



Fraunhofer Institute for Cell Therapy and Immunology, Branch Bioanalytics and Bioprocesses IZI-BB

CCCRYO – CULTURE COLLECTION OF CRYOPHILIC ALGAE

You can browse our online-catalogue

cccryo.fraunhofer.de

Motivation

There is an increasing demand for biobased ingredients for the cosmetics, functional food and feed supplements sector, special fine chemicals and enzymes – new bioresources for natural and innovative substances are needed.

Solution

The algal collection CCCryo hosts a broad range of algae, cyanobacteria, fungi and mosses from extreme polar and high alpine regions of our earth. The strains have been isolated from field samples collected during several expeditions to the Arctic and Antarctic. The CCCryo is a unique bioresource and exceptional in its diversity. With this unique character, it offers innovative companies an exceptional bioresource for novel raw materials and ingredients for their new product developments.

Facts

To-date the collection of microalgae, cyanobacteria, mosses, fungi and bacteria from extreme environments comprises more than 520 strains in 177 species from 101 genera. In parts, these strains already have been characterised with regard to their metabolites (pigments, UV-protectants, fatty acids, extracellular polymers (EPS), extremozymes et al.) and growth requirements. Further strains are continuously under investigation. We own full rights on the strains.

Advantages

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

Product example

Polyunsaturated fatty acids (PUFA) such as the omega-3 fatty acids Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA) are essential constituents of our 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, fish oil capsules as well as food and feed enriched with EPA or DHA 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.

Solution

Microalgae are a perfect natural source for these essential fatty acids. They are the primary producers of EPA, DHA as well as of carotenoids/astaxanthin 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.



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

Unsaturated fatty acids from cryophilic microalgae

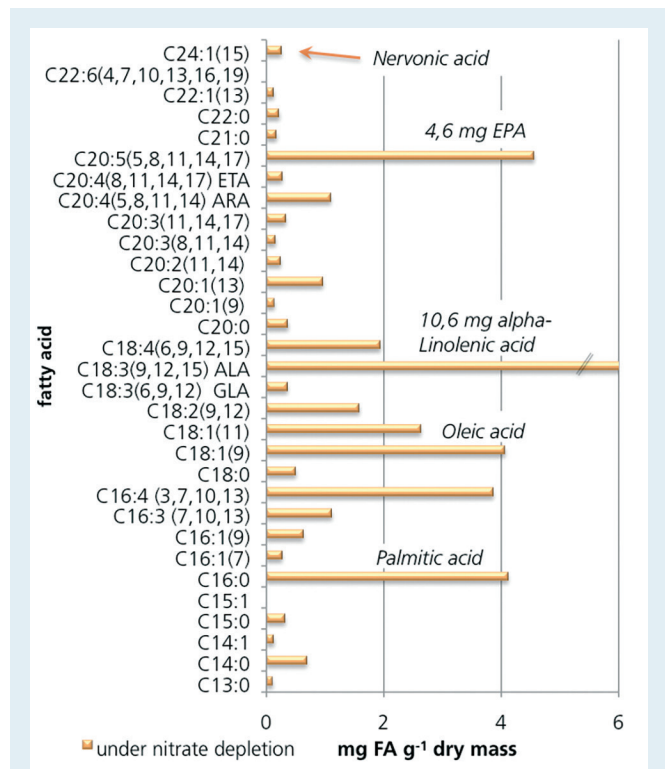
Due to their natural environment the cryophilic microalgae from the CCCryo are well adapted to low temperature, light and nutrient conditions. Especially their adaptation to freezing temperatures demands a distinct fatty acid metabolism, as cell membrane fluidity has to be maintained under these cold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

This CCCryo strain was isolated from a permafrost soil sample. Polyunsaturated fatty acids in total amount to 27 mg per g dry mass 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. One gram of dry mass contains approx. 4.6 mg EPA. The fatty acid spectrum of this alga is shown in the right figure. An interesting aspect is the 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.

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)
- Cryopreservation and backup of your valuable production strains at the IZI-BB cryobank at Potsdam (near Berlin)
- 2-day courses in cryopreservation methods



Specific values for fatty acids (FA)

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 %

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Culture Collection
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