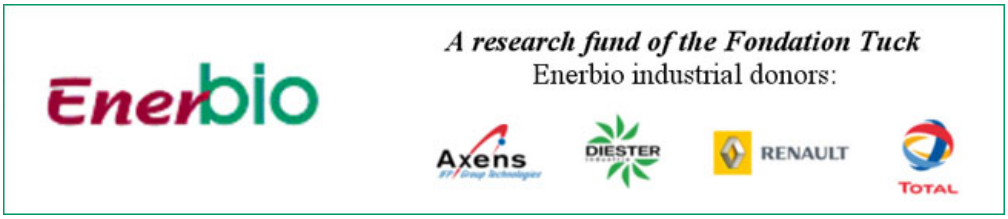
PHOTOPROD : Metabolic engineering of cyanobacteria for the photoproduction of ethanol



PROJECT 2010

Title of the project	**Metabolic engineering of cyanobacteria for photoproduction of ethanol**
Acronym	PHOTOPROD
Coordinator	CNRS URA 2096, Bat 142 , CEA-Saclay, 91190 Gif sur Yvette *Responsable scientifique : Corinne Cassier-Chauvat*
Partners	Laboratoire de Biologie Intégrative (LBI), iBiTec-S, CEA-Saclay, Bat 142, 91190 Gif sur Yvette *Responsable scientifique : Franck Chauvat* Laboratoire d'Etude du Métabolisme et du Médicament (LEMM), iBiTec-S, CEA-Saclay, Bat 136, 91190 Gif sur Yvette *Responsable scientifique : Christophe Junot*
Duration	Two years 2010-2012

Summary

Production by cyanobacteria, the robust very-abundant photosynthetic microorganisms, of renewable biofuels from nature's most plentiful resources : solar light, water, mineral salts and CO2, is of great public interest in allowing to recycle CO2 and save arable soils for crops production. However, cyanobacteria lack of some of the biofuels producing enzymes, emphasizing that an "ideal" photosynthetic organism for the production of bio-energies does not exist. Consequently, our 25-years experience in genetics and physiology of cyanobacteria will be used to construct promiscuous metabolic engineering cassettes for biofuel production, and test them in various favorable cyanobacteria to select a powerful cyanobacteria factory.

Practically, two metabolic engineering cassettes will be constructed for high-level photoproduction of ethanol and isobutanol. The resulting vectors will be introduced and tested in various cyanobacteria with different natural advantages. *Synechocystis* PCC6803 will be used because it possesses a promising alcohol dehydrogenase enzyme, it naturally produces abundant PHB (biodegradable plastics) and because many oxidative-stress resistant mutants that should tolerate high-level alcohols production, have been constructed.

Synechoccus PCC 7002 will be tested because it grows well on glycerol, a cheap surplus of industries that might facilitate mass cultivation for large-scale biofuels production.

Synechoccus PC 7942 will also be tested because it could be reprogrammed for the weak and transient production of alcohols.

The main deliverables of the project will be :

promiscuous metabolic engineering cassettes ;
effective cyanobacterial factories for high-level photoproduction of alcohols ;
a better understanding of the cyanobacterial metabolism that also holds promises for the production of bioplastics and therapeutics.

Contact

Corinne Cassier-Chauvat
CNRS URA 2096, Bat 142 , CEA-Saclay, 91190 Gif sur Yvette
Tel : 01 69 08 35 74
corinne.cassier-chauvat@cea.fr