News Front Page
World
UK
England
Northern Ireland
Scotland
Wales
Business
Politics
Health
Education
Science/Nature
Technology
Entertainment
Have Your Say
Magazine
Country Profiles
In Depth
Programmes
RELATED SITES
BBC SPORT
BBC WEATHER
CBBC news
BBC ON THIS DAY

Last Updated: Friday, 12 December, 2003, 11:37 GMT

E-mail this to a friend
Printable version

Uranium bug has power potential

US scientists have decoded and analysed the genome of a bacterium which could help clear up radioactive waste and possibly even generate electricity.

The biochemical tricks of *Geobacter sulfurreducens* are revealed

The Geobacter species has genes that allow it to convert uranium and other radionuclides dissolved in water to solid compounds that can be extracted.

Its ability to manipulate electrons in metals could form the basis of a bio-battery, the US Energy Department says.

The genetic research on the bug is reported in the journal Science.

The organism, called *Geobacter sulfurreducens*, was found in a soil sample in Oklahoma that was contaminated by hydrocarbons - the breakdown products of fossil fuel combustion.

Researchers at The Institute for Genomic Research (Tigr) and the University of Massachusetts, Amherst, tell Science the bacterium has extraordinary capabilities.

Sense and move

The Massachusetts workers have previously shown that Geobacter species can precipitate a wide range of radionuclides and metals (including uranium, technetium and chromium) from groundwater, preventing them from migrating to wells or rivers where they may pose a risk to humans and the environment.

Now, the genomic research has given some insights into how this is possible.

G. sulfurreducens has 100 or more genes that appear to encode for various forms of c-type cytochromes. These are proteins that help move electrons back and forth.

They enable *G. sulfurreducens* to "reduce" metal ions - in essence adding electrons to positively charged metal atoms so

SEE ALSO:
Extreme bugs found in slag dump
19 Nov 03 | Science/Nature
Microbe breaks temperature record
15 Aug 03 | Science/Nature
First salt-loving bug sequenced
02 Oct 00 | Sci/Tech
Radiation beating bug offers cancer clues
18 Nov 99 | Sci/Tech

RELATED INTERNET LINKS:
Science
The Institute for Genomic Research
Geobacter - University of Massachusetts, Amherst
The BBC is not responsible for the content of external internet sites

TOP SCIENCE/NATURE STORIES NOW
Cameroon demands bushmeat action
West Africa's ivory trade thrives
England's natural jewels in need
Ice mission delights scientists

that they become insoluble in water and precipitate as part of solid compounds.

These compounds are then more easily removed.

Small charges of electricity are also created through the reduction process and this has raised the possibility that Geobacter could form part of a bio-battery.

The team has already shown how the bug can remove uranium from groundwater

"We've provided a comprehensive picture that has led to fundamental changes in how scientists evaluate this microbe," said Barbara Methe, the Tigr researcher who led the genome project and is the first author of the Science paper.

"Research based on genome data has shown that this microbe can sense and move towards metallic substances, and in some cases can survive in environments with oxygen."

G. sulfurreducens was previously thought to be an anaerobic organism.

Nature's 'toolbox'

Massachusetts co-worker, Derek Lovley, who discovered the Geobacter group of bacteria, said: "Sequencing the genome of *G. sulfurreducens* has radically changed our concepts of how this organism functions in subsurface environments."

The genome analysis, he said, "revealed previously unsuspected physiological properties" of the bacterium and also gave scientists insight into the metabolic mechanisms that the organism uses to harvest energy from the environment.

"The genome of this tiny micro-organism may help us to address some of our most difficult cleanup problems and to generate power through biologically-based energy sources," Secretary of Energy Spencer Abraham said.

"Geobacter is an important part of Nature's toolbox for meeting environmental and energy challenges.

"This genome sequence and the additional research that it makes possible may lead to new strategies and biotechnologies for cleaning up groundwater at Department of Energy and at industry sites."

E-mail this to a friend Printable version

LINKS TO MORE SCIENCE/NATURE STORIES

Select Go

E-mail services | **Desktop ticker** | **Mobiles/PDAs** | **Headlines for your site** |

Back to top ^ ^

News Front Page | **World** | **UK** | **England** | **Northern Ireland** | **Scotland** | **Wales** | **Politics**
Business | **Entertainment** | **Science/Nature** | **Technology** | **Health** | **Education**
Have Your Say | Magazine | Country Profiles | In Depth | Programmes

BBCi Homepage >> | BBC Sport >> | BBC Weather >> | BBC World Service >>

ABOUT BBC NEWS | Help | Feedback | News sources | Privacy | About the BBC