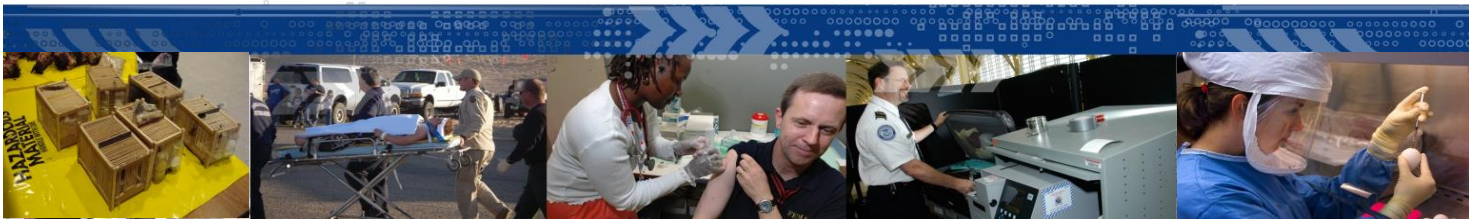


National Biosurveillance Integration Center

Ebola virus in West Africa

14 October 2014

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

Source: CDC

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

Region	Cases	Deaths
Guinea	1,350	778
Liberia	4,076	2,316
Nigeria	20	8
Senegal	1	0
Sierra Leone	2,950	930
Spain	1	0
United States	2	1
Total	**8,400**	**4,033**

(CDC, 12 October 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

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). As of 14 October 2014, the WHO and U.S. health officials acknowledge 8,400 cases of Ebola virus disease (EVD) and 4,033 deaths since the outbreak was first recognized in March 2014. As of 14 October, six American citizens have been diagnosed with Ebola while in West Africa, one Liberian national was diagnosed with Ebola virus while in the U.S., and a healthcare worker who provided care for the Liberian travel-associated EVD case has tested positive for Ebola. The most recent U.S. case, announced on 12 October 2014 is the first reported domestic transmission in the U.S. Three of the American EVD patients recovered and were discharged from the hospital, while three remain hospitalized. One American died while receiving treatment in Nigeria. The Liberian EVD patient was not symptomatic upon arrival and determined not to be infectious during travel. The Liberian patient died while in isolation on 8 October 2014. On 11 October 2014, the CDC and the Department of Homeland Security's Customs & Border Protection (CBP) began enhanced entry screening of passengers with recent travel to West Africa at New York's JFK International Airport. Enhanced entry screening is scheduled to begin on 16 October 2014 at Washington-Dulles, Newark, Chicago-O'Hare, and Atlanta international airports. Based on the recent domestic transmission, state and federal officials are re-examining whether equipment and procedures were properly followed, and whether additional protective steps and guidance are needed. The CDC believes the U.S. medical, public health infrastructure/responses are sufficient to prevent the spread of the Ebola virus in the U.S. 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).**

