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Ravi Saraf
Department of Chemical Engineering, University of Nenraska-Lincoln, rsaraf@unl.edu

Vikas Berry
Department of Chemical Engineering, University of Nebraska-Lincoln, vberry2@unlnotes.unl.edu

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Gold-plated bacteria bring nanodevices to life

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US researchers have coated live bacteria with gold nanoparticles to create a highly sensitive bio-electronic device that responds to changes in humidity.

The outermost protective layer of gram-positive bacteria such as *Bacillus cereus* expands with increasing humidity. Vikas Berry and Ravi Saraf at the University of Nebraska at Lincolncoated this peptidoglycan layer with positively charged gold nanoparticles, which adhere by electrostatic interaction. Previous research had shown that electric currents pass between these particles by tunneling mechanisms, which are extremely sensitive to distance changes.

Saraf and colleagues selected living *B. cereus* cells of similar size (around 5µm long, 0.9µm diameter) and deposited them on a chip containing pairs of gold electrodes at 7µm distance. They optimised the experimental conditions so that the bacteria formed several bridges spanning each pair of electrodes. The gold nanoparticle coating on the bacteria established an efficient conducting bridge between the electrodes.

The researchers increased the current fortyfold by decreasing the humidity from 20 per cent to zero. This change was reversible over five cycles. 'It is possible to make nanodevices piggyback on a living cell,' triumphed Saraf. He now looks forward to coupling the two so that the live cell can drive the device.

'If such a coupling were possible,' said Saraf, 'one could also imagine electronics gadgets, locally powered by living microorganism consuming biodegradable carbon food rather than using caustic batteries.' *Michael Gross*

References

V Berry and R F Saraf, *Angewandte* (DOI: 10.1002/anie.200501711)