Researchers discover how bacteria can immobilize uranium

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(PhysOrg.com) -- For several years, researchers have known that certain kinds of bacteria are able to "feed" off certain metals by either adding or removing electrons from their structure, but until now, haven't really understood how they do it. Now, new research by Gemma Reguera and her team at Michigan State University have shown that the bacteria do so by means of protein nanowires, called pili, which are hair-like appendages with electrical conductivity. They have reported their findings in the *Proceedings of the National Academy of Sciences.*

The team specifically set out to find out how a specific type of bacterium known as a *Geobacter*, in this case, *G. sulfurreducens*, are able to clean up nuclear waste left behind by the cold war in such places as Colorado mines. They, like other researchers, believed that the bacteria were able to do its work through use of pili. In order to find out for sure, they had to induce the specimens to actually grow some in the lab, something that had stumped others before them. To force them, Reguera and her team subjected *G. sulfurreducens*, to much more harsh conditions than had been done before, presuming that the bacteria wouldn't resort to using its pili unless pressed.

The tactic worked and the team was able to cause *G. sulfurreducens* to grow a mass of pili, which allowed them to study how they interacted with uranium. They found that the pili served as a buffer of sorts, protecting the cell structure of the bacterium as they also allowed for adding electrons to uranium ions which causes it to become more water soluble and thus safer to handle and clean up.

The pili grow to enormous lengths (though they are very then - only a few nanometers) relative to the bacteria that produce them, forming a conductive and protective barrier that allows the bacteria to thrive in truly hostile environments.

The study, part of ongoing research into so-named bioremediation; using organisms to remove unwanted substances from soil and water, adds to the growing body of knowledge that scientists hope will one day soon provide a means for dealing with a wide variety of environmental pollutants.

As for Reguera and her team, they hope their research eventually leads to getting away from using biological bugs to clean up toxic environments and more towards creating tiny little programmed robots that can mimic their actions but can be more easily manipulated into doing exactly what is needed in particular circumstances.

More information: Extracellular reduction of uranium via *Geobacter* conductive pili as a protective cellular mechanism, Cologgi, et al. *Proceedings of the National Academy of Sciences,* 2011. dx.doi.org/10.1073/pnas.1108616108