'Rock-breathing' bacteria could generate electricity and clean up oil spills

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A discovery by scientists at the University of East Anglia (UEA) could contribute to the development of systems that use domestic or agricultural waste to generate clean electricity.

Published today by the leading scientific journal, Proceedings of the National Academy of Sciences (*PNAS*), the researchers have demonstrated for the first time the mechanism by which some bacteria survive by 'breathing rocks'.

The findings could be applied to help in the development of new microbe-based technologies such as fuel cells, or 'bio-batteries', powered by animal or human waste, and agents to clean up areas polluted by oil or uranium.

"This is an exciting advance in our understanding of bacterial processes in the Earth's sub-surfaces," said Prof David Richardson, of UEA's School of Biological Sciences, who is leading the project.

"It will also have important biotechnological impacts. There is potential for these rock-breathing bacteria to be used to clean-up environments contaminated with toxic organic pollutants such as oil or radioactive metals such as uranium. Use of these bacteria in microbial fuel-cells powered by sewerage or cow manure is also being explored."

The vast proportion of the world's habitable environments is populated by micro-organisms which, unlike humans, can survive without oxygen.

Some of these micro-organisms are bacteria living deep in the Earth's subsurface and surviving by 'breathing rocks' - especially minerals of iron.

Iron respiration is one of the most common respiratory processes in oxygen-free habitats and therefore has wide environmental significance.

Prof Richardson said: "We discovered that the bacteria can construct tiny biological wires that extend through the cell walls and allow the organism to directly contact, and conduct electrons to, a mineral. This means that the bacteria can release electrical charge from inside the cell into the mineral, much like the earth wire on a household plug."

More information: 'Characterization of an electron conduit between bacteria and the extracellular environment' by R Hartshorne et al. is published on December 14 in the online early edition of *PNAS*.

Source: University of East Anglia