

Microalgae biofuel: from genomics, genetics to energy dense molecules

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Algae are considered as one of the most promising platforms to produce sustainable liquid biofuels. However, biofuel production from microalgae is not yet commercially viable and requires a deeper understanding of the pathways of fatty acid synthesis, lipid assembly and oil degradation in microalgae. Beyond biofuels, research on these pathways will be useful for harnessing the production of high value added lipids in microalgal cells. In this communication, I will first summarize our major current genetic and physiological strategies aimed at not only increasing oil content per cell but also not compromising lipid productivity. Insights gained through mutant studies highlight the tight integration of lipid metabolic pathways to general cellular metabolisms across several subcellular compartments in *Chlamydomonas*. Secondly, I will present our attempts to engineer lipid metabolism through gene expression in the plastid genome of *Chlamydomonas*. Future directions on engineering lipid metabolism through a synthetic biological approach will be discussed.

Keywords: *Chlamydomonas reinhardtii*; Light; Lipid catabolism; Oil content; Genetic engineering