Max-Planck-Innovation

Technology Offer

Method of producing autotrophic microorganisms with altered photorespiration and improved CO_2 fixation

Ref.-No.: 0706-5602-IKF

Background

Biological fixation of CO_2 is an important process carried out by plants and several microorganisms, which can be harnessed for sustainable, biobased production of fuels and chemicals. Particularly, the fixation of CO_2 by autotrophic microorganisms such as cyanobacteria and microalgae can be employed for converting CO_2 into value-added products, such as commodity chemicals or fuels. However, the sustainable autotrophic production of chemicals and fuels is still limited due to the low growth rate, productivity and energy conversion efficiency of autotrophic microorganisms.

Technology

Scientists from the Max-Planck-Institute for Terrestrial Microbiology have developed autotrophic microorganisms with altered photorespiration, which is projected to increase growth rate, productivity and energy conversion efficiency of these organisms.

The invention bypasses the naturally occurring photorespiration pathways in autotrophic microorganisms with the ß-hydroxyaspartate cycle (BHAC). In ubiquitous marine Proteobacteria, the BHAC enables the production of oxaloacetate from glyoxylate through four enzymatic steps, representing an efficient glyoxylate assimilation route. In contrast to the natural photorespiration pathways no CO_2 is released, no ATP and only 1 equivalent of NADH is required. The BHAC represents a CO_2 neutral photorespiration bypass with the least amount of required reducing equivalents and the regeneration of the catalytic amino donor, which makes it the most efficient glyoxylate assimilation pathway described to date.

We are looking for a collaboration partner to further develop this exciting project.

Patent Information

A PCT application was filed on 15.04.2019.

Literature

Schada von Borzyskowski, Lennart et al. Nature. 2019, doi:10.1038/s41586-019-1748-4

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