Response Surface Modeling of Lipase-Catalyzed Production of Human Milk Fat Substitutes rich in Omega-3 Polyunsaturated Fatty Acids

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Human milk fat presents a unique triacylglycerol structure since palmitic acid, the major saturated fatty acid (20-30%), is mostly esterified at the internal position of the triacylglycerols, while unsaturated fatty acids, namely oleic (30-35%) and linoleic (7-14%) acids are esterified at the external positions. The incorporation of omega-3 polyunsaturated fatty acids (omega-3 PUFA) in human milk fat substitutes (HMFS) has known benefits in the development of brain and nervous system of infants.

In this study, modelling of interesterification of tripalmitin with omega-3 PUFA, aimed at the production of HMFS, catalyzed by the commercial immobilized preparation of *Rhizomucor miehei* lipase (Lipozyme RM IM, Novozymes De) was carried out in solvent-free media, as a function of molar ratio tripalmitin:omega-3 PUFA (1:2 to 1:4) and reaction temperature (58ºC to 72ºC). A full factorial design with the repetition of the centre point was followed. Omega-3 PUFA incorporation increased with both temperature and molar ratio. Further experiments were carried out at 70ºC using molar ratios up to 1:9. An increase of omega-3 PUFA incorporation was observed for increasing molar ratios.