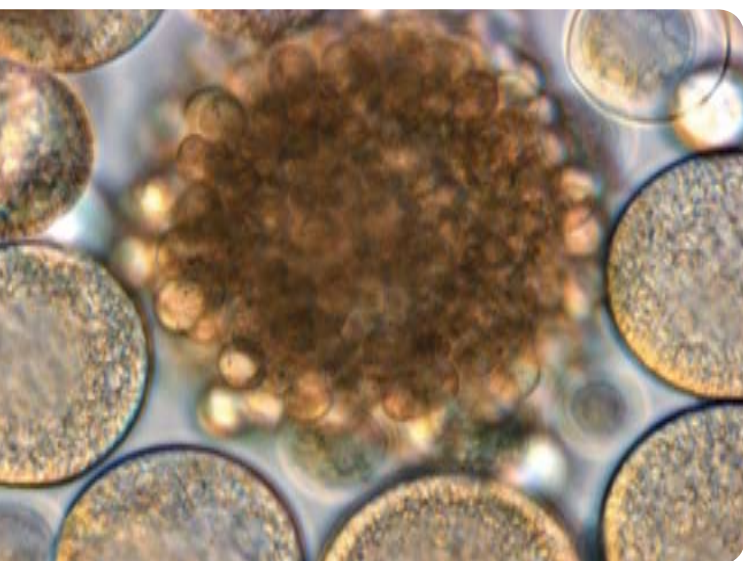


# CSIRO – Alternate sources of Omega-3 oils

Long-chain Omega-3 oils are mainly derived from seafood and play an important role in human nutrition, including development in infants. These oils are beneficial against a range of human disorders such as coronary heart disease, rheumatoid arthritis and hypertension. Against an increasing understanding by nutritionists on the beneficial effects of these oils, global fisheries are generally acknowledged to be threatened and in some case unsustainable, indicating a need for new and sustainable sources of the Omega-3 oils. New sources of these valuable oils would reduce pressure on declining fish resources worldwide and provide Australian biotechnology companies with new microalgal derived products and grain growers with new high-value crops.

The CSIRO Food Futures Flagship Omega-3 project involves research teams from Divisions based in Hobart, Canberra and other centres. In the short to mid term, single cell oil-producing microalgae are being examined, with a longer term approach involving development of high value grains and resultant oilseeds that provide substantiated health benefits to consumers.



*Thraustochytrids are a source of single cell oils. Individual species can show great diversity in cellular morphology and can occur in single cells to clusters of cells, with complex reticulate forms and motile stages also occurring.*

## Omega-3 oils from fermentation

Microalgae and other marine microorganisms are the natural Omega-3 factories of the sea. It is often not widely appreciated that fish do not make these beneficial Omega-3 oils, rather the microalgae do; the beneficial oils are then passed up the food-chain to fish, and then humans. Microalgae therefore offer a renewable source of Omega-3 oils for use in human and animal diets, depending on how well they adapt to life in large-scale culture facilities.

Marine micro organism strains which have been recently isolated by CSIRO are to be evaluated by an industry partner – Clover Corporation - for their potential to produce Omega-3 oils in large scale fermenters. Under laboratory conditions the strains are efficient producers of the valuable long chain Omega-3 oils docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) which are not produced by land plants. This research is being performed in collaboration with the Bioproducts CRC with funding from a Food Innovation Grant.

## Land plants

The Food Futures Flagship project also aims to isolate, characterise and transfer new long chain polyunsaturated fatty acids (LC-PUFA) genes from Australian microalgae to land plants. Research to date has surveyed a range of microalgal classes for their LC-PUFA profiles. A suite of desaturase and elongase genes have been successfully transferred to the model plant Arabidopsis, with EPA and DHA having been produced in seed oil, the latter for the first time. With further development, omega-3 LC-PUFA oils from higher plants – seed oil and grains - offer alternative sources of these essential PUFA for use in human nutrition, biomedical applications and aquaculture and other feeds.

The incidence of type-II diabetes, colorectal cancer and cardio-vascular disease is increasing rapidly in developing nations. Therefore, these novel grains may provide significant health benefits to these nations, while opening up further market opportunities for Australia. Such novel grains are more suited to the needs of the processing industry and address growing consumer demands for healthy foods and raw ingredients. For the rural economy, they provide the opportunity for Australian farmers to move away from the intensely competitive, low price end of the grain market. They will allow Australian farmers to be among the first primary producers to capture emerging, high-value market niches.

*more info:*

<http://www.csiro.au/csiro/content/standard/ps3u,,.html>

<http://www.csiro.au/csiro/content/standard/pspx,,.html>