

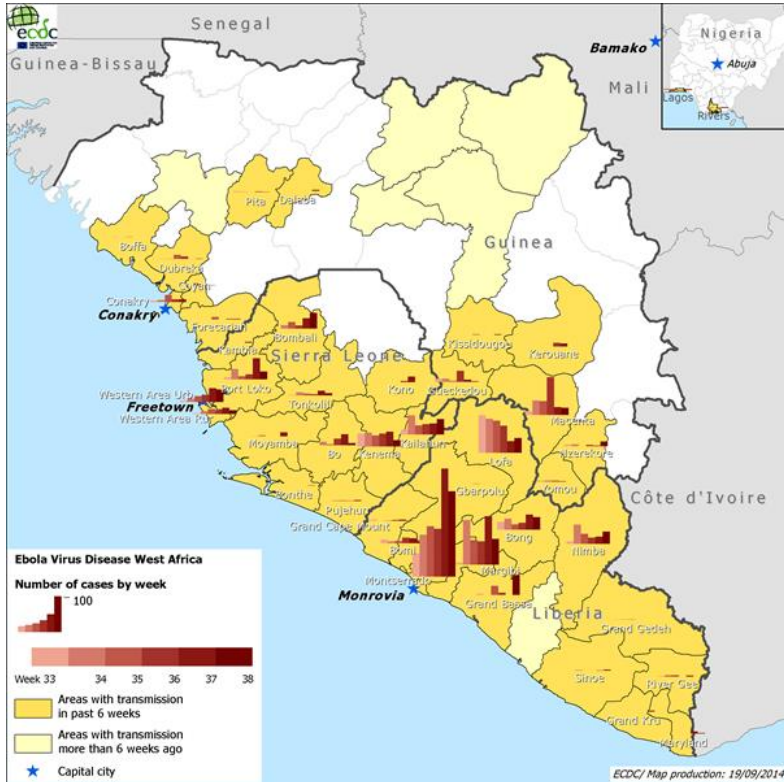


National Biosurveillance Integration Center

Ebola virus in West Africa

1 October 2014

Biosurveillance Event Report
Public Health State, Local, Tribal, & Territorial Edition



Confirmed, Probable, and Suspect Ebola Virus Disease Cases and Deaths in West Africa

Region	Cases	Deaths
Guinea	1,157	710
Liberia	3,696	1,998
Sierra Leone	2,304	622
Nigeria	20	8
Senegal	1	0
United States	1	0
Total	7,179	3,338

(WHO, 1 October 2014;
 CDC, 30 September 2014)

The NBIS Reporting List contains the most up-to-date outbreak statistics.

- Critical information Requirement(s):**
- 1) Anomalous levels of disease
 - 2) High visibility biological event
- Significant Features:**
 Largest reported outbreak of Ebola Virus Disease

Source: European Centre for Disease Prevention and Control

EXECUTIVE SUMMARY

On 8 August, the International Health Regulations Emergency Committee of the World Health Organization (WHO) declared the ongoing epidemic of Ebola virus to be a Public Health Emergency of International Concern (PHEIC). According to the WHO, regional health authorities in western Africa have reported 7,178 cases of Ebola virus disease with 3,338 deaths to the WHO since the outbreak was first recognized in March 2014. On 30 September 2014, The U.S. Centers for Disease Prevention and Control (CDC) announced that an unidentified man, who is receiving treatment at Texas Health Presbyterian Hospital in Dallas, Texas, has been diagnosed with Ebola virus. All previous cases associated with the U.S. were diagnosed in West Africa. One patient died while in Nigeria, and four were diagnosed in West Africa before traveling to the U.S. for treatment. Of these four, three have recovered and have been discharged from the hospital, while the fourth remains hospitalized. This newly identified case developed symptoms in the U.S. and was not symptomatic, and therefore not infectious, while traveling from Liberia. He is currently hospitalized and contacts are being traced, including one who has been identified by media source as a possible second case. The CDC believes the U.S. clinical and public health systems will work effectively to prevent the spread of the Ebola virus and the ongoing EVD outbreak in West Africa is unlikely to affect public health in the U.S. significantly.

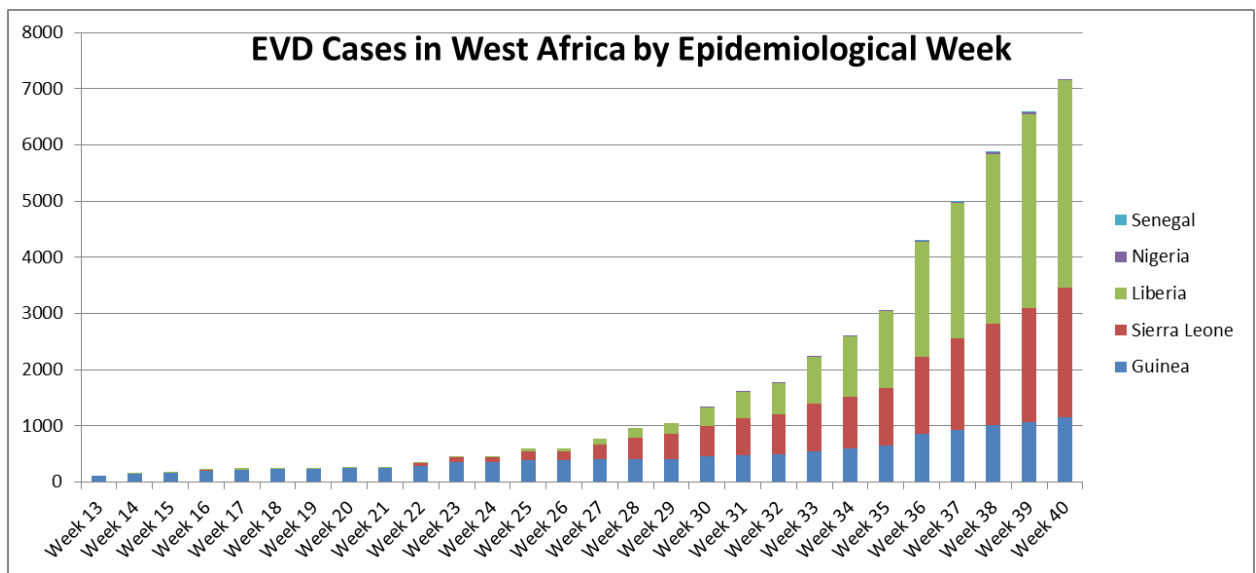
This epidemic is not related to the Ebola virus Disease (EVD) outbreak in the Democratic Republic of Congo. (Please see the Biosurveillance Event Report titled “Ebola virus in Democratic Republic of Congo” for more information related to this separate and unrelated outbreak).



