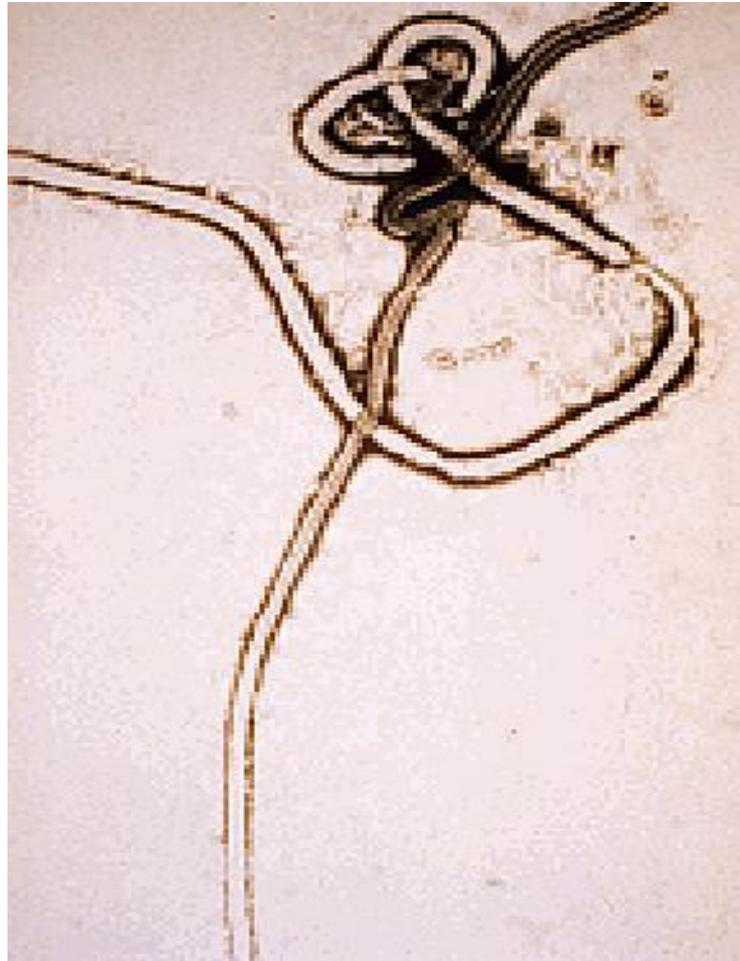
The slide features a green background with a pattern of overlapping hexagons. A dark grey rectangle is positioned at the top right. The main content is contained within a white rectangular area on the right side, which is bordered by a thin green line at the bottom.

# Ebola Virus

J.Talbot-Stern  
Emergency Department  
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# VIRUSES THAT CAUSE HEMORRHAGIC FEVER

- 30 viruses discovered
  - Arenaviridae
  - Bunyaviridae
  - Flaviviridae
  - Filoviridae
- RNA viruses with a lipid envelope
- All are considered zoonoses
- All damage the microvasculature (resulting in increased vascular permeability)



	Ebola	Marburg	MERS	SARS	
<b>Emerged / identified</b>	1976; latest outbreak in 2014	1967; latest major outbreak in 2005	2012-2013	2002-2003	
<b>Locus</b>	Originally, Congo Basin and central Africa; latest strain, West Africa	Originally, central Europe; latest major outbreak, Angola	Arabian peninsula	Southern China	
<b>Suspected source</b>	Fruit bats, by way of monkeys and other animals	Fruit bats, sometimes by way of monkeys	Bats, by way of camels	Bats, by way of civets	
<b>Type of virus</b>	Filovirus	Filovirus	Coronavirus	Coronavirus	
<b>Type of illness</b>	Hemorrhagic fever	Hemorrhagic fever	Respiratory syndrome	Respiratory syndrome	
<b>Fatality rate in outbreaks</b>	50% to 90%	24% to 88%	About 30%	About 10%	
<b>Known cases</b>	4,000+	570+	830+	8,200+	
<b>Known deaths</b>	2700+	470+	290+	775+	
<b>Person-to-person transmission</b>	Readily by close contact or fluids; not by aerosol	Readily by close contact or fluids; not by aerosol	Not very readily; mechanism unclear	Very readily by aerosol, fluids or close contact	

