Bacteria Turn Coal and Oil Into Renewable Energy

By Michael Reilly | Tue Jun 22, 2010 10:59 PM ET

Something amazing is happening in the Wilcox formation, a coal-bearing stretch of bedrock beneath central Louisiana. Bacteria that naturally feast on carbon dioxide (CO2) and coal in the presence of water are working overtime, producing natural gas (CH4; methane) as a byproduct.

Why is this so special? The CO2 isn't naturally occurring. In the 1980's an oil company working in the area injected it into a deep underground well in an effort to push out more petroleum. The well was later abandoned. But since then microbes have been busy taking our waste CO2, some hydrogen atoms out of the coal beds, and a few other nutrients and turning the lot into a fuel we can burn for energy.

This finding comes via a paper by Jennifer McIntosh of the University of Arizona and a team of researchers that's just been published in *GSA Bulletin*.

It raises an exciting possibility -- instead of destructively mining coal, burning it, and emitting CO2 as a greenhouse gas, what if we left it in the ground and seeded it with bacteria and CO2? Could we turn the planet's vast coal reserves into a form of renewable energy?
According to co-author Peter Warwick of the United States Geologic Survey, about 20-25 percent of the world's natural gas supply is generated by underground microbial activity. "We're probably never going to do better than that," he told Discovery News. That's because gas mining activity today taps methane reserves have been accumulating for millions of years.

But the team's results show what no one in the scientific community has before -- that microbes may convert CO2 to natural gas on fast enough timescales to be a useful source of energy for modern society. The prospect has even drawn the attention of noted synthetic biologist Craig Venter, who envisions engineering new forms of bacteria to speed up the process.

There are still a lot of kinks to work out. For instance, microbes need other nutrients like acetate and hydrogen to complete this methane-generating recipe. And the bugs seem to be most active when groundwater is percolating through rocks at a reasonable clip.

McIntosh and Warwick said that commercial gas companies are currently experimenting to see if they can make this type of production profitable, but they hold their results close to their chests.

"It's a hot area of research," Warwick said. "It's a lot easier to dig coal up and burn it right now, but we need to start asking, 'What would injection of CO2 do to microbes in coal seams?'"

He added: "It's not going to solve all of our problems, but it's one of the pieces that could be used for energy in the future."

Another, similar possibility may exist for oil-munching bacteria. As we well know from the ongoing oil spill disaster in the Gulf of Mexico, bacteria feast on Texas tea (though it'd be nice if they had a bigger appetite).

Speaking at a conference last week's in Tennessee, Steve Larter of the University of Calgary said that it might be possible to convert oil into natural gas, and recycle some CO2 in the process. From the press release:

Petroleum biodegradation takes place in environments where petroleum is near ground level, actually seeping from the surface, or in oil-spill situations. Bacteria, yeasts, molds and certain fungi naturally break down petroleum in these environments. Larter discussed how these microbes take the byproducts of decomposition, such as carbon dioxide, and produce methane (natural gas) and hydrogen, [two] less-polluting fuels.

Though intriguing, Larter's idea seems like it's still relegated to the drawing board at the moment. McIntosh and her team have at least shown that natural gas can be produced, relatively quickly, by injecting anthropogenic CO2 into coal seams. Either way (and not accounting for the fact that it might not prove feasible), it will be a while before before fossil fuels can start to be thought of as a source of renewable energy.

Image: A mule (coal car) pulling load of coal in an old mine, NIOSH