

EBOLA TESTING ON THE SPOT

A portable test kit developed by researchers in Japan can identify infection with ebolaviruses in as little as ten minutes.

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Photo: Miho Yanagisawa

PREVENTING the spread of infectious diseases is an important challenge in today's rapidly globalizing world. Ebola virus disease (EVD) is a case in point. The EVD outbreak in West Africa beginning at the end of 2013 killed more than 10,000 people before its eradication in early 2016. No effective treatment for the disease is currently available.

As with any infectious disease, to prevent the spread of EVD it is important to test for the infection as quickly as possible. The more rapidly a diagnosis can be made, the greater the likelihood of preventing secondary infection. Testing for ebolaviruses in the blood, urine, saliva or sputum typically takes over an hour. However, in 2015, Professor Jiro Yasuda at the Nagasaki University Institute of Tropical Medicine and researchers at Toshiba Medical Systems Corporation together developed a test kit for EVD that shortens the time needed for accurate diagnosis to ten minutes.

First, nucleic acid extracted from a patient's blood is mixed with a gene amplification reagent containing a primer that reacts to the specific genes of ebolaviruses. The blood is then heated in the newly developed device. If it contains an ebolavirus, the primer reacts with the viral genes and demonstrates infection on the

touch screen display. The lightweight device runs for about three hours on a full charge.

The new kit is based on the system commercialized by the same partners in 2009 to simultaneously identify some twenty biological agents including anthrax with the use of a DNA chip. Japan's police force and other public institutions are equipped with the system and use it to counter the threat of bioterrorism.

"The original system was capable of detecting ebolaviruses, but it took a relatively long time and the unit was quite large," says Hiroaki Goto of Toshiba Medical Systems' Molecular Testing Solutions Business Development. "The recently developed test kit weighs just 2 kilograms and is dedicated to the detection of EVD alone."

In March 2015, a group of researchers from Nagasaki University led by Professor Yasuda and Assistant Professor Yohei Kurosaki tested the effectiveness of the new kit over a period of one week at the Donka National Hospital in Conakry, the capital of the Republic of Guinea. At the time, EVD was epidemic in the West African country.

Local staff regarded the test kit highly for its speed in obtaining results, portability, and patient user-friendliness.

Immediately after the trial, the Japanese government donated three sets in response to a request from the Guinean government, and Professor Yasuda and Assistant Professor Kurosaki returned to the Donka National



- 1 Professor Jiro Yasuda (right) and Assistant Professor Yohei Kurosaki of Nagasaki University provide technical guidance on the test kit at the Donka National Hospital in the Republic of Guinea.
- 2 The test kit in the mobile examination vehicle
- 3 Professor Yasuda (center back) and Assistant Professor Kurosaki with children in Coyah, where the two Japanese researchers oversaw EVD testing using their device in an examination vehicle.



Hospital to provide the necessary training. On this occasion the two researchers also conducted a field in Coyah, 50 kilometers east of the capital, in which the kit was set up in an examination vehicle.

“When testing for EVD outside the hospital, the unit’s light weight and ease of operability are important advantages,” says Goto. “We often experience blackouts in Guinea, but if one occurs during an EVD test, doctors can still rely on the built-in battery and there is no need to repeat a test from the beginning.”

The World Health Organization (WHO) declared the end of the EVD epidemic in Guinea in December 2015, and the end of the EVD epidemic in West

Africa in January 2016. However, the situation is still critical, and the test kit will play an important role in controlling any future EVD outbreaks at an early stage.

In June, Toshiba Medical Systems Corporation launched the Genalyzer™ F Series and test reagents for research institutions. The Genalyzer™ F employs the same technology and is capable of determining DNA in a large number of infectious diseases.

“In addition to EVD, outbreaks of dengue fever, Zika fever and many other infectious diseases are feared around the world,” says Goto. “We hope to make a contribution by making it possible to rapidly determine infections using this device.”