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NUS team's device detects algae quickly

Portable system uses cellphone to detect toxin-producing algae within 15 mins

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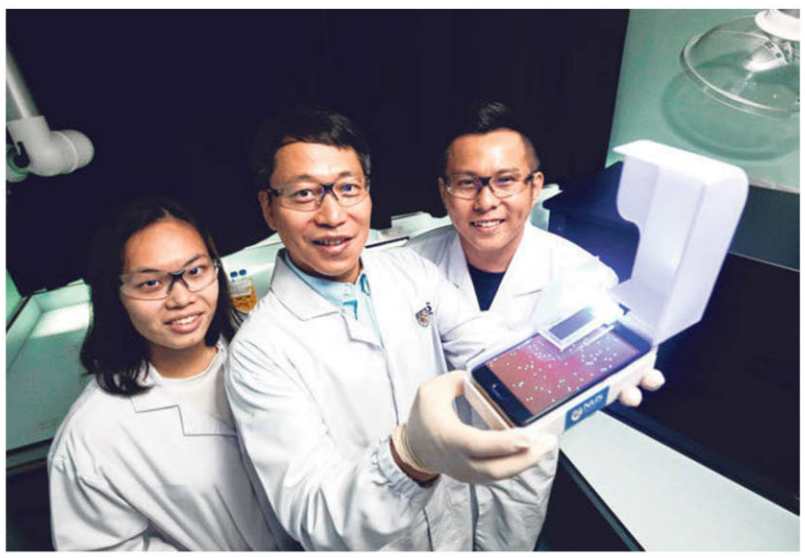

Assistant Professor Bae Sung-woo, flanked by master's student Elaine Chiang and doctoral student Thio Si Kuan, developed an easy-to-use device costing less than $300. Conventional methods can cost up to $100,000. PHOTO: LIANHE ZAOBAO

Conventional tests for the presence of algae in water involve bulky and expensive equipment and can take up to a week to get results as researchers have to take the sample back to their labs for analysis.

But a team of engineers from the National University of Singapore (NUS) has developed an easy-to-use, portable system that makes use of a smartphone to detect the presence of toxin-producing algae in water within 15 minutes.

The device costs less than $300, far cheaper than conventional methods, which can cost from $3,000 to $100,000.

Shortening the interval between collecting water samples and analysis will enable preventive action to be taken earlier to nip potential algal blooms in the bud, said Assistant Professor Bae Sung-woo, who is from the NUS engineering faculty's civil and environmental engineering department.

"By the time you get the results of the analysis a week later, the fact is the water in the sea is no longer the water you collected. It might be too late," said Prof Bae during a media demonstration of the new portable system at NUS yesterday.

"Our device can be used to detect algae in water bodies any time and anywhere, and before the algae are visible to the naked eye. It will be particularly useful in helping fish farmers to take early action."

Prof Bae developed the device alongside doctoral student Thio Si Kuan and master's student Elaine Chiang, who are both also from the faculty of engineering.

The device weighs less than 600g and has three components: a chip coated with a layer of photoconductive material which becomes more electrically conductive when exposed to light, a custom 3D-printed box that houses a battery and an LED light, and a smartphone of any model.

Droplets from a water sample are deposited onto the chip, which lies above the smartphone in the box.

The droplets are mixed with a dye to stain any viable algal cells present, and are made to move with the aid of an electrical field generated by the smartphone and the box's battery towards a small hole above the smartphone's camera. The smartphone camera then captures images of the stained algal cells illuminated by the LED light.

Depending on the staining dye used, different kinds of algal cells will show up in different colours, which can then be analysed by an app to calculate the level of algae present in the sample.

Prof Bae said the smartphone system has an accuracy rate of 90 per cent, comparable with a standard cell-counting technique using an instrument called a haemocytometer.

The research team is currently in discussion with industry partners to commercialise the technology. They are also working on developing their own app that can automatically analyse images and generate reports on the types of algae detected.

In 2015, fish farmers from 77 farms in Singapore were hit by an algal bloom that wiped out more than 500 tonnes of fish, costing them millions of dollars.

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USEFUL TO FISH FARMERS

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ASSISTANT PROFESSOR BAE SUNG-WOO, who is from the NUS engineering faculty's civil and environmental engineering department.