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Bacteria power may be possible

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AMHERST A slimy film of bacteria may not have quite the elegance of a solar cell or wind turbine, but in the effort to meet the world's growing energy needs, it may have its place.

A team of researchers at University of Massachusetts in Amherst has been able to dramatically increase the flow of electricity from fuel cells powered by so-called geobacter, tiny bacteria that convert iron to electricity, to the point that the systems can have commercial applications.

Headed by UMass microbiologist Derek R. Lovley, the team was able to achieve a 10-fold increase in the previous electrical output of microbial fuel cells by allowing the bacteria to congregate in sticky films on the metal electrodes in a fuel cell.

Lovley presented the results of the research this week at a meeting of the Electrochemical Society in Denver.

While bacteria are not likely to be running the nation's power plants anytime soon, they will be useful as a fuel cell power source in places where central electric grids don't exist, such as in rural areas and developing countries, he said.

"For instance, in some places, people put their trash into pits and use the methane gas that is produced as a cooking fuel, but it would be much more efficient (to use geobacter) to change that trash to electricity," Lovley said.

A typical fuel cell converts fuels to electricity without the need for combustion and microbial fuel cells work the same way. The bacteria break down the iron compounds, and in the process, they transfer electrons from inside their cells to the surrounding environment. When a conducting metal is placed amid the bacteria, those transferred electrons will create a flow of electricity in the metal. The metal electrodes in a fuel cell are the structures that conduct electricity to the outside for use as power.

The UMass researchers found that when the geobacter congregate in a film on

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a fuel cell electrode, the mass seems to act as one big, slimy, conductive mat, allowing electrons to be transferred by bacteria on the outer edges of the mat that aren't in direct contact with the electrode.

"It made sense that geobacter would have to be in direct contact with the electrode to pass electrons," he said. "But now we have these big slime layers - big red glops of geobacter growing on the electrode - and they are all passing electrons."

Lovley discovered geobacter in 1987 in the sediment of the Potomac River. While humans and most other living things use oxygen to create energy, geobacter produce energy using the iron naturally present in soil and other materials.

In 2002, Lovley reported in the journal Science how a UMass research team took a mason jar containing water and sediment from Boston Harbor, added mud containing geobacter and were able to encourage microbes to produce enough power to activate a light bulb.

The research has been funded in part by Toyota Motor Corp., which envisions applications "in mobile electronics in vehicles," Lovley said.

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