EVENT FEATURES

- On 12 October 2014, the Centers for Disease Control and Prevention (CDC) announced that a healthcare worker at Texas Presbyterian Hospital had tested positive for Ebola virus. The healthcare worker is a nurse who had cared for the Liberian national that was diagnosed on 30 September 2014 with Ebola virus disease (EVD) at the same Texas hospital. This marks the first domestic transmission of EVD in the U.S. The healthcare worker had been self-monitoring for fever and EVD-symptoms. The patient was isolated after the initial report of fever and is reported to be in stable condition at Texas Presbyterian Hospital. The patient has received a blood transfusion from one of the American medical aid workers who was infected while providing care in Liberia that has since recovered.
- As of 13 October 2014, the CDC and local health officials were compiling a list of healthcare workers who were involved in the care of the Liberian national who subsequently died.
- State and federal health officials are examining existing Ebola-related protocols at healthcare settings, determining whether equipment and procedures were properly followed in Texas, and whether additional protective steps and guidance are needed.
- As of 14 October 2014, six American citizens have been diagnosed with Ebola while in West Africa, one Liberian national was diagnosed with Ebola virus in the U.S., and one U.S. healthcare worker was domestically infected while caring for the Liberian national. A single case died while in Nigeria. Five were diagnosed in West Africa before traveling to the U.S. for treatment. Of these five, three have recovered and have been discharged from the hospital, and two remain hospitalized.
- As of 14 October 2014, the WHO and U.S. health officials acknowledge 8,400 cases of EVD and 4,033 deaths since the outbreak was first recognized in March 2014.
- On 11 October 2014, the CDC and the Department of Homeland Security's Customs & Border Protection (CBP) began enhanced entry screening of passengers with recent travel to West Africa at New York's JFK International Airport. Enhanced entry screening is scheduled to begin on 16 October 2014 at Washington-Dulles, Newark, Chicago-O'Hare, and Atlanta international airports. These five U.S. airports are reported to receive approximately 94% of travelers originating from Ebola-stricken nations of Guinea, Liberia, and Sierra Leone.
- On 6 October 2014, the WHO released a situational assessment describing the known routes of transmission of the Ebola virus among humans. In the assessment the WHO re-emphasized that Ebola virus is not an airborne virus and there is no evidence that the viral mode of transmission has changed from previous outbreaks.
- On 6 October 2014, Spanish health officials announced the first instance of domestic EVD transmission known to have occurred outside the epidemic region in West Africa. The patient, a nurse assistant, assisted in the care of a Spanish missionary that was transported to Madrid, Spain after developing symptoms of EVD in West Africa.
- On 5 October 2014, Uganda health officials released a statement confirming a fatal case of Marburg in a healthcare worker. One contact of the individual developed symptoms and has been placed in isolation. The last recorded outbreak of Marburg virus, a virus closely related to Ebola virus, occurred in Kabale, Uganda during 2012.
- On 2 October 2014, NBC news has reported that a freelance American cameraman contributing to coverage in Liberia has tested positive for Ebola virus. The infected American cameraman was transported to the U.S. for treatment at the Nebraska Medical Center.
- On 30 September 2014, the CDC announced that a traveler was diagnosed with EVD while receiving medical care at the Texas Health Presbyterian Hospital in Dallas, Texas. This is the first case of EVD diagnosed in the U.S. The patient left Liberia on 19 September and arrived in the U.S. on 20 September 2014. The traveler, reported to be a Liberian resident, develop symptoms on 24 September, sought medical care on 26 September, and was admitted to the hospital and

placed in isolation on 28 September. The Liberian EVD patient identified in the U.S. traveled to Texas from Liberia while asymptomatic and was determined not to be infectious during travel. The patient died while in isolation on 8 October 2014. Public health officials continue to monitor contacts of the patient's domestic U.S. contacts.

- On 26 August 2014, the Ministry of Health, Democratic Republic of Congo (DRC) notified the World Health Organization (WHO) of an outbreak of Ebola Virus Disease (EVD) in a rural region of the northern providence of Equateur after two patients tested positive for Ebola virus. The Ebola outbreak in DRC is independent and unrelated to the Ebola Virus Disease outbreak in West Africa (Please see the Biosurveillance Event Report titled "Ebola virus in the Democratic Republic of Congo" for more information related to that outbreak).

