

#InspiredByLife to Reduce the depletion of small fish in our oceans

Over millennia, living organisms and biological systems in nature and the human body have developed a resourceful toolbox of biochemical capabilities, cellular and biomolecular processes and genetic resources. Inspired by a deeper understanding of these tools, life sciences researchers have studied nature to create new biotech solutions, in sectors including healthcare, agriculture and industry that help people and the planet.

Today, modern biotechnology provides breakthrough therapeutic treatments and biofortified nutrition that save lives and improve wellbeing. It enables new technologies that support a circular bio-economy, the European Green Deal and more sustainable agriculture that reduces the impact of human activity on our climate and ecosystems. It has inspired the development of new cutting-edge industrial manufacturing processes that are safer, cleaner and more efficient.



Fish free algae omega-3's as a feed ingredient can reduce the dependence on small wild fish in our oceans



One of the many benefits of incorporating fish in our diets is that they are a source of long-chain omega-3 fatty acids. These nutrients are good for brain and eye health, reduce the risk of heart disease, stroke and some cancers, as well as improve bone and joint health.

In the wild, microscopic marine algae are a primary producer of omega-3 and the first step in the ocean's food chain. Small fish accumulate omega-3 by eating marine microalgae. In turn, larger fish accumulate omega-3 by eating smaller fish. In aquaculture, this food chain has traditionally been replicated by catching 'forage' or 'prey' fish to feed to larger farmed fish, like Salmon, to ensure that they are healthy and rich in omega-3's. Bio-scientists have now created alternative aquaculture feed ingredients that can be produced directly from omega-3 rich marine microalgae.

Learning from living organisms and biological systems in nature

Omega-3 rich fish feed ingredients are derived from marine microalgae, which are amongst the most ancient members of the plant kingdom. One of the source crops used is the microalga *Schizochytrium* – types of which have been harvested from South American mangrove swamps and the deep North Pacific – which are high in Docosahexaenoic (DHA) and Eicosapentaenoic (EPA) fatty acids.

Algae is cultivated in closed fermentation tanks, transforming renewable, sustainable plant sugars into algae biomass containing omega-3 rich oil in a matter of days.



The benefits of ensuring a sustainable supply of omega-3 rich fish for the planet's growing population are clear."

The microalgae use sugar for energy and growth and convert the carbon in sugar into nutritious and essential fatty acids. Some algae companies extract algal oils, while others use the biomass directly as an omega-3 feed ingredient.

The first generation of these cultivation strains of microalgae has delivered DHA fatty acids for human nutrition since the mid-2000s, however they have only been affordable in high-value applications such as DHA for infant formula. The ability to produce microalgae derived omega-3 fatty acids at scale has been developed more recently, reducing production costs sufficiently to compete on price with fish oils in the fish-feed market.

Improving human lives, health and wellbeing

Omega-3 fatty acids have enormous health benefits – reducing the risk of various diseases, while in pregnancy and infancy, they help a baby's nervous system develop – and it is recommended that a healthy diet includes two portions of fish per week. The benefits of ensuring a sustainable supply of omega-3 rich fish for the planet's growing population are clear.

Reducing the impact on climate and ecosystems while growing food production

Our ocean's resources are limited, and the world's growing population cannot continue to take fish from the seas indefinitely. That is why aquaculture has a big role to play in providing a sustainable, healthy food source. However, aquaculture has to be done in a responsible, sustainable way.



Did you know?

- One ton of algal Omega-3's for aquaculture equals 40- 60 tons of forage fish. The fish can either be left in the sea to rebuild depressed stocks or used sustainably for other purposes such as food for coastal populations.
- Fish lovers live longer. A study among elderly women showed that those with the highest omega-3 status (i.e. O-3 Index) were the ones with the lowest mortality.²
- Algae is now used in over 25% of Norwegian salmon feed.³



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With many fisheries being harvested to or beyond their limits, these algal solutions help provide some relief to the pressures of overfishing. At the FAO's Rome conference (2019), the High Level Panel for a Sustainable Ocean Economy called for "responsive action from governments, financial institutions and business" to create the conditions for the ocean to supply six times more food, using smarter management of wild fisheries and the sustainable development of marine aquaculture. This can only be achieved with innovative and sustainable feed ingredients such as marine microalgae.

This case study including sources and references is available at <https://www.europabio.org/inspiredbylife/case-studies>

- ¹ See blue paper: [High Level Panel for a Sustainable Ocean Economy \(2019\) The Future of Food From the Ocean](#)
- ² See: Harris et al. *J Clin Lipidol* (2017; 11:250–259). Multivariable-adjusted risk for death from any cause, in 6501 post-menopausal women between age 70 and 85.
- ³ See article: *Undercurrent News* (04/10/2019) [Salmon Group commitment means algae now used in over 25% of Norwegian fee](#)

Sources:

- **AlgaPrime:** ['Animal & fish feed' webpage](#)
- **Veramaris:** ['Animal & fish feed' webpage](#)
- **Veramaris (2019):** [Veramaris wine f3 fish oil challenge](#)
- **Corbion (2019):** [AlgaPrime DHA Chile \[video file\]](#)
- **Corbion (2019):** [AlgaPrime DHA \[video file\]](#)
- **Ventisqueros (2017):** [Silverside – Premium Pacific Salmon \[video file\]](#)
- **Feed Navigator (02/11/2018):** [Algae-based feed effort focuses on providing sustainable, alternative ingredient](#)
- **Salmon Business (06/03/2019):** [350000 tonnes of algae based feed one of the new tools in the toolbox](#)
- **Undercurrent News (04/10/2019):** [Salmon Group commitment means algae now used in over 25% of Norwegian fee](#)
- **High Level Panel for a Sustainable Ocean Economy (2019):** [The Future of Food From the Ocean](#)

Health benefits:

- **UK National Health Service (04/12/2018):** [Fish and shellfish](#)
- **Harris et al. *J Clin Lipidol* (2017; 11:250–259).** Multivariable-adjusted risk for death from any cause, in 6501 post-menopausal women between age 70 and 85.

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