biotechnological methods to harness marine algae in the production of omega-3 fatty acids.

Company information

Evonik, the creative industrial group from Germany, is one of the world leaders in specialty chemicals. Profitable growth and a sustained increase in the value of the company form the heart of Evonik's corporate strategy. Its activities focus on the key megatrends health, nutrition, resource efficiency and globalization. Evonik benefits specifically from its innovative prowess and integrated technology platforms.

Evonik is active in over 100 countries around the world. In fiscal 2015 more than 33,500 employees generated sales of around €13.5 billion and an operating profit (adjusted EBITDA) of about €2.47 billion.

About Nutrition & Care

The Nutrition & Care segment is led by Evonik Nutrition & Care GmbH and contributes to fulfilling basic human needs. That includes applications for everyday consumer goods as well as animal nutrition and health care. This segment employed about 7,000 employees, and generated sales of around €4.9 billion in 2015.

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