

# **Enzymatic Oil Extraction from the Copepod *Calanus finmarchicus***

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There has been a large increase in the demand for oils containing the unique long chain n-3 PUFA, EPA and DHA, both from the aquaculture feed industry and from the nutraceutical and functional food industries. The limited amount of available oils has led to extensive search for alternative sources of oils rich in long chain n-3 PUFA. These fatty acids in the fish oil originate from marine phytoplankton and one possibility is to harvest on resources lower in the marine food web such as zooplankton. The zooplankton *Calanus finmarchicus* is present in large amounts in the North Atlantic and lipid rich stages can be harvested by trawling in the late spring and summer months.

The main object of this study was to investigate if the use of food grade proteolytic enzymes, Alcalase® and Flavourzyme®, could improve oil recovery in an industrial-like process, and to characterize oil obtained from *C. finmarchicus* with respect to lipid classes and fatty acid composition.

The results showed a substantial higher oil yield with the use of proteolytic enzymes compared to standard fish oil production technology. The improved oil recovery was reflected in lower lipid content in the press cakes and protein concentrates compared to the control. The fatty acid composition of the oil from *C. finmarchicus* had a high content of n-3 PUFA (36 % of the total fatty acids) comprising mainly of stearidonic acid (18:4n-3), EPA and DHA. Wax esters were the dominating lipid class in the oil. The free fatty acids (8 %) probably originate from degradation of phospholipids by endogenous enzymes during harvest and subsequent frozen storage, and possibly also during the applied production process.

Using enzyme technology for improved extraction yield of lipids from zooplankton is a safe and more environmentally friendly alternative to organic solvents extraction that have safety concerns and recycling costs. The results from this study demonstrated that treatment with food grade proteolytic enzymes clearly improves the lipid extraction from industrially harvested *C. finmarchicus*, and may be implemented as an industrial process.