

Enzymatic Production and NMR Assessment of Omega-3 Concentrates

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The therapeutic and health-promoting effects of fish oil and omega-3 fatty acids are well known, and blood levels of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are considered important health biomarkers. Not surprisingly, there has been an increasing demand for EPA and DHA concentrates thus creating the need for the development of effective concentrating technologies. Two enzyme-driven omega-3 concentrate producing technologies were developed at Ocean Nutrition Canada laboratories and transferred in different variants to the manufacturing scale. The first methodology was based on the enzymatic coupling of the omega-3 fatty acid (or omega-3 ethyl ester) concentrates with glycerol. The second methodology was based on the selective removal of saturated fatty acid residues from triglyceride entities of fish oil, followed by reesterification of the generated diacylglycerides with EPA or DHA donors in the presence of *Candida antarctica* lipase B. A powerful ¹³C NMR method was developed to investigate the positional distribution of EPA and DHA residues in the original and reconstituted triacylglyceride oils, and the positional distribution of these in the corresponding concentrates. The NMR structural assessment revealed differences between the natural and reconstituted triacylglyceride oils. The data and experience obtained from these investigations have laid the groundwork for stability and bioequivalence studies of EPA/DHA rich oils and the corresponding concentrates.