Effects of Artificial Algal-Bacterial Symbioses (E. coli K-12, C. fruendii, & E. coli MC4100) on Microbial Hydrogen Production

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Climate change is a very current and real problem, and the most effective way to combat it would be to switch energy production from unsustainable fossil fuels to sustainable, renewable energy sources. One promising opportunity is hydrogen, as it burns clean and has high energy per volume. However, producing it is currently done via steam methane reformation which cuts into hydrogen's benefits because it produces CO2; in order to form a hydrogen economy, a clean way of producing hydrogen has to be developed. Various microbes produce hydrogen as a result of their biological processes, and these processes (along with inter-microbial dynamics and relationships, like symbiosis) can be exploited for human benefit. The purpose of this experiment is to further research the potential of algal-bacterial symbiotic cultures on increasing hydrogen production when compared to either organism alone. The hypothesis is "If hydrogenases are inhibited by higher oxygen levels and aerobic bacteria consume oxygen, then the symbiotic cultures will produce increased levels of hydrogen." Both pure algal and pure bacterial cultures were maintained and then combined and their H2 production analyzed via titration. With a p value < .05, the results are significant, and show all three bacteria are effective aerobic symbioses in enhancing hydrogen production.. This information could be expanded upon and used to optimize microbial hydrogen production to the commercial scale, a step this field needs to take.