

Identification of a Very Long-Chain Polyunsaturated Fatty Acid Δ 4-Desaturase from the Microalga *Ostreococcus lucimarinus*

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Ostreococcus lucimarinus is a close relative of the microalgal species *Ostreococcus tauri* which has been shown to harbour an acyl-CoA-dependent desaturase and which contains remarkably high amounts of the very long-chain polyunsaturated fatty acid docosahexaenoic acid (DHA, 22:6(n-3)). DHA is synthesized from 18:3(n-3) via consecutive desaturation and elongation cycles in which Δ 4-desaturation displays the last enzymatic activity required. Here we describe the identification of a cDNA coding for a Δ 4-fatty acid desaturase which exhibits a cytochrome b₅ domain fused to its N-terminus and three histidine boxes that are typically found in front-end desaturases. Heterologous expression of the partly codon-optimized version of the cDNA in *Saccharomyces cerevisiae* revealed that the encoded protein catalyzes the conversion of 22:5(n-3) into 22:6(n-3). In the future, the identified enzyme might be used together with already known desaturases and elongases for production of DHA in plants.