NREL Highlights

SCIENCE

NREL Discovers Novel Protein Interaction in Green Algae that Suggests New Strategies to Improve Hydrogen Photoproduction

Research team uncovers previously unknown role for a second algal hydrogenase that may result in strategies to improve the H_2-producing capabilities of green algae.

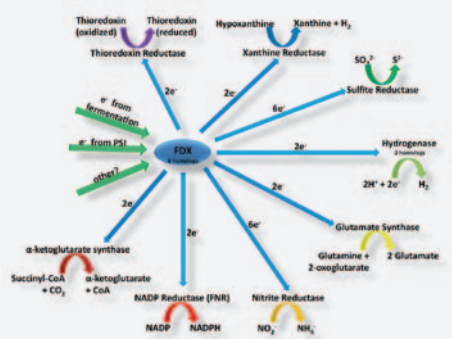
A research team at the National Renewable Energy Laboratory (NREL) discovered a specific interaction between the protein ferredoxin—responsible for distributing reductants from photosynthesis to different metabolic pathways—and the HYDA2 hydrogenase, suggesting a role for HYDA2 in photohydrogen production.

Hydrogen holds the promise of providing the world with an inexhaustible clean fuel, particularly when produced from renewable sources such as photobiological water splitting.

NREL has been working on green algal photohydrogen production for more than 15 years. About 10 years ago, the NREL research team discovered that green algae not only encoded and expressed the well-known [FeFe]-hydrogenase HYDA1, but also a second [FeFe]-hydrogenase, HYDA2. Although HYDA2 was shown to produce hydrogen in vitro, its role in biological metabolism has remained unknown.

Recently, NREL detected a specific interaction between HYDA2 and ferredoxin, the protein responsible for shuttling reductant from the photosynthetic electron transport chain to the hydrogen-producing catalyst. This was accomplished through the Yeast Two-Hybrid Assay, which detects strong interactions between two sets of proteins (baits and preys), and it has been confirmed by specific assays using selective growth media.

This research is an important step toward better understanding the flow of reducing equivalents between pathways that lead to hydrogen production and pathways that do not. It suggests strategies for improving the efficiency of algal photohydrogen production, which shows tremendous promise.



Key Research Results

Achievement

NREL detected an interaction between the HYDA2 hydrogenase in a green algae and the ferredoxin that play a key role in shuttling electrons from photosynthesis to different pathways.

Result

The discovery of a likely function of the HYDA2 enzyme in photohydrogen production could lead to optimally engineered hydrogen-producing algae.

Potential Impact

Boosting the rate of hydrogen production from green algae could lead to a cost-effective, low-land-use renewable fuel.

NREL
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