

There is no licensed vaccine or treatment for Ebola, which has killed more than 8,600 people in West Africa out of more than 21,700 infected since the start of 2014.

This is the status of the quest for drugs to tackle the emergency.

- **VACCINES** - US health authorities announced Thursday that a large-scale trial will start in hard-hit Liberia with the two leading candidate vaccines.
- **chAd3-ZEBOV**: Developed by British company GlaxoSmithKline (GSK) and the US National Institute for Allergy and Infectious Diseases (NIAID), it is based on a chimpanzee adenovirus to which an Ebola virus gene has been added to stimulate an immune response. Phase I trials, the first step in the process to vet a new drug for safety and effectiveness, started in September among 20 healthy adults in the United States and 60 in Britain, later expanded to Switzerland and Mali.

Early results showed it was safe and people injected with it developed antibodies against the Ebola virus.

It will now go straight to Phase III trials with about 30,000 people in Liberia. Phase III is usually the final trial stage to show that a vaccine provides effective virus protection. In parallel, Phase II safety trials will be conducted in west African countries not affected by Ebola -- Cameroon, Ghana, Mali, Nigeria and Senegal.

- **rVSV-ZEBOV**: Developed by the Public Health Agency of Canada, the license for commercialisation is held by a US company, NewLink Genetics. It uses a weakened virus for vesicular stomatitis, a livestock disease, of which one of the genes has been replaced by an Ebola virus gene.

A Phase I trial in Switzerland was suspended last month after some volunteers experienced joint pain, but has since resumed at a different dosage. It is also being tested in the United States, Canada, Germany, Kenya and Gabon.

- A Phase I trial with an experimental vaccine duo (Ad26-EBOV and MVA-EBOV) made by Crucell, a subsidiary of US company Johnson & Johnson, started in England this month, but is months behind the other two.
- **TREATMENTS** - - Of several prototypes in the pipeline, one dubbed ZMapp has been fast-tracked for use. A cocktail of three antibodies that cling to the virus and inhibit its reproduction, ZMapp is developed by Mapp Biopharmaceutical in California, in conjunction with the US Army.

Since the WHO gave the green light last August for experimental treatment to be used in the Ebola crisis, ZMapp has been given to a small number of infected frontline workers. Among those who survived, it was unclear whether ZMapp was the cause.

On Thursday, the US-based Biomedical Advanced Research and Development Authority (BARDA) announced a ZMapp clinical trial with 100-150 volunteers will be conducted in Liberia and the United States.

If it is shown to be effective, several thousand doses could be produced by the end of the year, said BARDA director Robin Robinson. Very limited stocks ran out last August.

- TKM-Ebola: A drug that kills virus-infected cells, is being developed by Vancouver-based Tekmira Pharmaceuticals under a \$140-million (125-million-euro) contract with the Pentagon.

In tests on a small group of monkeys, it provided 100 percent protection against an otherwise lethal dose of Ebola virus. It is being tested in a Phase I trial on humans.

-- Anti-viral drugs: Several proposed Ebola treatments started out as influenza drugs.

Avigan, a tablet developed by Toyama Chemical, a subsidiary of Fujifilm Holdings, is undergoing clinical trials in the United States and Guinea and has been administered as an emergency treatment to patients evacuated from West Africa to Europe.

North Carolina-based BioCryst Pharmaceuticals has received \$2.4 million from NIAID to test the efficacy in primates of its BCX4430 antiviral as a treatment for Ebola.

- Blood therapy: In which antibodies from the blood of survivors is given to patients, has been used as an ad-hoc treatment in Ebola-hit countries but its effectiveness has not been proven in a clinical trial.

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