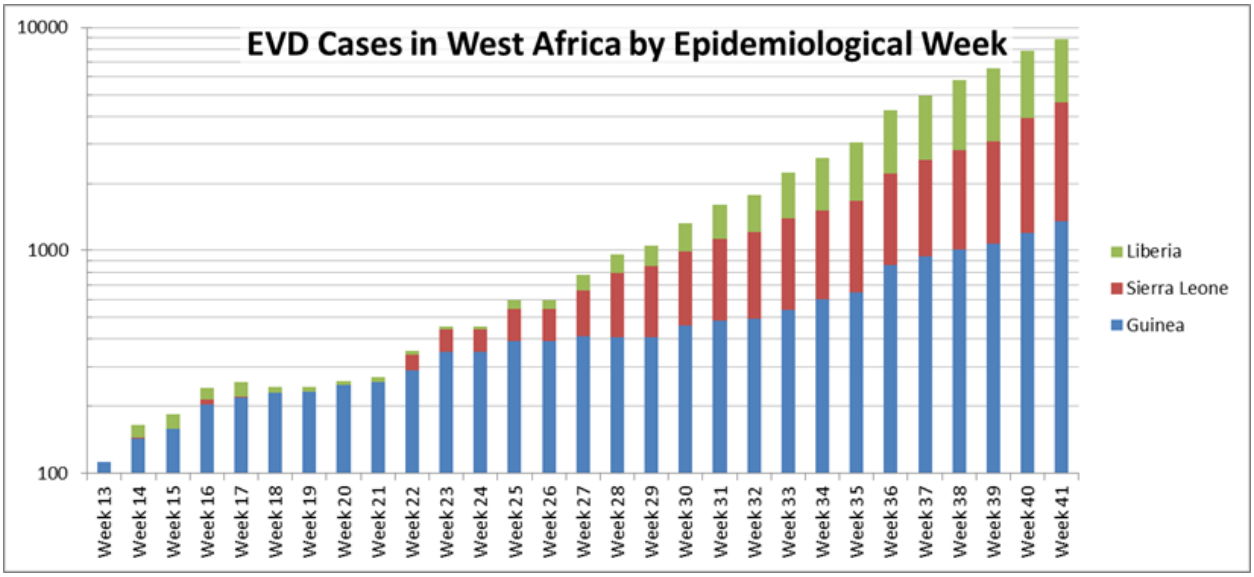


Figure 1. Cumulative EVD cases as reported by the WHO (please note the log scale)
Note: Epidemiological week 41 ends on 11 October; data for this week are thus incomplete.

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

- 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.

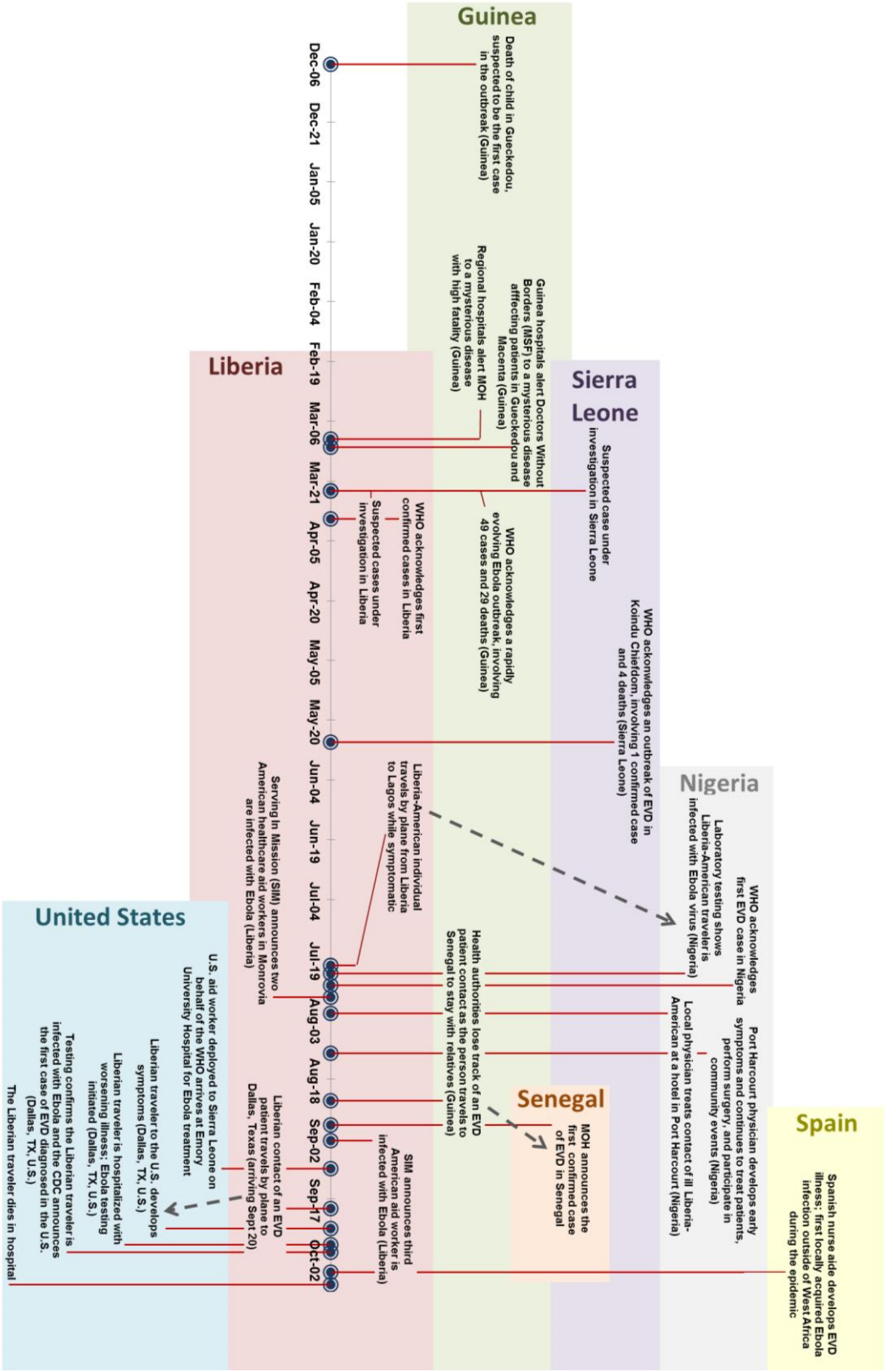
- On 28 August 2014, Science Magazine released a report detailing an analysis of the genomic diversity of Ebola virus isolated from 78 patients in Sierra Leone. The authors suggest these analyses indicate:
    - The outbreak resulted from a single introduction of Ebola virus from a natural reservoir 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.

