

Oil producing diacylglycerol acyltransferases encoded by the genome of oleaginous microalga *Nannochloropsis oceanica* – functional analysis and biotechnological applications

SUMMARY

Single cell photosynthetic microalgae are considered as promising, sustainable biofuel feedstock because they can produce more biomass on a few percent of arable land when compared to land plants. This biomass can be directly used as fuel or converted into different kinds of energy. Oleaginous microalgae are tiny oil factories. Under stress (like nitrogen deprivation), they are able to produce massive amounts of oil (from 20% to 50% of their mass). This oil is produced mainly in the form of triacylglycerol (TAG), which is a valuable precursor of biodiesel. The proposed project aims at deciphering the role of extremely abundant enzymes directly involved in the final steps of TAG synthesis – diacylglycerol acyltransferases (DGATs). The experimental model in the proposed research will be *Nannochloropsis oceanica*. This green oleaginous microalga produces very high amounts of oil under stress and its genome contains extremely high number of DGATs genes, reaching 13 copies, meanwhile most of living organisms contains only few of them (from 1 to 5). This proposal is a continuation of a previous EU-funded project – *AlgaeOilSynth* (no. 627266) and will include functional analysis of all the mentioned DGAT-encoding genes by using advanced genome editing (CRISPR/Cas9) as well as diverse molecular and biochemical approaches. The obtained results will widen our knowledge on oil synthesis in oleaginous microalgae and will indicate novel directions in genetic engineering aiming towards faster development of biofuel-oriented industry.