

Bioengineered Microorganisms that can "Eat" (Fix) CO₂ (Yeda)

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Summary

Biomass production by plants and other photosynthetic organisms involves carbon fixation, the process of incorporating inorganic carbon dioxide into organic compounds. Currently carbon fixation by plants and other photosynthetic organisms is the limiting factor in biomass production. Improvement in the metabolic pathway related to carbon fixation would have great value in increasing crop yields, synthesizing high value compounds in algae, and developing means in removing CO₂ from the atmosphere to combat climate change. The present technology is an engineered E. coli with a carbon fixation pathway. The unique innovation can be used to efficiently screen the activity of RuBisCO, the most abundant carbon fixing enzyme on earth, which is further applicable to improving biomass production in different photosynthetic organisms such as plants and algae.

Applications

Powerful platform for screening and improving various enzymes in the carbon fixation process. Unique metabolic pathway for use in Synthetic Biology applications. Possible Carbon Credits for developing improved means of carbon fixation.


Advantages

E. coli is **fast** growing and easily manipulated by various **genetic tools**. **Novel** source of biomass production. Potentially **low cost** R&D system.

Technology's Essence

The technology functions by the recombinant insertion of two enzymes from the Calvin-Benson-Bassham (CBB) into E. coli, kinase prk and the carboxylating enzyme RuBisCO. With further modifications, the engineered E. coli's metabolism was divided into two subsections. First a carbon fixing metabolism that can incorporate inorganic CO₂ into sugar production, the second subsection consumes organic pyruvate to produce energy to drive the aforementioned carbon fixing cycle. Subsequently the technology is overall carbon neutral, but is an inexpensive and fast platform for screening improvements in the CBB carbon fixation pathway.

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