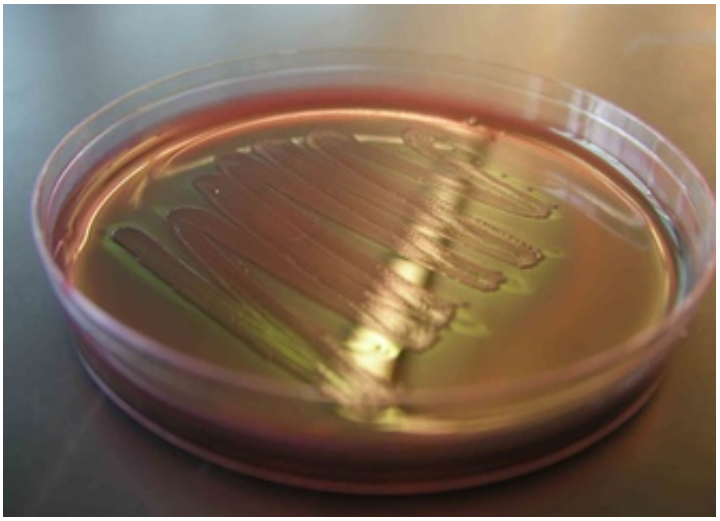
Quick ID for water pathogens

October 30 2013, by Anthony King



Credit: Anthony D'Onofrio

Drinking water flowing from your tap can contain harmful bacteria, viruses and single-cell animals. And most countries do not routinely test for all these bugs. Instead, scientists usually take a water sample and then place it in a growth dish suitable for so-called indicator gut bacteria such as E. coli. These bacteria do not cause illness, but if they are present then water has been contaminated with sewage.

The trouble is "there are weaknesses in the traditional approach. The biggest is that you can still have infectious pathogens in drinking water when there are no indicator bacteria present," says Paul Hunter, clinical professor at the University of East Anglia, Norwich, UK. It can take two days for the usual test to be run. Yet, contamination in public drinking

water might last just a few hours or a day. It is over by the time you detect it. Also, chlorine can kill indicator organisms, whereas the harmful bugs survive.

Hence, testing for the presence of faeces in our water makes sense. But it would be even better if we could routinely test for the bugs which actually cause illness, not just indicators. Hunter coordinates an EU-funded research project called Aquavalens, which has just started and aims to develop a rapid test for the worst microbial offenders in our drinking water. The team will carry out field research in both drinking water and food production systems across Europe.

Hunter's team plans for a test combining genetic techniques and nanotechnology to design a device that could be hooked up to major water suppliers. This would flash red for the major microbes causing gastrointestinal illness. It might even distinguish between virulent strains of the one microbe and ones that do no harm.

Around 330,000 cases of water-related disease are reported yearly in Europe according to the World Health Organisation (WHO). The offenders are single-celled protozoan animals like Cryptosporidium and Giardia, viruses like norovirus and rotavirus and bacteria like campylobacter, shigella and even salmonella. Hunter has a particular interest in Cryptosporidium, which is a single-celled organism that can cause outbreaks of stomach illness even in small quantities. "If you got 100 Crytosporidia in 1,000 litres, this may well be associated with an outbreak. You can even have outbreaks if there is one in ten litres," Hunter tells youris.com.

This is where high-tech biosensors might work. The project is set to trial various technologies to see what works best, dumping any that do not make the grade by year two. The group also hopes to develop a straightforward but quick test for small water supplies. "If you could go

around to a small water supply and take a sample and within a matter of minutes get some indication of whether the supply is polluted or not, I'd be very pleased," notes Hunter. If such a test were also inexpensive, it could have a big impact on water quality in the developing world.

Experts believe the strategy is likely to bring an improvement. "New molecular methods may or may not be necessary based on the pathogen target. It is definitely necessary to include monitoring of key pathogens and norovirus is likely the most important one," commented Stefan Wuertz professor of environmental engineering at the University of California, Davis, USA. "However, the project is about platforms and reducing time scales of detection. Any such improvement would be good."

Even companies developing leading edge monitoring systems face a tough challenge, and innovative solutions are few and far between. "Tracking new contaminants means that water users have to treat water to address them. In other words, what a drinking water utility doesn't know, it doesn't have to treat," says Laura Shenkar, water technology expert at Artemis Water Strategy, San Francisco, USA. "At the same time, we have not seen many innovative technologies and designs that would dramatically change the costs of monitoring onsite, with shorter analysis times."

Provided by Youris.com

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