National Biosurveillance Integration Center

TIMELINE OF EVENTS



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.
- According to the WHO, transmission remains most intense in Conakry, Macenta, and Gueckedou prefectures; the Donka Ebola treatment unit (ETU) in Conakry is being expanded to accommodate increased demand for treatment beds.
- Since 3 October, Lola prefecture reported its first cases. Like Beyla prefecture, which reported its first cases on 27 September, Lola borders Cote d'Ivoire.

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.
- The healthcare system in Liberia remains overwhelmed, as the rate of infection continue to increase in many counties. The WHO's 8 October situation report notes that the situation continues to deteriorate, emphasizing that new cases are being underreported due in part to problems with data management. Lofa County, however, is reporting a decreased rate of new cases believed to reflect a true decrease.
- International contributions to response have increased markedly, with efforts focused on improving diagnostic capacity, increasing ETU capacity, and training of healthcare workers and other responders.
- Public opinion on the Sirleaf administration's response to the outbreak has received significant media attention in the past week, with residents expressing discontent over the curfew, which remains in place, attempts to limit social gatherings, and perceptions of nepotism and corruption, particularly as it pertains to use of funds earmarked for Ebola response.

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.
- The United Kingdom has deployed both equipment and personnel to support response in Sierra Leone; their contributions will include five ETUs, among other efforts.
- Media reporting from Sierra Leone highlights coordination challenges that may be hampering response. These include a failure to pay burial teams, which resulted in strike, and a two-month-delay in the unloading of a cargo ship containing personal protective equipment and other supplies.

Nigeria

- While initial EVD cases in Nigeria were limited to Lagos state, community transmission subsequently occurred in Port Harcourt, Rivers state. The last confirmed case in Port Harcourt was reported on 1 September. Nigeria has not confirmed any new cases since 5 September. If no additional cases are identified, the Nigerian outbreak will be considered resolved on 20 October.

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. As of 10 October, Senegal has completed 42 days with no additional cases.

United States

- On 12 October 2014, the CDC announced that a healthcare worker at Texas Presbyterian Hospital had tested positive for Ebola virus. The healthcare worker is a nurse who had cared for the Liberian national that was diagnosed on 30 September 2014 with Ebola virus disease (EVD) at the same Texas hospital. This marks the first domestic transmission of EVD in the U.S. The healthcare worker had been self-monitoring for fever and EVD-symptoms. The patient was isolated after the initial report of fever and is reported to be in stable condition at Texas Presbyterian Hospital.

- 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 was isolated at the Texas Health Presbyterian Hospital in Dallas, Texas, where he died on 8 October.

    - Local health officials are monitoring 48 contacts of this case, including 10 considered high-risk.

- On 2 October, media and official sources announced that a U.S. citizen was diagnosed with Ebola in Liberia. The individual has been evacuated to the U.S. for treatment.

- 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.

Spain

- On 6 October 2014, Spanish authorities announced that a Spanish nursing aide who treated a recent fatal EVD case, a Spanish national medically evacuated from West Africa, had tested positive for Ebola. The individual developed symptoms on 29 September but did not seek care until 5 October. This represents the first locally acquired Ebola infection outside of West Africa associated with the 2014 epidemic.

- Multiple contacts of the case and of the previous medically evacuated case are being monitored; several individuals have been quarantined.

Germany

- On 14 October 2014, German health officials reported that a United Nations Sudanese healthcare worker that was infected with EVD in Liberia and transported to Leipzig, Germany for treatment died.

- Another patient who was infected while in West Africa is receiving treatment in a Frankfurt, Germany hospital. A single EVD patient who was being treated at a Hamburg, Germany hospital has since recovered and has been released.

