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Study on physiology of *Yarrowia lipolytica* yeast to use lignocellulosic biomass as a carbon source for lipid biosynthesis

In 2022, the global population exceeded 8 billion. Such a large population requires increasing amounts of food, energy and availability to drinking water. In the light of the decreasing reservoirs of fossil fuels and related with that economic and geopolitical problems, it is necessary to search for an alternative. Biofuels can be such a substitute. Nowadays, for biodiesel production the vegetable oils such as rapeseed oil are used. However, this is ethically questionable as a significant amount of arable land is used for non-food purpose. Whereas, the production of biofuels by microorganisms, is a part of actions based on sustainable development, which protects the natural environment, without reducing the quality of people life now and in the future.

The solution to this problem may be produced by microorganisms a microbial oils, which are perfect for the production of biodiesel and other important substances. The yeast *Yarrowia lipolytica* is such an oleaginous organism, characterised by high metabolic potential and application possibilities. These non-pathogenic yeast has an extraordinary capability to produce lipids, that can be used for the production of biofuel. The yeast, like any heterotrophic organism, needs a source of carbon and energy, currently used substrates - such as glucose, are expensive, which is not beneficial in industrial production. The aim of the project is to use waste plant biomass, containing huge amounts of organic carbon as a “food” for yeast. Before we can use plant biomass to produce biofuel, we need to study the physiology of oleaginous yeasts and modify them to ensure that the process meets the conditions of efficiency, ecology and economy.

Due to a wide range of molecular tools, the genetic modifications can be introduced, modifying activity of metabolic pathways, results in yeast able to utilizing a previously unavailable carbon source and tolerate stressful conditions. This provides an excellent field for basic study to answer the question of the effects of alternative raw materials on yeast cell metabolism. Due to the possibilities given by synthetic biology, combined with the development of research on basic metabolism, it will be possible to create a "microbial cell factory" based on yeast, which will combine the development of waste plant biomass with the production of valuable chemicals, such as biofuels. Introducing bioproducts obtained with the help of microorganisms into everyday life in the future is a response to the increasing requirements for the sustainable development of our civilization.