Harvesting Solar Energy: Hydrogen production by a semi-artificial photo-system (Ramot)

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The Technology

An artificial ferredoxin-hydrogenase fusion enzyme (Fd-HydA) has been developed for the production of hydrogen gas in algae. The Fd-HydA fusion enzyme interferes with the formation of the naturally occurring ferredoxin-sugar production pathway in photosystem I (PSI) complex and shuttles the donated electrons directly to the hydrogenase as shown in in vitro studies. Preliminary expression of Fd-HydA in algae supports hydrogen production.

Stage of Development

- Fd-HydA fusion enzyme has been constructed and expressed in E. coli and evidence of electron transfer has been demonstrated in vitro
- Fd-HydA fusion protein increases rate of hydrogen photoproduction by 400% in vitro
- Fd-HydA fusion protein has specific activities of 3000 U (U = 1 μmol hydrogen mg−1 min−1) for hydrogen evolution from reduced methyl viologen (MV).
- Fd-HydA fusion enzyme is expressed and active in alga (preliminary work).

These results suggest a new direction for improvement of biohydrogen production and a means to further resolve the mechanisms that control partitioning of photosynthetic electron transport.

Patent Status

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