A hand-held sensor to measure arsenic levels in water has been developed by researchers at University College London (UCL) and Imperial College London, with funding from BBSRC. Spin-out company Bio Nano Consulting is now performing field trials.

“Arsenic contamination of water is a hugely important issue,” says Dr David Sarphie, CEO of Bio Nano Consulting, “and the technology hasn’t existed to enable it to be addressed properly. We feel that a user-friendly, cheap and rapid test could be extremely beneficial in terms of revolutionising how the problem might be addressed.”

140M people worldwide drink water containing unsafe levels of arsenic, according to the World Health Organisation (WHO). In a highly-affected area of Bangladesh, one of the worst-affected countries, around one in five deaths is attributable to arsenic poisoning.

Currently available tests for arsenic need to either be carried out by scientists in a laboratory or using chemical test kits that produce toxic chemicals, and take up to half an hour to give a result. In contrast, this new sensor resembles the blood glucose meters used by diabetics: when you place a drop of water onto the test strip which is inserted into the sensor, it produces a digital reading of the arsenic level in one minute. This would allow it to be used by local people in rural areas in low and middle income countries, where the problem of arsenic poisoning is greatest.

“We were doing some early-stage field trials a few months ago in Bangladesh,” says Sarphie, “and a lot of the villagers were actually pleading with us to come and measure their well, because they had no idea how much arsenic was in their water.”

Dr Joanne Santini, Reader in Microbiology at UCL, had the idea of developing a sensor to detect arsenic in water when she discovered a microscopic organism that eats arsenic. She realised that an enzyme produced by this organism could be used to measure arsenic levels.

Follow-on funding and a CASE studentship from BBSRC allowed Santini and Tony Cass, Professor of Chemical Biology at Imperial College London, whose work led to development of the first electronic blood glucose monitor, to begin work on an arsenic sensor.

Bio Nano Consulting, a spin-out from UCL and Imperial College London, has patented the sensor design and, using a Smart Award from Innovate UK, created a prototype which it can produce in batches of up to 100.

The arsenic sensor business forms roughly one third of Bio Nano Consulting, which has a total annual turnover of £1M and employs 11 people. The company has leveraged around £850k for its work on arsenic sensors and currently has two Newton Fund awards to work with collaborators in India and Mexico on ways which the sensors could be employed in these countries. The global market for water testing and analysis instruments is projected to reach $3.5Bn by 2019.
Bio Nano Consulting is now spinning out a new company, AquAffirm, which will focus solely on sensor development, beginning with the arsenic sensor. Sarphie recognises the role that BBSRC funding has played in reaching the point at which AquAffirm could be created.

“The financial support that helped Santini to get this work going will be instrumental in having the company established,” he says.

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