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EVENT FEATURES

- On 30 September 2014, the CDC announced that an unidentified man, who is receiving medical treatment at Texas Health Presbyterian Hospital in Dallas, Texas, has been diagnosed with Ebola virus. This is the first EVD diagnosis performed in the U.S. The patient had returned from Liberia on 19 September and arrived in the U.S. on 20 September 2014. The traveler develop symptoms on 24 September, sought medical care on 26 September, and was admitted to the hospital and placed in isolation on 28 September.
- Individuals infected with Ebola are not infectious until they develop symptoms. This patient developed symptoms in the U.S. and therefore, was not infectious, while traveling from Liberia into Dallas, Texas. He is currently hospitalized and contacts being traced, including one who has been identified by media source as a possible second case. His nationality has not been made public.
- This is the sixth person closely associated with the U.S. to be diagnosed with Ebola virus. All previous such cases were diagnosed in West Africa. One case died while in Nigeria. The remaining four were diagnosed in West Africa before traveling to the U.S. for treatment. Of these four, three have recovered and have been discharged from the hospital and the fourth remains hospitalized.
- The WHO indicates that regional health authorities in West Africa have reported (as of 1 October 2014) 7,178 cases of Ebola virus disease with 3,338 deaths since the outbreak was first recognized in March 2014.



Note: Epidemiological week 40 ends on 4 October; data for this week are thus incomplete.

Figure 1. Cumulative EVD cases as reported by the WHO

(Note: WHO reports are posted periodically; cumulative totals are revised both up and down to reflect the results of laboratory confirmation and data harmonization.)

- Representatives from the CDC emphasized the reported toll of the epidemic is "far larger than has been recorded, not because they [affected countries] are trying to hide anything but because they are really overwhelmed by these numbers."
- News sources continue to report the evaluation and testing of returned travelers in multiple locations under suspicion of EVD. More such reports are extremely likely as countries are

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responding with enhanced prevention measures to reduce the risk of imported Ebola cases.

- This epidemic is independent to the EVD outbreak affecting the Democratic Republic of Congo. (Please see the Biosurveillance Event Report titled “Ebola virus in the Democratic Republic of Congo” for more information related to that outbreak).
- The WHO released an Ebola response “Roadmap” on 28 August 2014, with a stated goal of stopping EVD transmission in six to nine months and preventing further international spread.
 - The roadmap assumes that true morbidity may be two-to-four-fold higher than currently reported in areas with intense transmission.
 - The document acknowledges that total cases may exceed 20,000 (given infection control measures do not significantly improve) over the course of the event, a projection widely re-reported by news media.
 - The roadmap further recognizes that additional countries could be exposed but assumes that emergency application of standard control strategies will stop transmission within eight weeks of the appearance of an index case.
 - By late September, a comprehensive United Nations-led plan will be launched to both enhance response activities and to address the broader consequences of the outbreak (education, food security, primary and secondary healthcare, etc.).
- On 28 August 2014, Science Magazine released a report detailing an analysis of the genomic diversity of Ebola virus isolated from 78 patients in Sierra Leone. The authors suggest these analyses indicate:
 - The outbreak resulted from a single introduction of Ebola virus from a natural reservoir followed by sustained human-to-human transmission.
 - The Ebola virus-Zaire isolate associated with the epidemic in West Africa is genetically distinct from Ebola virus-Zaire isolates of previous outbreaks in central Africa. The phylogenetic comparison/analysis suggests the West Africa version diverged from a common Ebola virus-Zaire strain around 2004.
 - The rate of mutations in the Ebola virus genome has been higher during the 2014 outbreak. Similar findings have been reported during previous outbreaks and are likely due to the rapid spread of the virus during this period partially circumventing natural processes selecting against sub-optimal genomic constitutions.
- On 8 August 2014, the WHO International Health Regulations Emergency Committee declared the ongoing epidemic of EVD to be a PHEIC. The Committee made recommendations to interrupt transmission within the affected countries and to reduce the risk of further geographic spread. Recommendations highlight the need for a coordinated international response, as well as laying out specific measures to be taken in countries with Ebola transmission, in neighboring countries, and globally.
- The WHO has attributed the continuous propagation of EVD in West Africa to three major factors, namely:
 1. Mistrust, apprehension, and resistance to adopt recommended public health measures, due primarily to cultural practices and traditional beliefs
 2. Population movements both within and across borders
 3. Non-comprehensive coverage of containment measures, due to the involvement of multiple countries and need for a robust capacity to respond effectively that is lacking in this area.

EVENT TIMELINE

STATE, LOCAL, TRIBAL, & TERRITORIAL
UNCLASSIFIED



New information in blue
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- **6 December 2013, Meliandou, Gueckedou, Guinea: Death of the suspected first case (age 2).**
- February 2014, Gueckedou, Guinea: A healthcare worker (HCW) triggers spread of the virus to Macenta, Nzerekore, and Kissidougou prefectures, all located in Guinea.
- 10 March 2014: Regional hospitals and health services alert the Guinean Ministry of Health of a mysterious disease characterized by fever, diarrhea, vomiting, and high fatality.
- 12 March 2014: Gueckedou and Macenta, Guinea hospitals and health services alert Doctors Without Borders (MSF) in Guinea to the mysterious disease affecting patients in those regions.
- 14 March 2014: Local news sources report a "new disease" in Macenta prefecture, Guinea, describing "strong hemorrhaging" and nosebleeds. A nurse interviewed by the news source indicated the disease first appeared two weeks prior in the urban area of Macenta as well as surrounding villages. This report is picked up by HealthMap.
- **23 March 2014, Gueckedou, Macenta, Nzerekore, and Kissidougou prefectures, Guinea: WHO reports notification by the Guinean Ministry of Health of a rapidly evolving Ebola outbreak in southeastern Guinea, involving 49 cases and 29 deaths as of 22 March, as well as three suspect cases in Conakry, Guinea. Suspect cases were also being investigated in border areas of Liberia and Sierra Leone.**
- **30 March 2014, Lofa County, Liberia: WHO reports first confirmed cases of EVD in Liberia.**
- 9 April 2014, Liberia: Final case in first wave. The first wave comprised 12 cases (final count, following reclassification of several individuals).
- **25 May 2014, Sierra Leone: WHO notified of an EVD outbreak in Koindu chiefdom, comprising one confirmed case and four deaths; samples were tested at the VHF laboratory in Kenema.**
- 20 July 2014, Monrovia, Liberia – Lagos, Nigeria: Liberian-American travels by plane from Monrovia to Lagos, Nigeria while symptomatic and is treated at a private hospital.
- 22 July 2014, Lagos, Nigeria: Samples from the Liberian-American traveler are found positive for Ebola virus (Lagos University Teaching Hospital laboratory).
- **25 July 2014, Lagos, Nigeria: WHO reports Nigeria's first EVD case.**
- **28 July 2014, Liberia: U.S.-based missionary organization Serving In Mission (SIM) announces that two American doctors working in Monrovia have tested positive for Ebola virus.**
- 1 August 2014, Port Harcourt, Nigeria: Close contact of Nigerian index case is treated at a Port Harcourt hotel by a local physician.
- 11 August 2014, Port Harcourt, Nigeria: Port Harcourt physician develops symptoms including fever and weakness. He continues to treat patients until 13 August 2014, operating on at least two. He also participates in a birth celebration and in a religious healing exercise reportedly involving the laying on of hands.
- 20 August 2014, Guinea: Guinea health officials tracing a close contact of a known EVD patient lose track of the contact as he travels by road to Dakar, Senegal to stay with relatives.
- 23 August 2014, Senegal: The EVD patient contact, the Guinean national mentioned above, seeks care for fever, diarrhea, and vomiting and is treated for malaria. The ill contact is referred to Fann Hospital in Dakar and admitted on 26 August 2014.
- **29 August 2014, Senegal: The Senegalese Minister of Health announces the country's first confirmed EVD case via news media after treating healthcare providers diagnose the ill contact with EVD.**



