

AA-Structured Triacylglycerols from Arasco® Oil

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Arachidonic acid (AA, 20:4 n -6) is a fatty acid (FA) belonging to the n -6 polyunsaturated FA (PUFA) family. In the human metabolism, AA is synthesized *via* the precursor linoleic acid (LA, 18:2 n -6). AA is considered as conditionally essential, being located predominantly in the structural lipids of the cell and intracellular membranes. Both AA and docosahexaenoic acid (DHA, 22:6 n -3) are the mayor long-chain polyunsaturated fatty acids (LC-PUFAs) in the brain and retina. AA acts as precursor of prostanoids (prostaglandine E₂, prostaciline I₂, tromboxane A₂), and leukotrienes (serie 4).

Nowadays, there is consensus on the need of supplying both AA and DHA in infant formulas. As they appear mainly as triacylglycerols (TAGs) in human breast milk, they are usually added in this form when infant formula fortification is carried out. Moreover, structured TAGs (STAGs) containing medium-chain FAs in *sn*-1,3 position and long-chain FA in *sn*-2 position (MLM-STAGs) have been suggested as a suitable dietary source to improve the digestibility and absorption of LC-PUFAs. In this regard, the synthesis of structured MLM-STAGs containing AA as LC-PUFA has been reported in few works, although when natural oil sources were used, a mixture of desired and undesired TAGs was obtained. Until now, high purity of the desired STAG was only achieved by employing commercial sources of pure AA.

In this work, STAGs have been synthesized from an AA-enriched TAG fraction previously purified from ARASCO® oil, and coconut oil as medium-chain FA donor. A three-step process was performed comprising: i) ethanolysis of coconut oil, by employing *Termomyces lanuginosus* lipase, ii) ethanolysis of an AA-enriched fraction by *Candida antarctica* lipase and iii) esterification of the products obtained in the previous steps. Three different lipases from *Rhizomucor miehei*, *Rhizopus oryzae* and *T. lanuginosus* have been tested in the esterification step. The whole process has been designed in agreement with commercial laws about solvent safety.