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 counties. If travel is necessary the CDC is recommends that travelers to these countries protect themselves by avoiding contact with the blood and body fluids of people who are sick with Ebola. 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 14 August, U.S. Department of State (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.
- On 7 August, the 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.
- 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 first two American patients transported to the U.S. for treatment under the FDA's Expanded Access regulation.
- The FDA has made provisions to allow two experimental drugs, ZMapp™ and TKM-Ebola to be used certain circumstances detailed in the Expanded Access regulation. Both experimental drugs haven 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.
- 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 U.S. 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 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).

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
- Prior to the outbreak in West Africa, the U.S. has diagnosed 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).

- In parts of West Africa, the healthcare system has become overwhelmed. Many healthcare facilities have had to close and many residents are resisting medical care for non-Ebola ailments due to the fear of hospital-acquired Ebola infections. Compliance with containment measures remains a challenge throughout the region.

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	Hospital staff members are trained to isolate patients exhibiting hemorrhagic fevers. Public health authorities have the resources and training to trace and monitor contacts. Protocols exist for the proper handling of corpses and disposal of bio-hazardous materials. Hospitals have access to advanced life-support equipment and resources. 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	In some locations, the healthcare infrastructure is poor. Healthcare workers and supplies including Personal Protective Equipment (PPE) may be lacking in many regions.

- 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.
    - 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.

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.

DOD
On 1 October 2014, the Armed Forces Health Surveillance Center published updated guidelines for the detection and reporting of Department of Defense (DoD) cases of EVD. As part of a stepped-up whole of government response, the U.S has begun deploying an estimated 3,000 troops to provide command and control, medical, engineering, and logistics support to the Ebola control effort. About 195 DoD personnel are now in West Africa and over the past weekend equipment for a 25-bed hospital for health care workers and two mobile labs arrived in Monrovia.

DHS

- On 11 October 2014, the CDC and CBP began enhanced entry screening of passengers with recent travel to West Africa, including a questionnaire and temperature screening.
- CBP personnel are conducting "passive surveillance" for general overt signs of illnesses (visual observation, questioning, and notification of CDC as appropriate) at all U.S. ports of entry, including all federal inspection services areas at U.S. airports that service international flights. When a traveler displays overt signs of illness or is identified from information that is received from the CDC, CBP personnel will make appropriate notifications. CBP will also take appropriate safety measures and put on personal protective equipment (PPE), to include gloves and surgical masks, which are readily available for use in the course of their duties.
- Secretary Johnson directed CBP, working with CDC, to develop a "tear sheet" to provide to all travelers from Liberia, Sierra Leone, and Guinea with medical information and instructions should the traveler have a concern of possible infection in the future. CBP is providing the tear sheet to travelers entering the U.S. that have traveled from or transited through the affected countries.
- Secretary Johnson has also directed TSA to issue an Information Circular to air carriers reinforcing the CDC's message on Ebola and providing guidance on identifying potential passengers with Ebola
- The Transportation Security Administration and CBP display messages from the CDC at select airport locations and ports of entry that provide awareness on how to prevent the spread of germs, typical symptoms of Ebola, and instructions to call a doctor if the traveler becomes ill.
- The DHS Office of Health Affairs (OHA), through 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. OHA has issued an Occupational Health Advisory to DHS components and will continue to monitor the outbreak and provide situational awareness.
- DHS is also working with the CDC to assist in contact investigations for those who may have been exposed to the sick passenger during flight.
- DHS is working closely with its Federal partners on a range of issues related to Ebola, and will not hesitate to execute additional safety measures should it become necessary.

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.
  - 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.
- 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.
    - 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.
    - 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 makes, 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.
- USAID continues to provide updates on U.S. government efforts in West Africa. Key USAID reporting and links to the latest reports are available here.

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. 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.

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.

The WHO released a situational assessment describing the known routes of transmission of the Ebola virus among humans. In the assessment the WHO re-emphasized that Ebola virus is not an airborne virus and there is no evidence that the viral mode of transmission has changed from previous outbreaks.

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 of treating Ebola virus infections.

No FDA-approved vaccine or medicine (e.g., antiviral drug) is available for Ebola. Symptoms of Ebola are treated as they appear. The following basic interventions, when used early, can significantly improve the chances of survival:

- Providing intravenous fluids (IV)and balancing electrolytes (body salts)
- Maintaining oxygen status and blood pressure
- Treating other infections if they occur

Recovery from Ebola depends on good supportive care and the patient's immune response. People who recover from Ebola infection develop antibodies that last for at least 10 years, possibly longer. It is not known if people who recover are immune for life or if they can become infected with a different species of Ebola. Some people who have recovered from Ebola have developed long-term complications, such as joint and vision problems.

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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.