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- 2 September 2014, Monrovia, Liberia: U.S.-based missionary organization SIM announces the confirmation of a third case among its team, an American doctor practicing obstetrics in Monrovia.
- 9 September 2014, Atlanta, Georgia: A U.S. aid worker deployed to Sierra Leone on behalf of the WHO arrived at Emory University Hospital for treatment.
- 30 September 2014, Dallas, Texas: [The CDC announces the first imported EVD case into the United States \(or any country outside West Africa\). The individual developed symptoms after arrival from Liberia. This person is now in isolation at the Texas health Presbyterian Hospital in Dallas, Texas.](#)

LOCAL RESPONSE EFFORTS AND RELATED CHALLENGES

Guinea

- The government declared a health emergency on 14 August 2014, involving heightened control measures including limitations on internal movement, health inspections at borders, mobilization of all health and security/defense personnel, increased restrictions on both suspect cases and contacts undergoing tracing, and a ban on movement of corpses.
- Ebola incidence continues its resurgence in Macenta prefecture, due in large part to the arrival of sick individuals from Liberia. The Ministry of Health has acknowledged repeated reticence in that to interventions. This is complicating contact tracing efforts.
- Over the past two weeks, public protests and acts of violence directed towards Ebola response teams have been reported in Macenta, Forecariah, and Nzerekore prefectures.
- The rate of infection is beginning to stabilize in many areas, with the notable exception of Macenta prefecture.

Liberia

- Liberia launched wide-scale control efforts under “Operation White Shield,” during the first week of August. These include the establishment of checkpoints intended to restrict domestic movement of populations in multiple areas, as well as quarantine of multiple counties. President Ellen Johnson Sirleaf acknowledged at that time that civil liberties would be restricted and that seasonal and endemic diseases such as typhoid and malaria go untreated, due to the closure of many hospitals and clinics.
- Countrywide, media continue to emphasize the negative effects of the Ebola outbreak on other public health priorities, including assisted childbirth and treatment of malaria and typhoid, as well as the need for food and other supplies in quarantined zones. While efforts are in place to ensure food delivery, the WHO and MSF have called attention to the lack of sufficient international support.
- The healthcare system in Liberia remains overwhelmed, as the rate of infection continue to increase in many counties. The epidemic is having a significant impact on health, economic, and political conditions.

Sierra Leone

- Sierra Leone implemented Operation Octopus during the first week of August, under which the districts of Kenema and Kailahun were placed under quarantine.
- Media reporting from Sierra Leone remains significantly less prolific than that in Liberia.
- China plans to support the establishment of an Ebola holding center and laboratory at the Sierra Leone-China Friendship Hospital.



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- As in Liberia, reporting on the event emphasizes the impact of Ebola on agriculture and food security, as many farmers have died or abandoned their crops. The outbreak is also affecting HIV/AIDS prevention and control, as many people have stopped going to clinics for treatment.
- Sierra Leone focused much of its response effort over the past few weeks on a three-day “lockdown,” held 19-21 September, during which 130 to 300+ new cases were identified and 70 to 90 bodies recovered. Since the lockdown, the government has sealed off borders with Guinea and Liberia and placed most of the population under quarantine. Media report widespread food and healthcare shortages.

Nigeria

- While initial EVD cases in Nigeria were limited to Lagos state, community transmission subsequently occurred in Port Harcourt, Rivers state.
- Nigeria has not confirmed any new cases since 5 September.

Senegal

- On 29 August 2014, Senegal’s Minister of Health announced the country’s first EVD case, a Guinean national who recently arrived to Senegal. The individual tested positive for the virus and is now in isolation in Fann-Point E-Amitié outside of Dakar, Senegal.
- All identified potential case contacts have completed a 21-day follow-up with no further EVD reported.
- The last confirmed case of EVD in Senegal was reported 28 August 2014.

United States

- On 30 September 2014, the CDC announced the first imported EVD case into the United States in an individual who developed symptoms after arrival from Liberia. This person is now in isolation at the Texas Health Presbyterian Hospital in Dallas, Texas.
- The patient is characterized as in “serious but stable condition”.
- The CDC and Texas health officials are actively working to identify all contacts that the patient may have encountered while symptomatic; these individuals, as well as healthcare workers and emergency responders, will be monitored for the 21-day maximum incubation period for any signs of infection. Emergency responders are temporarily off-duty while under observation.
 - According to an official with the Dallas County Department of Health and Human Services, authorities have identified five household and 12-18 other contacts(Gittens, 2014). However, health officials have not announced if this is the total number of identified contacts.
 - According to the Dallas County Health and Human Services Director, as quoted by open-source media, officials are monitoring a second individual characterized as both a “close associate” and a “possible second Ebola patient” (Viebeck, 2014).
 - The patient was in contact with five students during the period 27-28 September; these children are being kept home from school and monitored at home. These potential contacts attend four different schools, two elementary schools, a middle school and a high school and some attended school earlier this week. The school district has notified parents about the possibility of exposure as a precaution, as well as adding extra medical and custodial staff. All of the exposed children are currently asymptomatic (Gittens, 2014).



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- The U.S. healthcare system is capable of effectively treating patients and protecting public health. U.S. health authorities indicate the Ebola virus is unlikely to spread effectively in domestic U.S. communities and there is low risk to the U.S. public health at this time.
- The CDC has been preparing for the potential of an Ebola case identified in the U.S., providing health alerts and guidance for the U.S. healthcare community.

TRAVEL ALERTS AND RESTRICTIONS

- On 11 September 2014, The CDC updated the Level 3 Warning Travel Notice for Guinea, Sierra Leone, and Liberia. The notice recommended U.S. residents avoid nonessential travel to listed countries. If travel is necessary the CDC recommends that travelers to these countries protect themselves by avoiding contact with the blood and body fluids of people who are sick with Ebola.
- On 31 July 2014, The CDC issued a Level 3 Warning Travel Notice recommending U.S. residents to avoid nonessential travel to Guinea, Sierra Leone, and Liberia. The CDC also indicated the governments of these countries have instituted enhanced measures to control the spread of EVD in the countries and these enhanced measures could affect travel as well.
- On 11 September 2014, the CDC issued an updated Level 2 Alert Travel Notice advising travelers to Nigeria to practice enhanced precautions.
- On 7 August, the U.S. Department of State (DOS) issued a travel warning ordering all family members residing with Embassy staff in Monrovia, Liberia to evacuate the country in addition to warning U.S. residents against non-essential travel to Liberia due to the ongoing EVD epidemic.
- On 14 August, DOS issued a travel warning ordering all family members residing with Embassy staff in Freetown, Sierra Leone to evacuate the country as well as warning U.S. residents against non-essential travel to Sierra Leone due to the ongoing EVD epidemic.
- Currently, the WHO does not recommend travel or trade restrictions pertaining to the EVD epidemic in any West Africa nation and perceives the risk of infection to travelers to be very low.

