



Bringing safe water testing
to its source.

Bridging a gap in the water-testing market.

Lack of clean drinking water is a contributory factor in the proliferation of diarrhoeal diseases which kill 1.8 million people every year, of whom 1.5 million are children under the age of five. In fact, diarrhoea kills more young children than AIDS, malaria and measles combined.

So the need for high-quality water testing – in both developed and developing countries – is critical. But there are problems. In the more remote areas of the developing world, existing water testing systems are proving unsuitable. Lab-based facilities often do not offer a cost-effective service; and a lack of skilled personnel, combined with remote locations, often make the provision of acceptable testing regimes (whether regulatory or operational) unrealistic.



Governments and programmes around the world are responding to this crisis with initiatives such as the Millennium Development Goals. But ultimately, what is needed is a cost-effective, user-friendly, lab-quality but field-based system that can be used in the developing world, particularly in rural settings.

Now there is a response to this need...

...and it's called Aquatest.



"Lack of clean drinking water and diarrhoeal diseases are contributory factors in the death of 1.8 million people every year."

Making water testing possible in EVERY environment.

Aquatest does something that has never previously been possible. It provides users with actionable information on water contamination levels, taking reliable, quantitative water testing out of the lab and direct to the water source – without huge cost or effort. You do not have to be highly skilled to use it. It does not cost thousands to deploy. And it does not involve days or weeks of complex lab processing to deliver accurate results, when and where they are needed.

After initial European Union funding, supported by a further \$13 million from the Bill & Melinda Gates Foundation, the Aquatest testing system is both innovative and simple compared with traditional laboratory testing. The 'Aquatest' itself is a small, single-use device for testing microbial water quality, which combines with an incubator and ultraviolet (UV) lamp for reading results, to deliver lab-quality testing wherever it is needed.



1 Simple. Straightforward. Effective. Aquatest in action.

The tester goes into the field and collects 100ml of sample water (in accordance with WHO guidance) directly in the Aquatest device. Shaking mixes the selective growth medium with the sample. A twist of the lid separates it into chambers on the bottom of the device for incubation.

To ensure the integrity of the test, the unit is self-contained, featuring waterproof sealing and a one-turn lock mechanism. After 24 hours of incubation at 37°C, the chambers are checked under a handheld UV lamp, and the number of chambers fluorescing indicates the level of *E. coli* contamination.

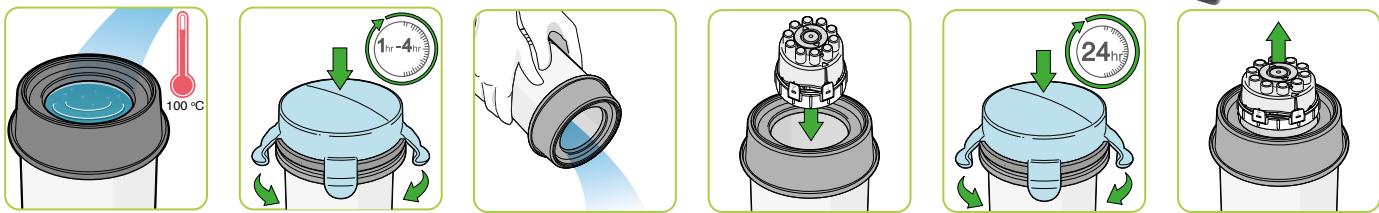
The more chambers that fluoresce, the greater the contamination.

Once testing is complete, an on-board disinfectant is released to ensure safe disposal.



2 Lab-standard testing made as easy as boiling a kettle – the Aquatest incubator.

E. coli grow best at around body temperature (37°C). If the temperature drops too low growth is slow; too high and the *E. coli* might die. The Aquatest incubator ensures neither is an issue. Low cost, reusable and weighing just 2kg, the incubator frees the tester from power-hungry incubators, and requires a single charge of boiling water, rather than a constant source of electricity, to maintain a steady temperature. And this is its great advantage over conventional incubators. Even when they are powered by mobile solutions such as car batteries, they have not always performed adequately in field settings.



