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Photosynthetic Production of Acyl-CoAs as Precursors for Ethyl Ester Synthesis & Other Chemicals

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Petrochemical sources for industrial feedstocks and fuels is finite, thus a shift toward alternative and renewable sources continues to be a high priority in the US and around the world. Photosynthetic microorganisms, such as cyanobacteria, are one such potential source. These microorganisms have been extensively studied and different pathways genetically altered to produce a variety of useful products and alternative sources of energy.

Researchers at Arizona State University have introduced an orthogonal heterologous pathway to produce activated acyl-CoAs utilizing a fatty acid synthase type I (FAS I). This functional FAS I is introduced into a photosynthetic host and can be used to produce ethyl esters or a variety of chemicals if coupled with additional conversion enzymes. Not only are ethyl esters a great source of biofuels, but they are also precursors to many products that are widely used in the food and chemical industries. Because the orthogonal FAS type I pathway may be outside the control mechanisms of the cell, productivity may be increased, and inhibition eliminated.

These methods for expressing functional bacterial type I fatty acid synthase in a photosynthetic host could provide alternative means to produce biofuels and other important chemicals in a sustainable and economical manner.

Potential Applications

- Photosynthetic production of ethyl esters
  - Biofuels and lubricants
  - Precursors for compounds used in the food and chemical industries such as fragrances, surfactants, solvents, etc.

Benefits and Advantages

- Can be used with any photosynthetic host

- Could reduce the reliance on petrochemical feedstocks
- The orthogonal FAS type I pathway may be outside the control mechanisms of the cell, improving productivity and eliminating inhibition
- Could be of use for the production of a variety of products

For more information about the inventor(s) and their research, please see

Dr. Vermaas' departmental webpage

Dr. Vermaas' Institute webpage