POTENTIAL/EXPERIMENTAL TREATMENTS

- Samaritan's Purse, the international relief organization that the two American patients worked for while in Liberia, and Emory University Hospital requested the U.S. Food and Drug Administration (FDA) and Mapp Biopharmaceuticals (Mapp) to make an experimental drug, ZMapp™, available to the two American patients under the FDA's Expanded Access regulation.
- The FDA has made provisions to allow two experimental drugs, ZMapp™ and TKM-Ebola to be used under certain circumstances detailed in the Expanded Access regulation. Both experimental drugs have not undergone human safety or dose trials.
- ZMapp™ is a result of collaboration between Mapp and LeafBio (San Diego, CA), Defyrus Inc. (Toronto, Canada), The United States Army Medical Research Institute of Infectious Diseases (USAMRIID), U.S. Defense Threat Reduction Agency (DTRA), and the Public Health Agency of Canada (PHAC) to develop monoclonal antibody therapy against EVD. It is an optimized cocktail, combining the best components of MB003 (Mapp) and ZMAb (Defyrus/PHAC). ZMapp™ is comprised of three "humanized" monoclonal antibodies manufactured in plants, specifically *Nicotiana benthamiana* (indigenous to Australia), a close relative of tobacco. This technology has also been underway for the past 20 years.
- Monoclonal antibody therapy is a mature technology with adalimumab (Humira™) considered by IMS Health (a company that provides information, services and technology for the healthcare industry) to be the world's bestselling drug. ZMapp™ was first identified as a drug candidate in January 2014 and has not been evaluated for safety in humans. As such, very little of the drug is currently available. Mapp and its partners are cooperating with appropriate government agencies to increase production as quickly as possible.



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- In May 2010, a series of studies were performed that demonstrated the ability of an RNAi (RNA interference) therapy using lipid nanoparticle delivery technology to protect non-human primates from Ebola virus were published in *The Lancet*. The result of these preclinical studies demonstrated siRNA (small interfering RNA) delivered by LNP technology (Tekmira Pharmaceuticals, Burnaby, BC, Canada) targeted Ebola virus replication to treat previously infected non-human primates and. The experimental drug treatment was 100 percent effective at protecting non-human primates from an otherwise lethal dose of Zaire Ebola virus. In March 2014, the company was granted a Fast Track designation from the FDA for the anti-Ebola viral RNAi therapeutic (TKM-Ebola). The FDA's Fast Track is a process designed to facilitate the development and expedite the review of drugs to get important new therapies to the patient earlier. A Phase I clinical trial began in January 2014 to assess the safety, tolerability and pharmacokinetics of administering TKM-Ebola to healthy adult subjects without administering any steroid premedication. On July 3, 2014, the company received a verbal notice from the FDA that the TKM-Ebola Phase I healthy volunteer clinical study was placed on clinical hold to ensure the safety of healthy volunteer subjects while the FDA reviewed additional data related to the mechanism of cytokine release observed at higher doses.

BUSHMEAT AND EBOLA VIRUS

- Multiple international initiatives and U.S. federal agencies regulate and enforce policies against the trade of wildlife. Illegally traded wildlife may include live-animals sold as pets, hunting trophies, skins or leather goods, manufactured clothing or accessories, traditional medicines, and foods, including “bushmeat”.
- Bushmeat is a loosely defined term that encompasses the prohibited products of animal origin. The term is most often used for those meats that are harvested in African forests; however, some definitions will include animal meats that are consumed in Asian and Latin American nations, also. Most definitions pertain to those meats derived from terrestrial wild animals. The meat of cane rats, porcupines, lemurs, bats, wild cats, and non-human primates are consumed as a protein source but also as a delicacy, a ceremonial food, or as a medicine for common ailments in some cultures. The progressive loss of habitat and the severity of hunting of some species have endangered some species and threaten the extinction of others.
- The hunting and consumption of bushmeat is a traditional part of African cultures. According to the FAO, bushmeat contributes 30% to 80% of protein intake for rural Central African communities. The sale of bushmeat can contribute substantially to family income and, therefore, an important economic good. In some African communities, bushmeat prices may be 10 times higher than price of beef (FAO, 2010).
- The US is believed to be one of the world’s largest markets of wildlife and wildlife products (FWS, 2013). Consumers of bushmeat in the U.S. may include West African expatriate communities and those wanting exotic food-fairs.
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement amongst governments to ensure that international trade of wild animals and plants does not threaten their survival (CITES, 2014). Since its inception, 179 nations including the U.S. have agreed to regulate the trade of more than 35,000 species of wild animals and plants. The US Fish and Wildlife Service (FWS) is responsible for implementing CITES regulations. The FWS is also developed consumer awareness programs for consumers who may be inclined to consume exotic meats and for those that travel abroad.
- There are multiple federal agencies that regulate and enforce policies against the trade of prohibited products of animal origin; including the U.S. Department of Agriculture’s Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture’s Food Safety and Inspection Service (FSIS), the USFWS, the CDC, and the U.S. Food and Drug Administration (FDA).
- APHIS and FSIS has jurisdiction and regulates those items listed in Title 9 in the Code of Federal Regulations. Title 9 regulates meat, and meat products in interstate commerce or those being



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imported into the U.S. that pose a risk of introducing a pest or foreign animal disease to domestic livestock and poultry (Klein, 2004).

- The FWS regulates those products that are prohibited under the Lacey Act and the Wild Bird Conservation Act. These Acts prohibit the importation of wild animals and any wildlife products that may be injurious to native wildlife or species conservation (Klein, 2004).
- The CDC regulates those products that are prohibited under the Public Health Service Act (PHSA), which regulates foreign quarantine procedures and prohibits the importation of animals and animal that may introduce communicable diseases that threaten public health (Klein, 2004).
- The FDA protects consumers against impure, unsafe, and fraudulently labeled food covered under the Federal Food, Drug, and Cosmetic Act (FD&C Act). This Act covers those products that are not covered by the USDA's Poultry Products Inspection Act (PPIA) and Federal Meat Inspection Act (FMIA). The agency is also responsible for ensuring the compliance of commercial food products under the Fair Packaging and Labeling Act (FPLA) (Klein, 2004).
- The Department of Homeland Security, Customs and Border Protection (CBP) organization is responsible for the identification, detention, and enforcement of products prohibited by its sister agencies, as stated by the regulations of the above authorities.
- Though the reservoir for Ebola virus remains unknown, the virus has been associated with a variety of mammalian species, including chimpanzees, gorillas, fruit bats, monkeys, antelopes, porcupines, rodents, dogs, and pigs (Vegas, 2014). Some sources suggest hunting wild animals and consumption of bushmeat, a common practice in many African cultures, may an important source of human infection during the emergence of Ebola virus outbreaks.
- On 21 July 2014, the Food and Agriculture of the United Nations (FAO) issued a press release warning against the consumption of African bushmeat due to the risk of the Ebola virus. The press release indicated the virus may be inactivated if the meat is "cooked at high temperatures or heavily smoked." However, individuals may be exposed to raw tissues of infected animals during hunting, handling, and slaughter. The FAO recognizes cultural tradition and the agency does not advocate terminating hunting (FAO, 2014).
- Bushmeat is commonly imported and sold in other countries where African immigrants reside. Although bushmeat is illegal in the United Kingdom, an estimated 7500 tons of bushmeat is imported through the black market each year according to one open source report (Dassanayake, 2014).
- Despite clear restrictions making it illegal to import bushmeat into the U.S., it is widely recognized that large amounts are smuggled into the U.S. every year. A study published in PLoS ONE in 2012 identified John F. Kennedy Airport (JFK), Washington-Dulles International Airport, Atlanta Hartsfield-Jackson International Airport, George Bush Intercontinental Houston, and Philadelphia International Airport as five major ports of entry for illegal bushmeat (Smith et al, 2012). Furthermore, a 2009 ABC news article reported bushmeat is sold in public markets in some locations, such as Queens, NY, Washington D.C., and Minneapolis-St. Paul, MN (Harris, 2009).
- It is difficult to estimate the quantity of illegal importation of bushmeat entering this nation. In a review of the CDC port-of-entry surveillance records from September 2005 and December 2010 were evaluated for bushmeat seizures in order to estimate the extent of the problem and determine trends (Bair-Brake et al., 2014). Within the five-year review period, 543 confiscated bushmeat items were documented. The number of confiscations appeared to increase during the spring and summer months and during an enhanced surveillance period, suggesting that routine surveillance may underestimate the actual level of illegal importations (Bair-Brake et al., 2014).
- In one estimate, only about 10% of the illegal animal trade is halted by authorities. Approximately 55 million pounds of wildlife products including foods, fashion, animal-based medicinals, and hunting trophies are estimated to enter into the U.S. annually (Huus, 2012). The FWS estimates that the annual trade is worth more than \$2.8 billion (FWS, 2013)



