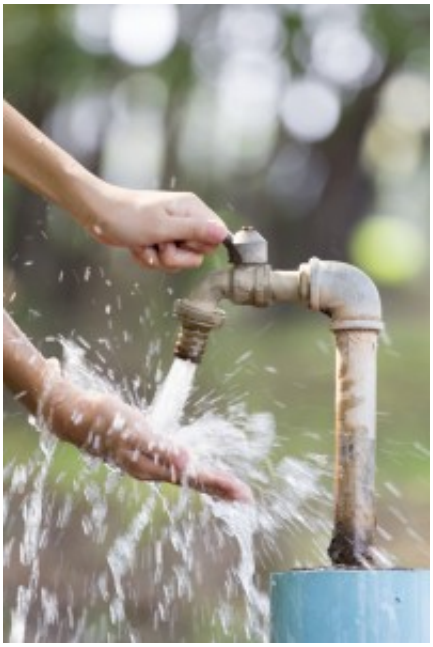
# Electric bugs used to detect water pollution

August 11 2014



(Phys.org) —Scientists from our Department of Chemical Engineering have developed a low-cost device that could be used in developing countries to monitor the quality of drinking water in real time without costly lab equipment.

Current methods of detecting pollutants in water are costly, time-consuming and require specialist technical expertise. However researchers from the University in collaboration with Bristol Robotics Laboratory at the University of the West of England, have created a low

cost sensor using 3D printing technology that can be used directly in rivers and lakes for continuous water quality monitoring.

The sensor contains bacteria that produce a small measurable electric current as they feed and grow. The researchers found that when the bacteria are disturbed by coming into contact with toxins in the water, the electric current drops, alerting to the presence of pollutants in the water.

Dr Mirella Di Lorenzo, Lecturer in Chemical Engineering at Bath, explained: "When the bacteria feed in a microbial fuel cell, they convert chemical energy into electrical energy that we can measure.

"We found that when we injected a pollutant into the water there was an immediate drop in the electric current they produced. The drop was proportional to the amount of toxin present and the current is recovered once the toxin levels fell.

"This means we are able to monitor the level of pollutants in the water in real time without having to collect multiple samples and take them to a laboratory.

"Because this system uses live bacteria, it acts a bit like a canary in a mine, showing how these chemicals affect living organisms."

The effects of pollution on ecosystems are currently assessed using fish or daphnia, which is costly, takes time and is difficult to reproduce the results.

Other methods of detecting water pollutants involve mass spectrometry which is a very sensitive process but requires expensive specialist equipment and expertise, so is unsuitable for routine widespread water monitoring, and impossible in some of the developing countries that

need this technology most.

Using the device, the researchers were able to detect tiny concentrations of cadmium, a pollutant used in the electronics industry, at quantities well below the accepted maximum safe levels.

The research is published in the journal *Biosensors and Bioelectronics*.

**More information:** *Biosensors and Bioelectronics*, www.sciencedirect.com/science/ … ii/S0956566314004710

Provided by University of Bath