Technologies from the National Food Institute can be used to extract bioactive substances from e.g. seaweed and microalgae in a climate-friendly manner. The substances can be used in the production of food, feed, and cosmetics.

Algae. Colourbox

Seaweed and micro algae on the menu

In order to be able to produce enough food for the growing world population in the future, the National Food Institute is exploring the great potential in utilizing aquatic resources such as seaweed and microalgae for foods.

We need new ideas for food sources as the world population is growing. Naked farmland is becoming sparse, and therefore, the National Food Institute is looking under the surface of the ocean to explore the potential for growing nutritional resources such as seaweed and microalgae on a large scale.

The plants in the sea are a rich source from which omega-3 fatty acids, antioxidants, and bioactive peptides can be extracted and included in the food production and as ingredients for food and feed.

Think seaweed in new ways

For many Danes, seaweed is either a foul-smelling acquaintance on the beach or a nuisance that tickles between your toes when you get out in the waves. However, seaweed is looking increasingly like a nutrition-rich raw material in the production of food, and bladderwrack seaweed in particular can turn out to be a useful, healthy, and sustainable ingredient in foods.

"Bladderwrack contains antioxidants, and the National Food Institute has conducted research on how the antioxidants can prevent fatty acids in some foods from becoming rancid. As such, the antioxidants can give the foods a better taste," Professor and Head of Research Group Charlotte Jacobsen says. She adds: "It is essential that the foods of the future also taste good if they are to gain the consumers' acceptance and become profitable for the food industry." At the National Food Institute, a professional sensory panel working in accordance with the ISO standards assesses the taste experience.

The results show potential within the production of foods but also for inclusion in cosmetics and in the pharmaceutical industry where the natural antioxidants from bladderwrack can replace the synthetic antioxidants used by the industry today. However, more research on the antioxidants is needed before the industry can transform the Institute's results into products.

The research has also opened up opportunities for using environmentally friendly methods to extract antioxidants. Among other things, the National Food Institute has with great success used hot water under high pressure to extract antioxidants from seaweed.

Seaweed changes all year round
The researchers at the National Food Institute are carefully following the different natural phases that seaweed undergoes throughout the year in order to find the best harvest time for seaweed.

"Seaweed contains a number of positive and beneficial substances, but at some times of the year certain types of seaweed contain too much iodine to become feed or foods. At the Institute, we work with different types of seaweed and on mapping the ideal seaweed harvest time. Moreover, we are looking for methods to reduce the iodine content in seaweed," Charlotte Jacobsen says.

The small, green features of the sea
Seaweed is not the only resource that has captured the researchers' attention in the hunt for the foods of the future. There is also potential in extracting ingredients from algae which can be used in the production of foods. Therefore, the National Food Institute is exploring the possibilities of growing algae in large scale.

In a project financed by the Danish Innovation Fund, the aim is to grow seaweed in the form of brown algae in Danish and Faroese waters. Brown algae contain antioxidants, protein, polysaccharides, and minerals, and they could be interesting for the industry in relation to the production of functional ingredients in foods, feed, and skin lotions. For example, the sugar molecule laminarin has turned out to have an anti-tumour, anti-inflammatory, and anti-coagulant effect.

DTU develops technologies that enable better utilization of marine resources. These technologies include harvest, extraction, concentration, and fractionation of bioactive substances from e.g. seaweed.
Seaweed. Colourbox

Microalgae are growing at the National Food Institute

The National Food Institute grows different types of microalgae species, which promotes a strong analytical platform. Within the Institute's microalgae facility, ten different microalgae strains are growing under the best growth conditions. Here the researchers can work with the entire production chain, right from the growing phase to the final granulate.

Thanks to the facility, it is possible to test what it takes for the different types of algae to achieve the optimum content of the wanted nutrients so that they can produce new ingredients such as omega-3 fatty acids, pigments, and proteins. The aim is that the ingredients can make a positive contribution to the new foods, cosmetics, and nutraceuticals of the future.

The facilities make it possible to work with the microalgae in a very small scale, from small test tubes to large 50 litre tanks. The plant can be upscaled to 4,000 litres, and the National Food Institute has developed a drying facility that can produce microalgae meal, which the researchers can then study.

"**The ambition is** that the National Food Institute can contribute knowledge which would enable the industry to create healthy, nutritionally balanced, and sustainable foods from the ocean's resources. Globally, we must be better at utilizing the resources so that we are able to feed the growing population in the future as well."

Charlotte Jacobsen
Professor and Head of Research Group