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HEALTH SECURITY

- Past EVD outbreaks have primarily occurred in rural and geographically restricted regions. This current West Africa outbreak is believed to have originated in similar settings but has also spread to more urban centers including Conakry, Freetown, Lagos, and Monrovia. There are significantly greater health resources in the urban centers; however, many urban centers that are receiving EVD patients have become overwhelmed.
- In general, the health security capacity to mitigate biological threats is significantly greater in the U.S. when compared to many regions in West Africa (Table 1).

Table 1. Health security differences between the U.S. and West Africa (Fauci, 2014).

Health security factors	United States	West Africa
Resources	Health resource-rich nation that has the capability of treating major health challenges.	Health resource-poor nations already coping with major health challenges.
Societal factors	A majority of Americans trust their doctors and are confident in their advice.	In some areas, the local population has a strong mistrust, apprehension and public health messaging administered by the government. In some regions, traditional burial practices are a contributing factor to disease spread
Healthcare capacity	<p>Hospital staff members are trained to isolate patients exhibiting hemorrhagic fevers.</p> <p>Public health authorities have the resources and training to trace and monitor contacts.</p> <p>Protocols exist for the proper handling of corpses and disposal of bio-hazardous materials.</p> <p>Hospitals have access to advanced life-support equipment and resources.</p> <p>The CDC has issued infection prevention and control recommendations for hospitalized patients with known or suspected EVD and has provided guidance to medical personal on the proper specimen collection, transport, testing, and shipment for patients with suspected infection with EVD.</p>	<p>In some locations, the healthcare infrastructure is poor.</p> <p>Healthcare workers and supplies including Personal Protective Equipment (PPE) may be lacking in many regions.</p>

- In the past decade, the U.S. has had five imported cases of Viral Hemorrhagic Fever (1 Marburg, 4 Lassa); none of the cases resulted in further transmission in the U.S. (CDC, 2014).
- Due to the overwhelming of an already taxed healthcare system, closure of many local healthcare facilities, and fear of infection within the region, there has been a pervasive lack of medical treatment for health concerns unrelated to the outbreak.
- Compliance with containment measures remains a challenge throughout the region. Strict new control measures in Liberia and Sierra Leone, intended to be enforced by armed forces in both countries, include quarantine of suspect cases, door-to-door searches for contacts, and school closures (Liberia only). However, initial reports following troop deployment suggest that quarantine enforcement may already be lax.
- Strict quarantines, enforced to control the spread of the epidemic, have resulted in food insecurity and violence in the affected West African regions. The lack of food and other supplies in quarantined areas in Liberia and Sierra Leone continues to be major concern.



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- Many companies, including airlines and shipping companies, have stopped food delivery to affected countries.
- Residents restricted by quarantines have expressed fears of starvation and many have tried to venture beyond restricted zones for food. In Liberia, quarantine measures interrupting flow of staple food items within and to Liberia, resulting in increasing prices and concerns about starvation.
- The cost of food is rising with the reduction of these resources. For example, in Sierra Leone, National rice prices increased 30% on 15 Aug 2014; and salt prices doubled over a 24-hour period. In Liberia, food and commodity prices have doubled or tripled.
- The World Bank has done a preliminary assessment on the economic impact of Ebola.
 - In Guinea, as of 4 August 2014, GDP had been reduced an estimated full percentage from 4.5 to 3.5 percent.
 - Agriculture in Guinea, Liberia, and Sierra Leone has been affected as rural farm workers have fled, primarily in affected areas.

INTERNATIONAL RESPONSES

In addition to WHO activity and regional public health authorities' activities, response efforts are being supported by non-governmental organizations and foreign-national or international governmental institutions. These include the European Union Mobile Laboratory consortium, Institut Pasteur Dakar, Institut Pasteur Lyon, Institut Pasteur Paris, Bernard Nocht Institute in Hamburg, Médecins Sans Frontières/Doctors without Borders, Public Health Agency of Canada, Public Health England, CDC, and additional UN agencies.

World Bank

Under the leadership of the WHO, the World Bank Group is donating up to \$200 million in emergency funds to aid the building of public health systems, including medical staff and supplies, disease surveillance, and laboratory networks, in Guinea, Liberia, and Sierra Leone to control the spread of Ebola. Additionally, the organization will provide financial assistance to families facing economic hardship as direct result of the ongoing epidemic.

United Nations

On 18 September 2014, the UN Security Council unanimously adopted a resolution declaring the EVD epidemic in West Africa to be a threat to "international peace and security". The director-general of the WHO echoed that saying that this is the greatest challenge in peacetime that the UN has ever faced. The resolution called for urgency in providing aid and resources to contain and treat the disease. The Security Council urged that all nations with ties to the affected West African countries lift their travel and border restrictions to allow efficient delivery of aid and resources into the EVD-stricken regions. Instead of isolating these West African nations, we should flood them with resources to combat the epidemic. The resolution is available [here](#).

WHO

The WHO has provided materials to increase laboratory capacity and alerted all surrounding countries to heighten surveillance. Additionally, the WHO meets with regional public health officials and other partners within the National Crisis Committee to address key response coordination concerns for disease surveillance, clinical management, logistics, and social mobilization. The WHO is coordinating international efforts to raise monetary support for the outbreak response efforts. Furthermore, the WHO deployed experts from various scientific specialties (such as epidemiology, medicine, laboratory, logisticians, and infection control), social mobilization and risk communication, logistic support, personal proactive equipment, and medical supplies is support of regional efforts to treat patients with EVD and control the outbreak. Under United Nations (UN) response to disasters, the WHO has deployed health clusters to affected countries in the region.

The WHO is working with the UN World Food Programme (WFP) to ensure delivery of food and other supplies to quarantine zones.



