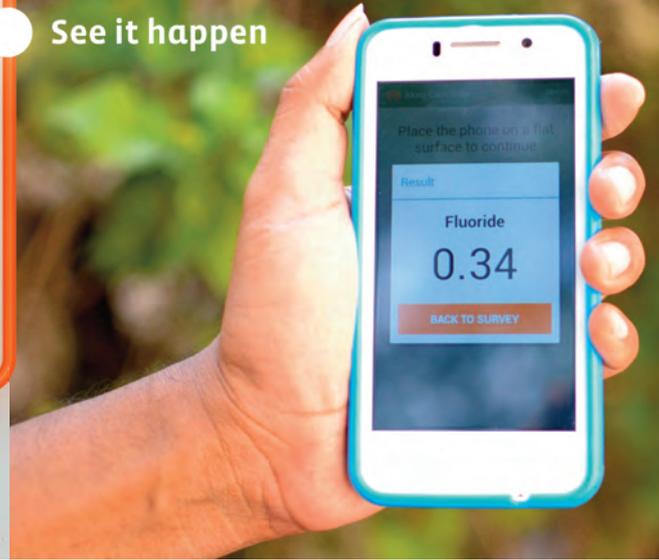# Akvo Caddisfly

Fast and easy drinking water fluoride testing using a smartphone

Akvo Caddisfly is a simple, fast, portable and low cost drinking water testing kit that can be used anywhere to quickly analyse the level of fluoride in drinking water, using a smartphone. Currently under development, it also allows water quality data to be accurately mapped and shared online. Both its hardware and software are open source.

Akvo Caddisfly will set a new standard in effective gathering and sharing at scale of data relating to drinking water quality, using the best available tool for this purpose – the smartphone.

Why is Akvo Caddisfly needed?

Globally, over 780 million people do not have access to clean water. In India and elsewhere, fluorosis is a serious health issue and more than 100 million Indians are at risk because they drink water containing fluoride or other contaminants such as arsenic or coliform bacteria. Existing water quality-testing procedures fall short in a number of ways. Field-test equipment is often hard to use and unreliable and lab tests are costly and slow. Resulting data is generally stored locally and not shared effectively. This makes it hard to quickly collect, analyse, present and efficiently use data to resolve drinking water issues.

What is needed to make Caddisfly a success?

Akvo Caddisfly is looking for partners keen to invest in a breakthrough technology with potential for strong and rapid market penetration, to set a new standard for drinking water quality testing. We seek strong partners with the capability to fund and support the execution of the 2015-2016 research and development phases.

Akvo FLOW already has a strong user base of international development teams, in organisations such as Unicef, WSP/World Bank, Millenium Water Alliance, SNV and ICCO, enabling fast upscaling of Akvo Caddisfly.

Akvo, a non-profit foundation that builds and supports open source web and mobile tools, is leading the technical development of Akvo Caddisfly in cooperation with TernUp India.

Testing drinking water has never been so easy

1 Fill the reusable (1) *test chamber* with a sample of water, place the (2) *reagent capsule* inside and close it.

2 Attach it to the (3) *phone case* on your (4) *smartphone* and run the (5) *Caddisfly app*.

3 Place the smartphone facedown, and wait around a minute until you hear a loud click.

TEST CHAMBER CAP

1 TEST CHAMBER

2 REAGENT CAPSULE

3 PHONE CASE

4 / 5 SMARTPHONE WITH CADDISFLY APP INSTALLED

4 The fluoride test result is now displayed on the smartphone's screen.

5 Data results can be shared online via Akvo FLOW, Akvo's mobile phone-based field survey tool.

Technical facts

- The test chamber contains the water sample and can be re-used for thousands of tests.

- The reagent is dispensed automatically from the capsule.

- The smartphone's camera acts as a colourimeter sensor, using the flash to illuminate the sample.

- The Akvo Caddisfly app analyses the water sample photograph against a calibrated range, giving an accurate and reliable result after one minute.

- The smartphone's GPS accurately identifies the location and the results can be integrated and reported via Akvo FLOW.

History and current status of the concept

In August 2012 TernUp Research Labs was set up in Bangalore, India, to develop products aimed at solving drinking water problems in India and elsewhere. In 2013, TernUp partnered with Akvo to develop Caddisfly and became Akvo's R&D hub, in India.

Benefits of Akvo Caddisfly

- Low cost

- Immediate results, anywhere

- Accurate and reliable

- Small and easy to handle

- Lets you map your findings and monitor them over time using Akvo FLOW

- Data is shared easily and quickly so responses can be rapid and effective

In 2014, a first Caddisfly prototype to test fluoride levels was developed. It is now being field-tested and the first positive outcomes are being recorded.

A sensor measuring water temperature and conductivity (EC) has also been developed to test the salinity of drinking and irrigation water. This simply connects to the micro-USB port of the phone and test results are read by the Caddisfly app.

Work is currently focussing on standardising the low cost hardware components and improving the usability of the software (the Caddisfly app). This is the groundwork to ensure a reliable, low cost drinking water test that can later be reproduced at scale.

By mapping the quality of water sources and presenting the results in an effective way, TernUp and Akvo aim to support access to safe drinking water.

Changing the future of drinking water quality testing

After piloting the fluoride test and the temperature / EC sensor in the field, Akvo plans to upscale and further realise the potential of the tool by:

1 Developing tests for arsenic, nitrate, coliform bacteria, chlorine and other critical contaminants.

2 Developing hydrogeological testing: e.g. pH and water levels.

3 Developing the Akvo FLOW dashboard to support easy online sharing of water quality testing data.

4 Fine tuning the industrial design, manufacturing and set up distribution channels.

Contacts

Partnerships   Akvo Foundation
Hans Merton (Amsterdam, Netherlands)
hans@akvo.org   +31 6 19 82 10 96   www.akvo.org

Research and development   TernUp
Samuel Rajkumar (Bangalore, India)
srajkumar@ternup.com   +91 98452 90855   caddisfly.ternup.com

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