

Ebola

Anshupa Patel Gupta¹, Himani Tambde²

^{1,2}NCRD's Institute of Pharmacy, Nerul, Navi Mumbai, India

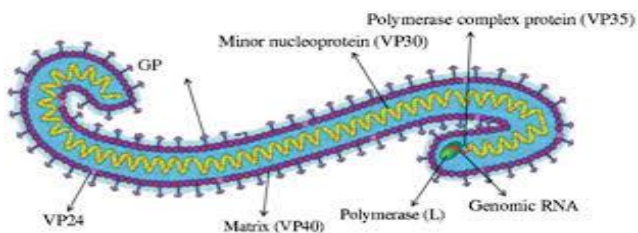
Abstract: Ebola virus disease or simply Ebola is lethal viral hemorrhagic fever caused by Ebola viruses. Many outbreaks have been seen from 1976 to recent 2016, killing around 50 % of persons affected. The Ebola virus includes six species of virus out of which Zaire ebolavirus has highest mortality rate. To get protection against this virus, the vaccine was invented by scientists at the Public Health Agency of Canada (PHAC). In 2014, Merck got the licence to develop this from Newlink (which was first licensed from PHAC). Now Merck Sharp & Dohme Corp has got approval in December 2019 for manufacturing it under the trade name ERVEBO[®]. ERVEBO is a live recombinant viral vaccine in the form of sterile suspension for intramuscular injection. It is to be administered in single 1 ml dose. Though it has few adverse effects it will certainly be a milestone fighting against Ebola disease.

Keywords: Ebola virus, Ebola virus disease (EVD), vaccine

1. Introduction

Ebola Virus

The Ebola virus (family *Filoviridae*)^[3] includes six species of virus viz. *Bundibugyo ebolavirus*, *Restonebolavirus*, *Sudan ebolavirus*, *Tai Forest ebolavirus*, *Zaire ebolavirus*, and *Bombali ebolavirus*. *Zaire ebolavirus* has the highest mortality rate of the Ebola viruses, and is responsible for the largest number of outbreaks including the 1976 Zaire outbreak and the outbreak with the most deaths (2014).



Ebola virus was first discovered in 1976 near the Ebola River in what is now the Democratic Republic of Congo (DRC). Since then, the virus has been infecting people from time to time, leading to outbreaks in several African countries. Scientists do not know where Ebola virus comes from. However, based on the nature of similar viruses, they believe the virus is animal-borne, with bats being the most likely source. The bats carrying the virus can transmit it to other animals, like apes, monkeys, duikers and humans.^[4]

Ebola Virus Disease

Ebola virus disease (EVD), also known as Ebola hemorrhagic fever (EHF) or simply Ebola, is a viral hemorrhagic fever of humans and other primates caused by Ebola viruses.^[1] After entering the body, it kills cells, making some of them explode. It wrecks the immune system, causes heavy bleeding inside the body, and damages almost every organ.^[2] Signs and symptoms typically start between two days and three weeks after contracting the virus with fever, sore throat, muscular pain, and headaches.^[1] Vomiting, diarrhoea and rashes usually follow, along with decreased function of the liver and kidneys.^[1] At this time, some people begin to bleed both internally and externally.^[1] The disease has a high risk of death, killing

25% to 90% of those infected, with an average of about 50%.^[1]

Outbreaks

EVD first appeared in 1976 in two simultaneous outbreaks, one in what is now Nzara, South Sudan, and the other in Yambuku, DRC. The 2014–2016 outbreak in West Africa was the largest Ebola outbreak. The outbreak started in Guinea and then moved across land borders to Sierra Leone and Liberia. The most recent 2018–2019 outbreak in eastern DRC is considered to be highly complex, with insecurity adversely affecting public health response activities.^[1] Between 1976 and 2013, the World Health Organization reports 24 outbreaks involving 2,387 cases with 1,590 deaths. The largest outbreak to date was the epidemic in West Africa, which occurred from December 2013 to January 2016, with 28,646 cases and 11,323 deaths.^[5]

Treatment

Since there aren't any drugs to fight the virus, health care teams treat the person's symptoms and offer basic support care. They include keeping the person hydrated with fluids through an IV, giving oxygen, maintaining their blood pressure and treating any other infections they have. A person's survival depends on how well his immune system works. The sooner the patient gets medical care, the better the chances of recovery.

After Ebola

Ebola survivors have certain proteins, called antibodies, in their blood that may protect them from the same strain of the virus for 10 years or more. But no one knows if they can get sick from the other strains. It's rare, but the Ebola virus can stay in semen for 3 months after a man recovers, so he should avoid sex or use a condom to keep from infecting others. The virus can stay in breast milk for 2 weeks after recovery, so women shouldn't breastfeed during that time.^[2]

EBOLA Vaccine

An investigational vaccine called rVSV-ZEBOV, showed to be safe and protective against the Zaire strain of the Ebola virus. This vaccine, was used under "expanded access" or what is also known as "compassionate use" in the Ebola outbreak in North Kivu.

