Stopping Ebola in its tracks: which vaccine will do it?

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Forty years after emerging in what is today the Democratic Republic of Congo, the Ebola virus may finally have met its match in a vaccine which could be "up to 100 percent effective", according to its makers.

Dubbed rVSV-ZEBOV, the vaccine is one of at least 15 being designed worldwide.

Since the end of the West African Ebola outbreak earlier this year, however, developers sit with a unique dilemma: they can only test a vaccine's ultimate efficacy by checking if it protects people in the midst of an epidemic.

Here are brief descriptions of the leading contenders for a vaccine to stop the deadly haemorrhagic fever, for which there is no cure.

rVSV-ZEBOV

The frontrunner vaccine candidate has been developed by pharma company Merck, Sharp & Dohme and funded by the World Health Organization (WHO), Canada's Public Health Agency and other donors.

It uses a modified version of the vesicular stomatitis virus (VSV), which causes illness in rodents, cattle, pigs and horses. Not dangerous to humans, the virus has had one of its genes replaced by an Ebola virus gene.

The vaccine prompts the human body to develop antibodies against the invader, so that when Ebola attacks, the antibodies are quick to identify it and fight back.

According to final trial results released by the WHO on Friday, not one of the nearly 6,000 people given the vaccine in Guinea contracted Ebola within 10 days. The trial was conducted when the outbreak was already winding down in 2015.

In a comparison group of similar size, not given the vaccine, there were 23 cases in the 10 days.

Guinea, Liberia and Sierra Leone were the countries hardest hit by the 2014-16 outbreak which made nearly 29,000 people ill and killed more than 11,300.

rVSV-ZEBOV could become available for use in 2018, under a fast-track drug-approval process.

chAd3

Britain's GlaxoSmithKline and the US National Institute of Allergy and Infectious Diseases (NIAID) have been developing the other of the two most advanced trial vaccines.

It is based on a type of chimp cold virus, known as an chimpanzee adenovirus type 3 (ChAd3), to which an Ebola virus gene has been added.

Phase I trials, the first step in vetting a new drug for safety and effectiveness, were conducted in the United States, Britain, Switzerland and Mali.

These showed the drug was safe, and people injected with it developed Ebola antibodies.

It went straight to Phase III tests in Liberia, but the epidemic ended and the trial was stopped without reporting any results.

A Phase III trial is meant to test whether a vaccine protects people under natural disease conditions—the final step before licensing.

Other

An experimental double-dose vaccine consisting of two different virus-based vaccines, Ad26-EBOV and MVA-EBOV, has passed a Phase I trial in England.

It is developed by Crucell, a subsidiary of US company Johnson & Johnson, in cooperation with the National Institutes of Health.

It is more onerous, requiring two shots three weeks apart, but may ultimately provide longer-lasting protection than a single dose.

Elsewhere, China has conducted early-stage human testing with a vaccine, while Russia is developing at least two—one of which, also a dual-dose drug, is already registered in Russia for emergency use.

The ideal is to have more than one vaccine type—preferably a combination of an easy-to-administer, quick-acting, single-shot version to be given to the general population to stop an outbreak, and a double-dose vaccine to confer longer-term protection on health personnel.