Engineered bacterium inhales carbon dioxide and hydrogen and excretes fuel alcohols

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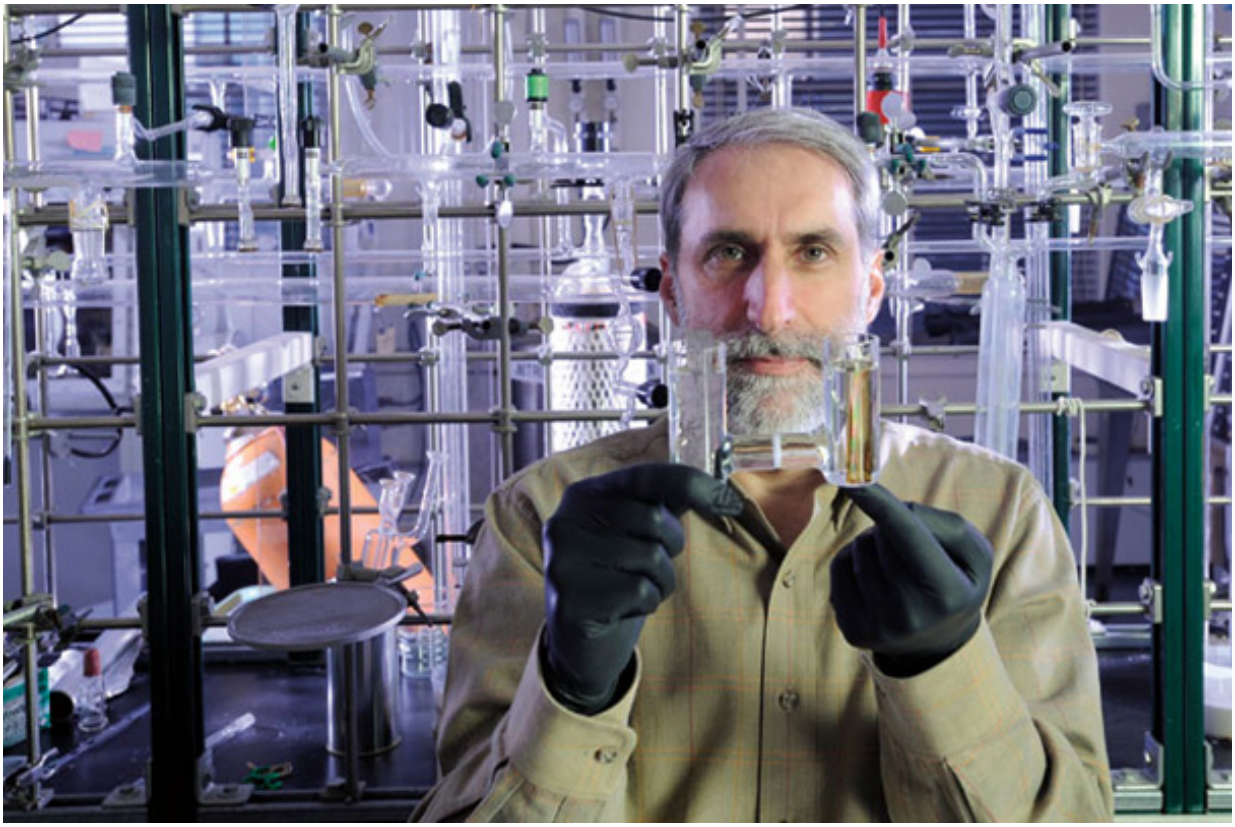

Daniel G. Nocera. Credit: Courtesy of Daniel G. Nocera

(Phys.org)—Harvard Chemist Daniel Nocera has announced during a lecture at the Energy Policy Institute in Chicago, that he and his colleagues have engineered a bacterium that has made it capable of

taking in carbon dioxide and hydrogen, and excreting several types of alcohol fuels, along with biomass that can be burned and used as an energy source. During the talk, he claimed that a paper he and his colleagues have written regarding the work will soon be published in the journal *Science*.

Nocera achieved a level of notoriety five years ago, when he and his team announced that they had created an artificial leaf that could be used to generate hydrogen for use as a fuel—that idea did not lead to hydrogen fuel cells displacing gasoline in automobiles, as he had hoped, so this go round, he has set his sights or providing a fuel source for those more in need—parts of India where there is still no electricity.

The new bacterium, which has been named Ralston eutropha was first caused (via genetic engineering) to take in carbon dioxide and hydrogen, which it used to produce adenosine triphosphate, as is done with plants. The team then took the work further by applying techniques pioneered by Anthony Sinskey to cause the bacterium to then convert the ATP to various types of alcohols (isopentanol, isobutanol, isopropanol) which were then excreted. Nocera claimed that when the bacterium was allowed to reproduce, clusters of them were capable of producing alcohols at 6 percent efficiency and biomass at 10.6 percent efficiency, (plants in comparison are approximately 1 percent efficient at converting sunlight and carbon dioxide into biomass).

Noting that some might see masses of such bacteria pulling carbon dioxide from the atmosphere as a possible solution to reducing global warming, which is believed to be at least partly caused by an excess of the gas in the atmosphere, Nocera suggested that was not the most likely outcome—he envisions people in need burning the alcohol and biomass as a fuel source, which would of course return the carbon dioxide back into the atmosphere—making it a carbon-neutral resource. He finished his lecture by announcing that he and his team are currently looking for

investors to bring the technology to parts of India where it is so badly needed.

More information: via Forbes