



## BRIEF REPORT

# Ebola Hemorrhagic Fever and the Current State of Vaccine Development

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Received: August 7, 2014  
Revised: September 18, 2014  
Accepted: September 29, 2014

### KEYWORDS:

Ebola virus,  
hemorrhagic fever,  
vaccine,  
outbreak

### Abstract

Current Ebola virus outbreak in West Africa already reached the total number of 1,323 including 729 deaths by July 31st. the fatality is around 55% in the south-eastern area of Guinea, Sierra Leone, Liberia, and Nigeria. The number of patients with Ebola Hemorrhagic Fever (EHF) was continuously increasing even though the any effective therapeutics or vaccines has not been developed yet. The Ebola virus in Guinea showed 98% homology with Zaire Ebola Virus.

Study of the pathogenesis of Ebola virus infection and assess of the various candidates of vaccine have been tried for a long time, especially in United States and some European countries. Even though the attenuated live vaccine and DNA vaccine containing Ebola viral genes were tested and showed efficacy in chimpanzees, those candidates still need clinical tests requiring much longer time than the preclinical development to be approved for the practical treatment. It can be expected to eradicate Ebola virus by a safe and efficient vaccine development similar to the case of smallpox virus which was extinguished from the world by the variola vaccine.

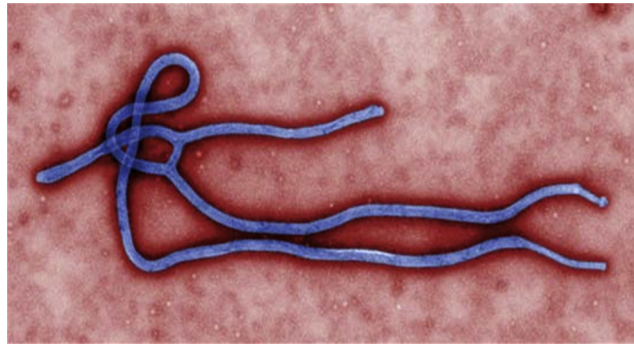
## 1. Introduction

In February 2014, the first outbreak case of Ebola virus (Figures 1) was confirmed and registered in the

region of Guinea (West-Africa) by the World Health Organization (WHO). By July 31, the total number of suspected and confirmed cases in the Ebola hemorrhagic fever (EHF) outbreak had increased to 1,323, including

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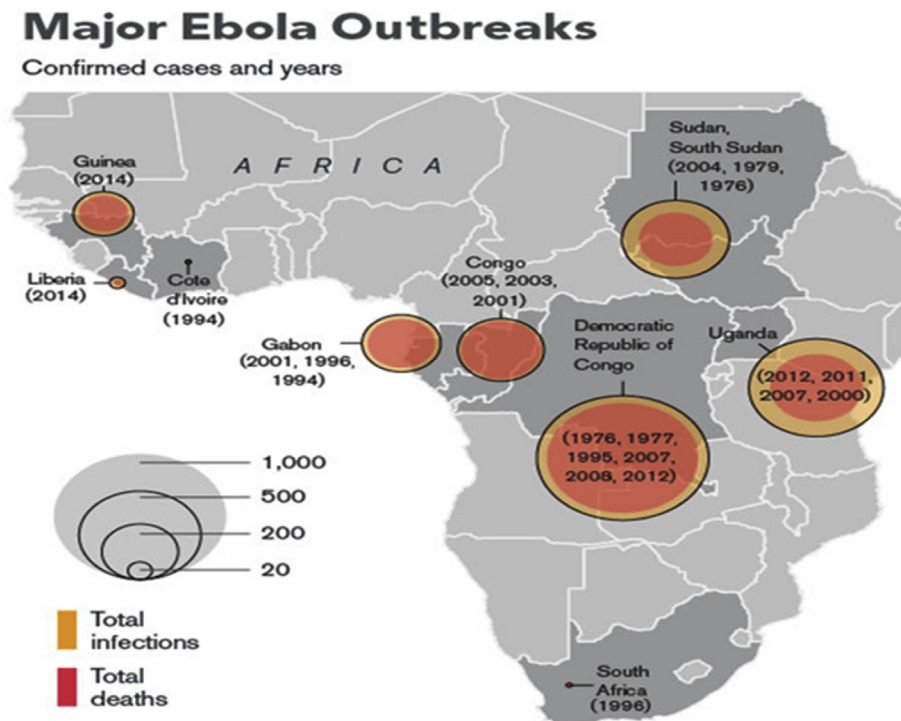


**Figure 1.** Ebola virus virion under light microscopy. (Courtesy of CDC/Cynthia Goldsmith).

729 deaths at a fatality rate of 55% in the southeastern area of Guinea, Sierra Leone, Liberia, and Nigeria [1]. The Ebola virus in Guinea showed 98% homology with the Zaire Ebola virus (ZEBOV) found in Congo and Gabon (1994–1995) [2].

Since the first outbreak of Marburg hemorrhagic fever occurred in 1967, there have been 18 reports of human outbreaks by Ebola or Marburg viruses, which has resulted in approximately 1,500 cases to date [3] (Figure 2). In 1976, the first outbreak reported in Zaire (Democratic Republic of the Congo) resulted in 318 cases and 280 deaths. Since then, Ebola virus epidemics have occurred in several countries in equatorial Africa and the strains were named after the regions of outbreak including Ebola-Zaire, Ebola-Sudan, Ebola-Tai Forest, Ebola-Bundibugyo, and Ebola-Reston. ZEBOV is the most lethal pathogen of the Ebola viruses which causes

> 90% of fatalities due to hemorrhagic fever in humans and primates [4]. In 1994–1995, outbreaks in Gabon and Zaire (Democratic Republic of the Congo) also resulted in 285 deaths of 367 infected cases [5]. An epidemiological study revealed that most cases occurred after direct contact with blood, secretions, or tissue of infected patients. In 1976, 27% of death cases among 88% of death cases in Zaire were reported as being due to patients having been injected with a contaminated syringe [6]. Mortality was higher even though the percutaneous exposure was of very low Ebola virus inocula. In 1995 in Kikwit, numbers of Ebola viral particles found in human skin and lumina of sweat glands raised concern about the disease transmission by touching an infected patient or corpse [7]. The overall window period ranges from 2 to 21 days, and patients usually do not show any symptoms within the 1st week.



**Figure 2.** Mapping the world Ebola outbreaks. <http://www.zerohedge.com/2014-04-05/mapping-workls-ebola-outbreaks>.

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