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U.S. GOVERNMENT ACTIONS

On 16 September 2014, President Barack Obama announced a major new strategy to help combat EVD in West Africa and the global threat that it imposes. President Obama's strategy to combat EVD includes controlling the current outbreak, address the cascading effect of economies and communities to prevent humanitarian disaster, coordinate the global response, and urgently build public health systems in West Africa and other resource-poor countries. In his remarks, President Obama outlined planned actions to execute these goals. At the request of the Liberian government, there will be military centers created to support civilian responses across Liberia, including support for command and control, logistics, and engineering. Other actions mentioned in his remarks include creating an air bridge to get healthcare workers and supplies into Liberia, setting up staging areas in Senegal to distribute personnel and aid on ground more rapidly, creating training sites to train thousands of healthcare workers to more effectively care for patients, and build more treatment centers and isolation spaces. The U.S. Armed Forces will deploy resources and 3,000 troops to support and enhance control efforts in Liberia. The U.S. Public Health Service Commissioned Corps will also deploy personnel to staff a new field hospital in Liberia. USAID will join international partners and local communities in community care campaigns to administer supplies and information kits to hundreds of thousands of families. A transcript of the President's remarks can be accessed [here](#).

DOS

The U.S. Embassies in Conakry, Guinea; Freetown, Sierra Leone; Lagos and Abuja, Nigeria; Dakar, Senegal, and Monrovia, Liberia are providing situational updates on the ongoing Ebola epidemic in those countries and have issued frequent security messaging for U.S. citizens, including prevention guidance.

DHS

The National Biosurveillance Integration Center (NBIC) is monitoring the outbreak to coordinate information in response to the event. Appropriate Federal agencies are coordinating their activities and surveillance measures. The National Biosurveillance Integration System will continue to monitor the outbreak and provide situational awareness.

CDC

- The CDC has been preparing for the potential of an Ebola case identified in the U.S., providing health alerts and guidance for the U.S. healthcare community.
 - CDC has issued guidance to state and local public health officials for the preparation and response of domestic EVD cases (Top 10 Ebola Response Planning Tips: Ebola Readiness Self-Assessment for State and Local Public Health Officials. Available at: <http://www.cdc.gov/vhf/ebola/outbreaks/preparedness/planning-tips-top10.html>).
 - On 5 August 2014, the CDC held a Clinician Outreach and Communication Activity (COCA) teleconference to provide guidance to hospitals for the preparation of EVD infections. (What U.S. hospitals need to know to prepare for Ebola virus disease. Available at: http://emergency.cdc.gov/coca/calls/2014/callinfo_080514.asp)
 - The CDC has provided guidance on the proper equipment and tools for protecting healthcare personnel when handling a suspected EVD case. Available at: <http://www.cdc.gov/vhf/ebola/hcp/index.html>
 - The CDC has issued guidance to medical personal on the proper specimen collection, transport, testing, and shipment of specimens from patients with suspected infection with EVD. (Interim Guidance for Specimen Collection, Transport, Testing, and Submission for Persons Under Investigation for Ebola Virus Disease in the United States. Available at: <http://www.cdc.gov/vhf/ebola/hcp/interim-guidance-specimen-collection-submission-patients-suspected-infection-ebola.html>)
 - The CDC has provided guidance for air flight crews, emergency medical services personnel stationed at airports, and DHS Customs and Border Protection (CBP) officers about reporting ill travelers to the CDC.
- CDC has activated its Emergency Operations Center (EOC) to help coordinate technical assistance and control activities with partners.



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- On August 6, CDC elevated the EOC to a Level 1 activation, its highest level, because of the significance of the outbreak.
- CDC is in regular communication with other U.S. government agencies that are participating in the response, the ministries of health of the affected countries, the WHO, and other international partners.
- Since July 9, 2014, approximately 500 CDC staff members have provided logistics, staffing, communication, analytics, management, and other support functions. CDC has deployed several teams of public health experts to the West Africa region. As of September 2, more than 60 CDC staff deployed to Guinea, Liberia, Nigeria, and Sierra Leone are assisting with various response efforts, including surveillance, contact tracing, database management, and health education.
 - CDC continues to send additional public health experts to the affected countries.
 - CDC staff are assisting with setting up an emergency response structure, contact tracing, providing advice on exit screening and infection control at major airports, and providing training and education in the affected countries.
 - As of August 22, eight health communicators are deployed to Guinea, Liberia, and Sierra Leone.
 - CDC health communicators and public health advisors in Sierra Leone, Guinea, and Liberia are working closely with country embassies, UNICEF, WHO, and ministries of health to develop public health messages and implement social mobilization activities.
 - In all three countries, CDC health communicators are meeting with local community leaders beyond capital cities.
 - CDC is partnering with major telecommunications companies in the affected countries (ORANGE and Cellcom in Guinea; Africell in Sierra Leone; and Cellcom and Lonestar in Liberia).
 - These providers disseminate radio and TV program information, public service announcements, and text (SMS) and interactive voice response (IVR) messages on Ebola with support from CDC.
 - CDC is assisting in training and preparing responses for national emergency call centers responding to Ebola.
 - CDC engaged with UNICEF and Focus 1000 in the development of a Knowledge, Attitudes, and Practices study and preliminary report in Sierra Leone and is using this report to inform future message strategies.
 - In Liberia, CDC is contributing messaging and supporting the Carter Center's trainings for leaders in 15 counties to improve Ebola response activities.
 - Africell (a telecommunications company in Sierra Leone with 2.6 million subscribers) is broadcasting daily 30-minute radio programs, weekly hour-long TV segments, and sending text messages on Ebola with the support of CDC, the U.S. Embassy, and the non-governmental organization, BBC Media Action.
 - CDC's Ebola radio spots for West African communities are played throughout the day by UNICEF, the U.S. Embassy, and other distribution outlets for public dissemination on radio and megaphones in churches, trucks, and public buildings in Freetown and Kenema, Sierra Leone.
 - Communicators are developing training and messaging for communities with low literacy skills on transmission, safe burial practices, and psycho-social support.



