



Lab finds new method to turn biomass into gasoline (2009-04-21)

A man fills jerry-cans with petrol at the marina in Marin on the Caribbean island of Martinique

By Jasmin Melvin

WASHINGTON (Reuters) - U.S. scientists have combined a discovery from a French garbage dump with breakthroughs in synthetic biology to come up with a novel method for turning plant waste into gasoline, without the need of any food sources.

A synthetic biology lab at the University of California San Francisco identified a compound able to use biomass to produce a gas that can be converted into a gasoline chemically indistinguishable from fossil-fuel based petroleum.

Their method allows for a variety of feedstocks to be used that are nonfood sources, such as agricultural waste products like corn stover and sugar cane bagasse.

Critics charge that making ethanol from corn helps drive up food prices and is not an environmentally sound way to produce a so-called green fuel.

The scientists said gasoline they were able to produce carried the same chemical and molecular makeup as gasoline from oil refineries.

"You could fill your car up with it right now, so there's no difference in engine technology or anything like that," said Chris Voigt, who led the research.

Voigt added that the United States could look to biological sources for a large percentage of its gasoline when oil prices are high.

"Then if the sugar price goes high and the oil price goes down, you could flip it and the consumer would not know any difference," he said. "You can't do that with ethanol."

With improvements in the rate of production from genetic engineering, Voigt estimates that gasoline could be produced at \$1.65 per gallon from sugar cane bagasse.

He expects fuel from cellulosic sources like poplar would be cheaper at \$1.10 to \$1.30 a gallon. But creating reliable cost models at this point is hard since there are no cellulosic fuel crops in production to base an estimate on, he said.

Scientists previously tried to find an enzyme that could break down the cell walls of plants to help make biofuels but "failed miserably," Voigt said.

"So we started looking at organisms that can do that naturally," he said. "We then found this one that we realized was unique."

Voigt's lab used a bacterium discovered in the early 1980s living in a French garbage dump. They combined the bacterium with yeast, which can make different chemicals.

When mixing this compound with biomass like switchgrass, the bacteria eats the grass and produces the chemical acetate. The yeast eats the acetate and converts it into methyl halides, molecules traditionally used as agricultural fumigants.

The methyl halides come off as a gas that can be collected and converted into gasoline.

Voigt noted that by using different catalysts the methyl halides can also be converted into other useful chemicals, such as the ethylene used to make plastic bags.

Methyl halides are naturally produced by marine algae, fungi and other organisms, according to the UCSF lab's paper in the Journal of the American Chemical Society. But it's produced in such low yields that it was not of use to industry.

These results demonstrate the potential for industrial production of methyl halides from nonfood sources to make gasoline. The first large-scale pilot plant could be built in three years, Voigt estimates.

The lab's discovery was helped by breakthroughs in synthetic biology over the past few years, Voigt said.

Labs can now design a piece of DNA on a computer, email it to a DNA synthesis company and have the actual DNA mailed to them in a matter of weeks.