3 A mini darkroom on the move – the Aquatest UV lamp.



The Aquatest UV lamp is a safe, simple-to-use, handheld ultraviolet light that reads the results from the Aquatest device. It is portable and rugged for use in field settings. Low-power UV LEDs, orientated so that they shine directly into the chambers, guarantee user safety and provide enough illumination to easily identify positive chambers. It is an ingenious design that limits the entry of external light and maximises the brightness of the UV LEDs, creating a mini 'dark room'. Within the confines of its 'dark room', the UV lamp shows how many chambers inside the Aquatest device have tested positive for the presence of *E. coli*. The greater the number of positive chambers, the greater the level of microbial contamination in the drinking water.

Sharing results across miles – the Water Quality Reporter.

Aquatest can also be allied to an optional Water Quality Reporter (WQR). A mobile phone application for recording, storing and transmitting results, it will ensure the right people receive the right data to take the right action – even when they are miles from the site of the testing.



Where will Aquatest be put to work?

In developed countries, water testing is carried out in well-resourced labs with good access to equipment, consumables and electric power. However, in developing countries, particularly in rural areas, there is a need to provide water testing in field settings, where labs are remote.

The great benefit of Aquatest in the developing world is that it gives laboratories better outreach, allowing them to test further into remote regions – which they cannot get to now due to long transportation times of samples which have to be kept at refrigerated temperatures.

There is also a significant opportunity to deploy Aquatest as a cost-effective testing solution in a wide range of applications, where custom (and therefore typically expensive) solutions have been previously required. However, it is also ideal for use in a regular incubator where there is a requirement to process a number of samples simultaneously.

Who will Aquatest help most?

Ultimately, Aquatest will give more people access to safer water. In terms of organisations, it will be beneficial to governments, NGOs and communities, particularly...

- **Organisations currently carrying out lab-based water testing**
Aquatest's flexibility and ease of deployment mean it will be invaluable to leverage the skills of trained personnel with simplified field testing.
- **Utility managers**
A cost-effective, in-field testing solution such as Aquatest means utility managers can arrange for their teams to test water regularly within regions – even in more remote areas, and where their teams are trained to a limited standard. Crucially they will be able to send and receive water-quality information while their testers are still in the field.
- **Water engineers**
Those responsible for building and maintaining rural water systems will appreciate the ease with which Aquatest can be deployed in the field.
- **Volunteers and community groups**
In many rural communities in the developing world, there are no water utilities. Instead, they arrange their own supply. If they have Aquatest at their disposal, volunteers in these communities can test their water supply at every supply point in the community.



Putting Aquatest to the test.

During design development, the device was subjected to usability testing in the UK, US and India. From early 2012, the Aquatest system will be piloted by many organisations worldwide to assess its usability in a variety of real-world settings.



Confirmed Early Adopter Pilot Partners

Nairobi City Water and Sewerage Company (NCWSC)

Water and Sanitation for the Urban Poor

Kenya

Thua Thien Hue Water Supply Company (HueWaco)

Vietnam

National Water Supply and Drainage Board (NWSDB)

Sri Lanka

Loja State Municipal Utilities

FORAGUA

Ecuador

Teuk Saat 1001

Cambodia

National Office of Potable Water (ONEP)

Morocco

Pichincha Provincial Health Directorate (DPSP)

Ecuador

Cochabamba Provincial Health Department (SEDES)

Bolivia

Sofala, Manica and Tete District Health Services

UNICEF

Mozambique

Chris Hani Municipal Health Services

South Africa

Alberta Health Services

Canada

Oxfam

Bangladesh, Kenya, Somaliland, DRC

Rollins School of Public Health,
Emory University

Ghana

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2007 – 2012 \$13.1 million



European Union FP6
2002 – 2007 €446,000

Who's involved?

 **University of BRISTOL**

 **Health Protection Agency**

 **UNC WATER INSTITUTE**

UNIVERSITY OF Southampton

 **University of Cape Town, Institute for Water and Sanitation Sciences (IWS)**

 **UNIVERSITY OF CALIFORNIA BERKELEY**

 **PATH**

 **UNIVERSITY OF SURREY**

 **aquaya**

Want to learn more about Aquatest?

www.bristol.ac.uk/aquatest

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