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- CDC worked with the Carter Center on brief public service announcements by President Jimmy Carter for Liberian and other West African audiences on Ebola-related stigmatization, contact tracing, and resiliency.
 - CDC's Health Promotion Team, the U.S. embassy, and UNFPA developed a distribution plan for messages by President Obama in Guinea, translated into French.
 - In Liberia, CDC is working with UNICEF and WHO on trainings for general community health worker volunteers.
 - An Ebola Field Communications Site provides resources and information to support CDC staff working in West Africa. It serves as a knowledge management platform to inform and coordinate the development of communications content and strategies with CDC staff working in the Emergency Operations Center in Atlanta.
- CDC is working closely with U.S. Agency for International Development (USAID), Office of Foreign Disaster Assistance (OFDA), to support the deployment to Liberia of a Disaster Assistance Response Team (DART), which is overseeing the U.S. government's Ebola response in West Africa.
 - CDC, in partnership with WHO's Global Outbreak Alert and Response Network and the U.S. National Institutes of Health, provided a field laboratory to Liberia to increase the number of specimens being tested for Ebola. The partners then worked together to set up the laboratory at the ELWA campus in Monrovia. As of August 22, the lab is operating at full capacity. In addition to providing much-needed testing support, the field lab is only the second site in Liberia capable of testing specimens from patients with suspected Ebola.
 - The Disaster Assistance Response Team (DART) continues to support the Government of Liberia (GoL) and U.N. agencies to plan, construct, and run ETUs throughout Liberia. On September 12, the International Medical Corps (IMC) opened an initial 10 beds at a new USAID/OFDA-funded 70-bed ETU in Bong County, Liberia. The DART also provided two generators to support the Island Clinic ETU in Monrovia, scheduled to open in the coming days.
 - CDC is working with airlines to address crew and airline staff concerns while ensuring the ability of humanitarian and public health organizations to transport assistance into the affected countries.
 - CDC is also working with airlines, airports, and ministries of health in West Africa to provide technical assistance for developing exit screening and travel restrictions in the countries where Ebola outbreaks are occurring. This includes:
 - Assessing the capacity of countries and airports to conduct exit screening
 - Assisting with development of exit screening protocols
 - Training staff on exit screening protocols and appropriate PPE use
 - Training in-country staff to provide future trainings
 - CDC has issued a Warning, Level 3 notice for U.S. citizens to avoid nonessential travel to the West African nations of Guinea (<http://wwwnc.cdc.gov/travel/notices/warning/ebola-guinea>), Liberia (<http://wwwnc.cdc.gov/travel/notices/warning/ebola-liberia>), and Sierra Leone (<http://wwwnc.cdc.gov/travel/notices/warning/ebola-sierra-leone>). CDC also has issued an Alert, Level 2 travel notice to advise about enhanced precautions for people traveling to Nigeria (<http://wwwnc.cdc.gov/travel/notices/alert/ebola-nigeria>) and the Democratic Republic of the Congo for an unrelated outbreak of Ebola (<http://wwwnc.cdc.gov/travel/notices/alert/ebola-in-democratic-republic-of-the-congo>).
 - At this time, CDC is not doing enhanced screening of arriving travelers because standard procedures are already in place for monitoring arriving travelers for illness at U.S. airports, seaports, or land borders.



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- CDC is working closely with Customs and Border Protection (CBP) and other partners at ports of entry (primarily international airports) to use routine processes to identify travelers who show signs of infectious disease. In response to the outbreak, these processes have been enhanced through guidance and training. CDC's quarantine station staff are asked to respond as needed, for example by evaluating ill travelers identified by CBP officers.
 - If an ill traveler is identified during or after a flight, CDC will conduct an investigation of exposed travelers and work with the airline, federal partners, and state and local health departments to notify them and take any necessary public health action.
- CDC has released interim guidance for airline flight crews, cleaning personnel, and cargo personnel that can be found at www.cdc.gov/quarantine/air/managing-sick-travelers/ebola-guidance-airlines.html.
- CDC has provided interim guidance for monitoring and movement. This guidance is available on CDC's website at www.cdc.gov/vhf/ebola/hcp/monitoring-and-movement-of-persons-with-exposure.html.
- CDC has developed and posted Ebola-specific travel messages for electronic monitors to reach travelers from West Africa and posters for TSA screening areas of airports to reach outbound travelers. Visit wwwnc.cdc.gov/travel/page/infographics-travelers to see the messages.
- CDC is actively working to educate U.S. healthcare workers on how to isolate patients and how to protect themselves from infection.
 - Resources for U.S. healthcare workers are available at <http://www.cdc.gov/vhf/ebola/hcp/index.html>.
- CDC has developed a web-based document that identifies rapidly emerging CDC guidelines for Ebola applicable to public health preparedness national standards for state and local planning. See "Top 10 Ebola Response Planning Tips: Ebola Readiness Self-Assessment for State and Local Public Health Officials" at <http://www.cdc.gov/vhf/ebola/outbreaks/preparedness/planning-tips-top10.html>.
- CDC continues to update its communication products and webpages with new information on the Ebola outbreak for the general public and specific audiences.
 - A Questions and Answers on Ebola document (www.cdc.gov/vhf/ebola/outbreaks/guinea/qa.html) is posted on CDC's Ebola website and will be updated regularly.
 - CDC is working with partners to display Ebola-specific travel messages for electronic monitors and posters at ports of entry to reach travelers from West Africa.
- CDC is using social media as a way to share credible, fact-based information and to dispel misconceptions about Ebola.
 - CDC Emergency participated in two Twitter chats organized and run by the Nigerian STOPEBOLA social media team. The first chat focused on general information and the second on stigmatization.
 - CDC hosted a Twitter chat about Ebola and the current outbreak on August 4. The chat was the largest chat in CDC history and provided the public an opportunity to have direct access to CDC's disease detectives. The potential reach of the chat was over 109 million.
- In late August, CDC returned a staff member from West Africa by charter flight after the employee had low-risk contact with an international health worker who recently tested positive for Ebola.
 - The CDC staff member worked in close proximity (within three feet) in the same room with the ill person for a prolonged period when that individual had symptoms.



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- The returning CDC staff person was rotating back to the United States, as scheduled, from their assignment in West Africa.
- All CDC staff members, including persons returning by charter flight, are monitoring their health when they return from their work in the Ebola response. Monitoring means checking for fever twice daily and contacting their doctor or health care provider immediately if they develop fever or other symptoms).
- The CDC staff person is not sick with Ebola, does not show symptoms of the disease, and therefore poses no Ebola-related risk to friends, family, co-workers, or the public.
- The exposed staff person is not restricted to staying at home and could return to assigned work duties at CDC during the 21-day period of symptom monitoring.

USAID

- In response to the emergency declaration by the Liberia government on 4 August, the U.S. Agency for International Development (USAID) deployed a Disaster Assistance Response Team (DART), comprised of members from Monrovia, Liberia, Conakry, Guinea and experts from the CDC to West Africa to coordinate planning, operations, logistics, and other components of the interagency response.
- USAID has additionally pledged over \$17 million to assist in the response to the ongoing EVD epidemic.
- Recently, USAID/OFDA provided nearly \$7 million to Global Communities (GC) and nearly \$1.6 million to Project Concern International (PCI) to support the EVD response in Liberia. USAID/OFDA also provided more than \$1 million to Plan International (Plan) and nearly \$1 million to the International Federation of Red Cross and Red Crescent Societies (IFRC) to support the EVD response in Guinea.
- USAID contributed \$5 million to support salaries for approximately 3,700 Government of Liberia (GoL) health sector employees.
- As of September 23, the USAID/OFDA-supported U.N. Humanitarian Air Service (UNHAS) has transported more than 380 humanitarian responders to EVD-affected areas. UNHAS has also transported more than 510 cubic meters of medical cargo in support of the EVD response.
- USAID/OFDA continues to airlift relief commodities into EVD-affected countries. Most recently, USAID/OFDA airlifted 9,000 protection kits—containing a bucket, a sprayer, garbage bags, gloves, protective gowns, surgical masks, soap, and chlorine—designed to minimize EVD transmission risks for patients cared for outside of ETUs and in ECCs into Monrovia on September 24. USAID/OFDA and the DoD Defense Threat Reduction Agency also recently transported 74,000 medical gloves, 4,900 face shields, and 3,325 PPE suits to Monrovia, which were consigned to WHO.