A ring vaccination tracks the epidemic, recruiting individuals at raised risk of infection due to their connection to a patient confirmed with the virus. The ring is not necessarily a contiguous geographic area but captures a social network of individuals and locations that may include dwellings or workplaces further afield, where the index patient spent time while symptomatic, or the households of individuals who had contact with the patient during the illness or after his or her death. Experience suggests that each ring may be composed of an average of 150 persons.^[8]

The vaccine for ebola was created by scientists at the National Microbiology Laboratory in Winnipeg, Manitoba, Canada, which is part of the Public Health Agency of Canada (PHAC). PHAC licensed it to a small company, NewLink Genetics, which started developing the vaccine; NewLink in turn licensed it to Merck in 2014. It was used in its investigational form, rVSV-ZEBOV (on compassionate basis) in the DRC in a 2018 outbreak in Équateur province, and has since been used extensively in the 2018-19 Kivu Ebola outbreak, with over 90,000 people vaccinated.^[7] The vaccine was approved for medical use in the United States in December of 2019 under the trade name ERVEBO.

Proper Name: Ebola Zaire Vaccine, Live

Trade Name: ERVEBO®

Manufacturer: Merck Sharp & Dohme Corp.

INDICATION: Indicated for the prevention of disease caused by *Zaire ebolavirus* in individuals 18 years of age and older.^[7]

Dosage and Administration

Administer a single 1 mL dose of ERVEBO intramuscularly.

Dosage Forms and Strengths

1 mL suspension for injection supplied as a single-dose vial.

Contraindications

Severe allergic reaction (e.g., anaphylaxis) to any component of ERVEBO.

Adverse Reactions

The most common injection-site adverse events were injection-site pain (70%), swelling (17%), and redness (12%). The most common systemic adverse events reported following vaccination with ERVEBO were headache (37%), feverishness (34%), muscle pain (33%), fatigue (19%), joint pain (18%), nausea (8%), arthritis (5%), rash (4%) and abnormal sweating (3%).

2. Preparation

Thaw vial at room temperature until no visible ice is present. Do not thaw the vial in a refrigerator. Gently invert vial several times. The vaccine is a colorless to slightly brownish-yellow liquid with no particulates visible. Parenteral drug products should be inspected visually for particulate matter and discoloration prior to

administration, whenever solution and container permit. If either of these conditions exists, discard the vial. Use the vaccine immediately after thawing. If not used immediately, the vaccine may be stored for 4 hours at room temperature (up to 25°C; 77°F) protected from light. DO NOT REFREEZE. Withdraw the 1 mL dose of vaccine from the vial using a sterile needle and sterile syringe.

3. Description

ERVEBO (Ebola Zaire Vaccine, Live) is a sterile suspension for intramuscular injection. It is a live recombinant viral vaccine consisting of a vesicular stomatitis virus (VSV) backbone deleted for the VSV envelope glycoprotein and substituted with the envelope glycoprotein of the Zaire ebolavirus (Kikwit 1995 strain). The vaccine virus is grown in serum-free Vero cell cultures. The virus is harvested from the cell culture medium, purified, formulated with stabilizer solution, filled into vials and stored frozen. When thawed, ERVEBO is a colorless to slightly brownish-yellow liquid with no particulates visible. Each 1 mL dose of ERVEBO contains a minimum of 72 million plaque forming units (pfu) of vaccine virus in a stabilizer solution containing 10 mM Tromethamine (Tris) and 2.5 mg/mL rice-derived recombinant human serum albumin. Each 1 mL dose may contain residual amounts of host cell DNA (≤ 10 ng) and benzonase (≤ 15 ng). The vaccine may contain trace amounts of rice protein. The product contains no preservatives.^[6]

4. Conclusion

Viruses pose threat to humans in the form of many diseases. Diseases like Ebola are lethal. This is endemic to the African continent and epidemic too. There have been Ebola outbreaks in the recent decades, so, a lot of research has been done on this to develop the ERVEBO vaccine. The vaccine in its investigational form rVSV-ZEBOV was recommended by the Strategic Advisory Group of Experts on Immunization (SAGE) for use in Ebola outbreaks caused by the Zaire strain of the virus, in the event where there was no licensed vaccine. It was used on compassionate grounds on contacts, and contacts of contacts of confirmed Ebola virus disease patients (dead or alive), health care and frontline workers (local and international) in the affected areas. Now, the authorities have given approval to ERVEBO on fast track basis on 19th Dec 2019. Isolation of the patients plays an important role in curbing the disease along with the vaccine. Still lots needs to be done on antivirals and vaccines. Hopefully, the commercial production of the vaccine by MSD will commence soon which will save many lives.

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