



1 *The CCCryo is a life culture collection for cold-adapted algae and other cryophilic organisms.*

CCCRYO – CULTURE COLLECTION OF CRYOPHILIC ALGAE

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You can browse our online-catalogue at
cccryo.fraunhofer.de

Motivation

Novel ingredients for the cosmetics, functional food and feed supplements sector, special fine chemicals and enzymes – new bioresources for natural and innovative ingredients increasingly are sought-after.

Solution

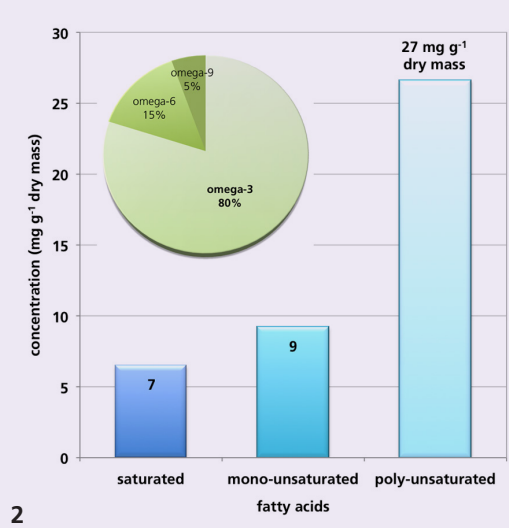
The algal collection CCCryo hosts a broad range of microalgae, cyanobacteria, eubacteria, fungi and mosses from polar and high alpine regions of our earth. The strains have been isolated from field samples collected during several expeditions. The CCCryo is a unique bioresource and exceptional in its diversity. With this unique character it offers innovative companies an exceptional source for novel raw materials and ingredients for their products in development.

Facts

To-date the collection comprises more than 400 strains in 127 species from 75 genera. In parts, these strains already have been characterised with regard to their metabolites and growth requirements. Further strains are continuously under investigation.

Advantages

With production strains or products from our collection CCCryo you will have a unique selling feature in your portfolio.



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Background

Polyunsaturated fatty acids (PUFA) such as the omega-3 fatty acids Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA) are essential constituents of the human diet. Often they are also supplemented in feed for aquaculture. Until now marine fish were the natural source for human consumption, yet this resource becomes increasingly rare and the demand for respective food supplements rises. However, those fish oil capsules as well as food and feed enriched with EPA or DHA also contain omega-3 fatty acids extracted from fish by-catch or clippings, which also diminish. In future there will be an increasing demand for alternative bioresources for PUFA.

Product example

Microalgae are an alternative and natural resource for these essential fatty acids. They are the primary producers of EPA, DHA and many other polyunsaturated fatty acids, and they pass these on to crayfish, fish, and finally the human within the natural food web. Thus, they are an ideal alternative source to fish, also because microalgae can be grown on an industrial scale under controlled conditions and free from pollutants.

production of Nervonic acid next to the omega-3 fatty acid EPA.

Our various cryophilic algal strains offer very different and interesting fatty acid patterns. They are also ideal production strains for the cooler climates in Europe, as no extra energy has to be invested in heating and illumination of respective photobioreactor plants.

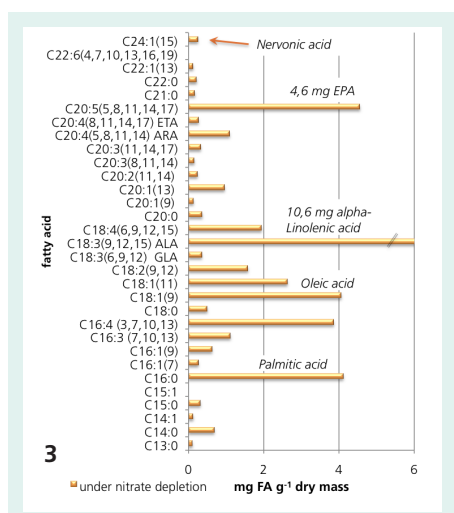
Unsaturated fatty acids from cryophilic microalgae

Due to their natural environment the cryophilic microalgae from the CCCryo are well adapted to low temperatures and low light and nutrient conditions. Especially their adaptation to freezing temperatures demands a distinct fatty acid metabolism, as the fluidity of cell membranes has to be maintained under these cold conditions to retain them physiologically permeable and flexible. In addition nutrient limitation results in an increased lipid production to serve as an energy storage (Fig. 1 N-).

This CCCryo strain was isolated from a permafrost soil sample. Polyunsaturated fatty acids amount to 27 mg per g dry mass (Fig. 2) with the omega-3 fatty acids representing 80 % of all fatty acids. The total fatty acid contents reaches approx. 40 mg per g dry mass (Table). One gram of dry mass contains approx. 4,6 mg EPA. The fatty acid spectrum of this alga is shown in Figure 3. An interesting aspect is the

Further services

- Sale of algal strains for your exclusive use
- Mass culture and processing of algal biomass according to your specifications (fresh and dry biomass, DNA, RNA, cDNA-syntheses, protein extracts)
- Fatty acid analyses by gas chromatography (GC-FID)
- Element analyses (carbon, nitrogen) by an element analyser
- Cryopreservation and backup of your valuable production strains at the Fraunhofer IZI-BB cryobank at Potsdam (near Berlin)
- 2-day courses in cryopreservation methods



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Specific values for fatty acids

| | |
|------------------------------|---------------------------|
| EPA content | 4.6 mg g ⁻¹ DM |
| EPA in proportion to all FA | 14 % |
| omega-3 FA content | 17 mg g ⁻¹ DM |
| omega-3 proportion to all FA | 45–50 % |
| Total fatty acid content | 38 mg g ⁻¹ DM |
| PUFA in proportion to all FA | 63–68 % |

1 Under nitrate depletion (N-) large lipid globules are produced, none, however, under a sufficient provision with nitrate (N+).

2 Proportions and concentrations of different fatty acid groups.

3 Fatty acid spectrum of a cryophilic permafrost alga from the CCCryo.