

SEMINAR

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Hosted by: Dr JI Lianghui

Metabolic Engineering of Oleaginous Yeast

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Doctor d'Etat ès Science in 1986 at University of Technology of Compiègne, France, Jean-Marc Nicaud is Research Director at the French National Institute for Agricultural Research, (INRA) since 2014. He is responsible of the BIMlip Team (Biology integrative of the microbial lipidic metabolism at the MICALIS institute (UMR1319 INRA AgroParisTech, Food and Gut Microbiology for human Health institute), Jouy-en-Josas, France.

Currently, its research activities relate to the integrative biology of the lipid metabolism (pathways for accumulation, modification and the degradation of the lipids, ...) in yeasts with an expertise in metabolic engineering for the production of lipids for application in white biotechnology. The BIMlip team undertakes a fundamental approach to systems biology of lipid metabolism of oleaginous yeasts. The team uses the knowledge for applications in biofuels, bio-lipids, bioplastics and white chemistry.

Currently, the most popular oleaginous yeast species for lipid production are *Lipomyces starkeyi*, *Rhodospiridium toruloides* and *Yarrowia lipolytica*. Among these species, *Yarrowia lipolytica* is a non-conventional oleaginous yeast model for fundamental and applied studies on lipid metabolism. *Y. lipolytica* is the only yeast for whom a large outfit of tools is available: a well-curated genome, efficient genetic tools, a recent lipid metabolism model of fatty acid transport and activation, and several genome scale models.

Production of biolipids and derivatives using microorganisms is the most promising alternative to petroleum-based chemistry. However, the production costs depend on the substrates costs. Therefore, efforts to use inexpensive carbon sources have been initiated. Several groups have focused on both, the genetic improvement of the *Y. lipolytica* ability to accumulate high amounts of biolipids and the genetic modifications required for increasing the substrate range that could be used by *Y. lipolytica*. A review of the latest advances made for expanding the substrate ranges will be presented.

Recent Publications:

1. Guo ZP, Duquesne S, Bozonnet S, **Nicaud JM**, Marty A, O'Donohue MJ. (2015) Development of cellobiose-degrading ability in *Yarrowia lipolytica* strain by overexpression of endogenous genes. *Biotechnol Biofuels*. 8:109
2. Ledesma R., Dulermo T, **Nicaud JM** (2015). Engineering *Yarrowia lipolytica* to produce biodiesel from raw starch. *Biotechnology for Biofuels*, 8:148.
3. Lazar Z, Gamboa-Meléndez H, Cruz-Le C A-M, Neuvéglise C, **Nicaud JM** (2015) Awakening the endogenous Leloir pathway for efficient galactose utilization by *Yarrowia lipolytica*. *Biotechnology for Biofuels*, 8:185. DOI: 10.1186/s13068-015-0370-4