

# Development of an efficient hydrocarbon producing algae by genetic modification of the genome

## Project Leader:

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## Objective:

Ethanol is a first-generation biofuel generated from starch or cellulose by fermentation, while hydrocarbons accumulated in algal cells are second-generation biofuels. We intend to develop a system in which useful hydrocarbons are produced efficiently by algae, thus creating an alternative energy resource to oil. For this, we will breed high-quality algae using molecular genetics. *Botryococcus braunii* is a colony producing green alga that has the characteristics necessary for this purpose.

## Project Outline:

- (1) Analysis of expression levels of MEP genes by second generation DNA sequencer to detect the limiting step in the squalene synthesis.
- (2) Cloning of the cDNA, and generating expression construct for the over expression of the gene in *Botryococcus braunii* and *Chlamydomonas reinhardtii*.
- (3) Repression of the byproduct pathways by the artificial micro RNA method to increase the squalene synthesis.

## References:

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- (2) Park S-H, Ohama T (2009) Biotransformation of a herb plant metabolite by a cell disruptant of *Chlamydomonas reinhardtii*. *Biosci. Biotechnol. Biochem.* 12, 2803-2805.
- (3) Ohama T, Inagaki Y, Bessho Y, Osawa S (2008) Evolving genetic code. *Proc. Jpn. Acad. (Ser B)* 84:58-74.
- (4) Yamasaki T, Miyasaka H, Ohama T (2008) Unstable RNAi effects through epigenetic silencing of an inverted repeat transgene in *Chlamydomonas reinhardtii*. *Genetics* 180:1927-1944.
- (5) Kurokawa S, Yamasaki T, Komatsu T, Watanabe KI, Ohama T (2006) Degenerated recognition property of a mitochondrial homing enzyme in the unicellular green alga *Chlamydomonas smithii*. *Plant. Mol. Biol.* 62: 141-150.

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