USDA

The U.S. Department of Agriculture does not recommend additional restrictions on importation of animals, animal products, or food products from affected regions in West Africa at this time.

AGENT

There are five Ebola virus subspecies, including Ebola virus-Zaire, Ebola virus-Sudan, Ebola virus-Tai Forest, Ebola virus-Bundibugyo, and Ebola virus-Reston. Three previous outbreaks (1989, 1990, and 1996) of Ebola virus-Reston were documented in the U.S. among colonies of monkeys imported from the Philippines. During the outbreak in 1990, four individuals developed antibodies to the virus, but did not develop disease. It remains uncertain if the Ebola virus *-Reston* strain can cause disease in humans.



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Ebola virus-Zaire was identified as the cause of the ongoing outbreak in western Africa and this strain is associated with the highest case-fatality during previous outbreaks.

In 2008, a Colorado woman that recently toured a Uganda cave associated with previous Ebola virus infections became ill upon return to the U.S. Although the cause of the illness was thought to be EVD, further diagnostic tests identified Marburg virus (a closely related hemorrhagic virus). To date, fulminant Ebola virus illness in humans has not been reported in the U.S.

DISEASE

This virus causes severe, often fatal, hemorrhagic fever in humans and nonhuman primates. EVD symptoms typically develop within two to 21 days following exposure to Ebola virus, most commonly between eight to ten days after exposure. Symptoms most commonly include fever, headache, joint and muscle aches, diarrhea, weakness, decreased appetite, vomiting, impaired liver and kidney function, and stomach pain. Less commonly, some patients may suffer from rash, red eyes, sore throat, chest pain, difficulty breathing and/or swallowing, hiccups, cough, and bleeding inside and outside of the body. The case fatality ratio can reach up to 90% of clinically ill EVD patients.

Variability of Clinical Manifestations

Ebola virus infection may result in immune suppression and inflammatory responses that lead to the impairment of the vascular and immune systems. Disease progression often leads to multi-organ failure and death; however, the EVD case fatality varies among different Ebola virus strains. Early supportive care, robust patient immune responses, and mild infections have been associated to improved survival. The clinical manifestations of mild infections are believed to be similar, but less severe, to the characteristics of lethal infections. Limited knowledge is available to determine the extent of mild or asymptomatic EVD infections.

Several published studies report some close contacts of known EVD patients did not develop classic EVD symptoms, but did develop antibodies to the virus. In 1995, an EVD outbreak emerged in the Democratic Republic of the Congo and sickened 315 individuals and 25% of all infections were among health care workers (Khan et al., 1999). A serology study found that 12 of 402 (3%) personnel working in hospitals or health centers antibodies to Ebola virus but no known history of symptoms consistent with EVD (Tomori et al., 1999). In a prospective study related to the same outbreak, 29 convalescent EVD patients and 152 household contacts were evaluated for Ebola antibodies and virus isolation over 21 months. Additional studies found similar results among close contacts of known EVD patients (Rowe et al., 1999 and Leroy et al., 2000).

Those that do recover from EVD infection are believed to develop immunity. Sobarzo et al. (2013) suggested that asymptomatic reinfection might explain fluctuations in immunoreactivity of IgG recognition over a 10-year serological survey of surviving Ugandan EDV cases.

SOURCE

The natural reservoir of Ebola viruses is still unknown. However, fruit bats, particularly *Hypsignathus monstrosus*, *Epomops franqueti* and *Myonycteris torquata*, may be the natural hosts of Ebola virus. Nonhuman primates, especially during slaughter and preparation of bushmeat, can be an environmental source for infection of people during the initial stages of an EVD outbreak.

TRANSMISSION

Human-to-human transmission of Ebola virus requires direct contact with blood or secretions from infected patients or exposure of objects contaminated with infected secretions. The virus can spread among family and friends during close contact while caring for those sickened with EVD. Regional cultural practices for mourning and burial often involve direct contact with the body of deceased victims. These practices may contribute to the transmission of the virus and spread within a community. Healthcare workers and caregivers of infected patients are at elevated risk for contracting the infection. However, the risk is greatly reduced with the use of appropriate use of PPE (ex. masks, gowns, and gloves) and adherence to clinical infection control procedures.



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The risk of transmission that mild or asymptomatic cases pose has not been defined; however, these particular cases are not believed to be a major source of transmission. Disease transmission has been associated with symptom onset and the transfer of bodily fluids from person-to-person.

HYGIENIC CONTROL MEASURES

Previous EVD outbreaks were quelled through widespread adherence of public health initiatives promoting barrier-nursing techniques, health education, and the rapid identification of cases (Khan et al., 1999). Similar to the current outbreak, healthcare settings and healthcare workers have represented a significant portion of identified cases. In the 1995 Democratic Republic of the Congo outbreak, 25% of all infections occurred in health care workers (Khan et al., 1999). Some of these facilities are reported to be underequipped, overwhelmed, or both. In the 1995 outbreak, it was believed that healthcare personnel not usually in contact with patients, and lacking proper training, were pressed into providing care when patient numbers exceeded capacity (Tomori et al., 1999). The adherence to proper usage of PPE and general clinical infection control techniques is challenging when resources are limited, when patient-provider ratio is high, and when healthcare workers lack proper training.

Washing hands with soap and water is one of the most effective means of preventing infection. In some rural West African regions, access to soap and potable water for hand washing is not always present. The WHO and the CDC have issued guidance on proper hand washing techniques. The Ministry of Health in Sierra Leone has been promoting hand washing with soap to the public. Health officials warn individuals that constant use of some sanitizers such as chlorine may be less effective and more harmful than hand washing with soap and water. Some sanitizers are caustic and may burn your hands with repetitive use. Hand washing with soap and water is much more effective in removing organic matter and oils from the skin than sanitizers or water alone.

DIAGNOSIS

Ebola virus is detected in blood only after onset of symptoms, most notably fever. It may take up to three days post-onset of symptoms for the virus to reach detectable levels. Specimens ideally should be taken when a symptomatic patient reports to a healthcare facility and is suspected of having an Ebola exposure. However, if the onset of symptoms is less than three days, a subsequent specimen will be required to rule-out Ebola. The virus is generally detectable by real-time RT-PCR between three to ten days post-onset of symptoms, but has been detected for several months in certain secretions (e.g., semen).

VACCINE AND TREATMENT

No specific vaccine or anti-viral treatment has been shown to be effective for preventing or treating Ebola virus infections.

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APPENDIX 1: WHO CATEGORIES USED TO CLASSIFY EBOLA CASES

- Suspected: Any person, alive or dead, who has (or had) sudden onset of high fever and had contact with a suspected, probable or confirmed Ebola case, or a dead or sick animal OR any person with sudden onset of high fever and at least three of the following symptoms: headache, vomiting, anorexia/ loss of appetite, diarrhoea, lethargy, stomach pain, aching muscles or joints, difficulty swallowing, breathing difficulties, or hiccup; or any person with unexplained bleeding OR any sudden, unexplained death.
- Probable: Any suspected case evaluated by a clinician OR any person who died from 'suspected' Ebola and had an epidemiological link to a confirmed case but was not tested and did not have laboratory confirmation of the disease.
- Confirmed: A probable or suspected case is classified as confirmed when a sample from that person tests positive for Ebola virus in the laboratory.

