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Teaching a Bacterium to Fight Global Warming

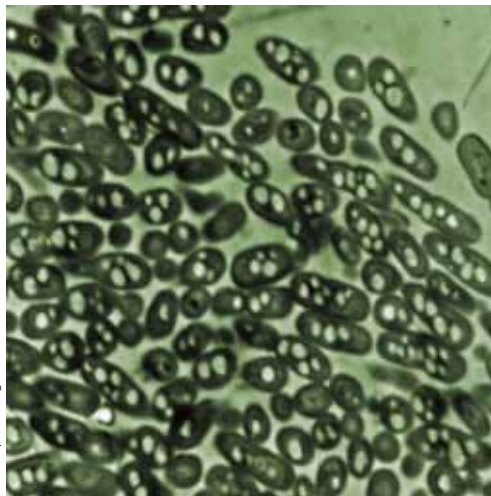
There is no doubt that our economy is still very dependent on fossil fuels. Our continuing to burn them releases megatons of unnecessary greenhouse gases into our atmosphere. Scientists have pegged carbon dioxide (CO₂) as the most troublesome greenhouse gas because of how long it will remain in our atmosphere. Atmospheric carbon dioxide is now at the highest level ever recorded. The CO₂ and other greenhouse gases in our atmosphere decrease the amount of heat that normally would escape our planet into space.

It is important to note that part of what makes us a Goldilocks planet is that our natural world has provided our atmosphere with just the right amount of water vapor and greenhouse gases, including CO₂, to trap the right amount of solar energy. The heat that is naturally trapped is needed to keep most of our water liquid and provide the temperatures needed by the different living organisms to flourish. The problem is that our use of fossil fuels is pushing more greenhouse gases into our atmosphere and this is creating a heating blanket that is pushing temperatures globally to record highs. Scientists list many calamities that will occur if our planet really overheats—for example, mass extinctions.

Researchers at MIT might have a solution to our CO₂ problem. They have genetically altered a soil bacterium (see photo) so that it can eat

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CO₂ and digest it into an isobutanol fuel. This fuel is a perfect substitute for gasoline and it could be used instead of gas in cars without any engine modifications.



Christopher Brigham

These genetically modified bacteria eat carbon dioxide and produce a fuel that is the perfect substitute for gasoline.

The *Ralstonia Eutropha* bacterium that MIT researchers are working with naturally converts what it eats into carbon compounds. In nature, this bacterium eats the nitrates and phosphates that are found in soil and stores what it doesn't need, for normal biological functions, as an organic polymer with properties similar to petroleum.

The MIT scientists genetically added one gene to this organism from another species and switched off some of its own genes to create a bacterium that eats CO₂ and poops fuel. Since it actually excretes the fuel, the bacterium doesn't need to be killed for the fuel to be harvested. Researchers are now working on building a bioreactor that can safely house the bacterium, feed it CO₂, and then draw off the fuel in an ongoing manufacturing process.

Time will tell if engineers can build bioreactors that can safely hold the bacteria and feed it CO₂ from the smokestacks at a fossil fuel power station. If such a bioreactor can be built, we could continue to be a fossil fuel-dependent society for the foreseeable future.

The possibility exists that if these bioreactors prove viable they will become smaller and more efficient over time. Perhaps one day the ultimate Tribid car would run on electricity, have a gas engine for recharging, and also have a biological catalytic converter to convert its tailpipe gases back into more fuel to further increase its range.

For now, the MIT research team has been concentrating on developing a bacterium that can eat CO₂. They indicate that the same approach could be used to develop bacteria that can digest any organic compound and turn it into a fuel.

Recalling the Facts

1. How does this bioengineered bacterium differ from its relatives that still live in the soil of our planet?
2. Internet research: Besides mass animal extinctions, what are some of the other disasters scientists indicate will happen to our planet if global warming isn't brought under control? 🌐

An advertisement for 'Foundations of Advanced Manufacturing'. It features a background of glowing, futuristic lines. The text includes: 'Foundations of Advanced Manufacturing', 'Authentic Learning Experiences for 21st Century Skills', a 'CERTIFIED' logo with a gear and hammer icon, 'Become a Certified Manufacturing Associate!', the 'intelitek' logo with a red arrow, and the website 'www.intelitek.com/cma' and phone number '1-800-221-2763'.