# Ebola virus

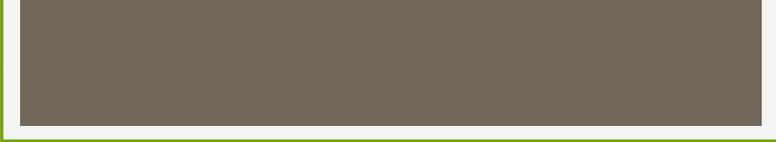
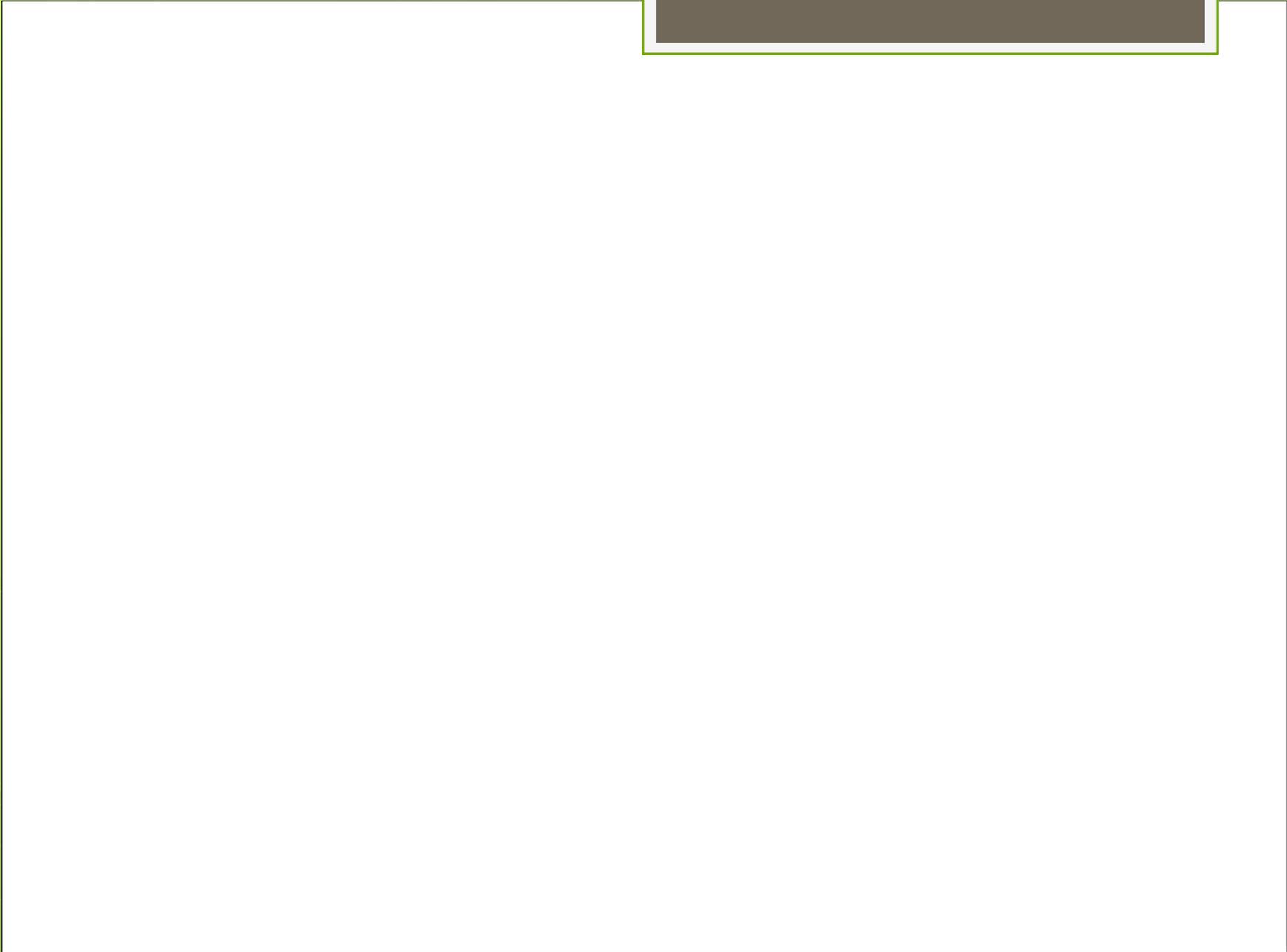
- Ebola virus is a member of the *Filoviridae* family.
- First isolated in 1976,
- 5 subtypes of Ebola virus are now recognized,
  - *Zaire ebolavirus*, - most deadly subtype – natural reservoir is fruit bat
  - *Sudan ebolavirus*,
  - *Tai Forest (Ivory Coast) ebolavirus*,
  - *Bundibugyo ebolavirus*
  - *Reston ebolavirus*, and - infects only primates

# Ebola Virus

- In the past, most outbreaks of Ebola in West Africa have been localized and well contained.
- Previous outbreaks:
  - 1976 Sudan, Congo 602 infected 434 deaths
  - 1995 Congo
  - 2000 Uganda
  - 2007 Uganda, Congo

# Ebola Virus: 2014

- What distinguishes this outbreak which began in March 2014 is its severity and spread.
- Thought to have started in a village near Gueckedou, Guinea where bat hunting common
- Guinea, Sierra Leone, Liberia – now Nigeria.



From NY Times - Joe Burgess, Denise Grady, Josh Keller, Patrick J. Lyons, Heather Murphy and Sergio Peçanha

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# Statistics : as of 11/8/2014

- Total 1,975 infected – 1059 deaths
- Guinea 510 infected – 377 deaths
- Liberia 570 infected – 335 deaths
- Sierra Leon 783 infected – 334 deaths
- Nigeria 12 infected – 3 deaths

# EBOLA VIRUS: HOW ACQUIRED

- Primary exposure – Travel to or work in an Ebola-endemic area
- Secondary exposure – Human-to-human exposure
  - Medical caregivers, family caregivers, or persons who prepared deceased patients for burial)
  - Primate-to-human exposure - Animal care workers who provide care for primates), or persons who collect or prepare bush meat for human consumption

# Ebola Virus: How does it spread?

- Not airborne
- It is acquired by direct contact with infected secretions such as vomit, diarrhea, and blood primarily (much higher concentration than below).
- It may also be spread by direct contact with saliva, sweat, and tears.
- Other means of transmission include
  - contact of secretions with a skin opening or healing wound,
  - or if a person contacts secretions and touches his or her eyes, nose, or mouth.

# Ebola VIRUS

- Ebola virus incubates in infected humans for 2-21 days,
- The majority of patients become symptomatic after 8-9 days.
- Once infected, patients can experience severe symptoms within 1-2 days.

# EBOLA VIRUS

- Difficult diagnosis: In the early days of the disease, the symptoms may be similar to those of other types of infectious diseases, such as malaria, Lassa fever, typhoid, cholera, and even meningitis
- Only after 3-5 days (or even later) might see hemorrhagic blisters -- along with internal hemorrhage, the hallmark of the illness -- become evident.

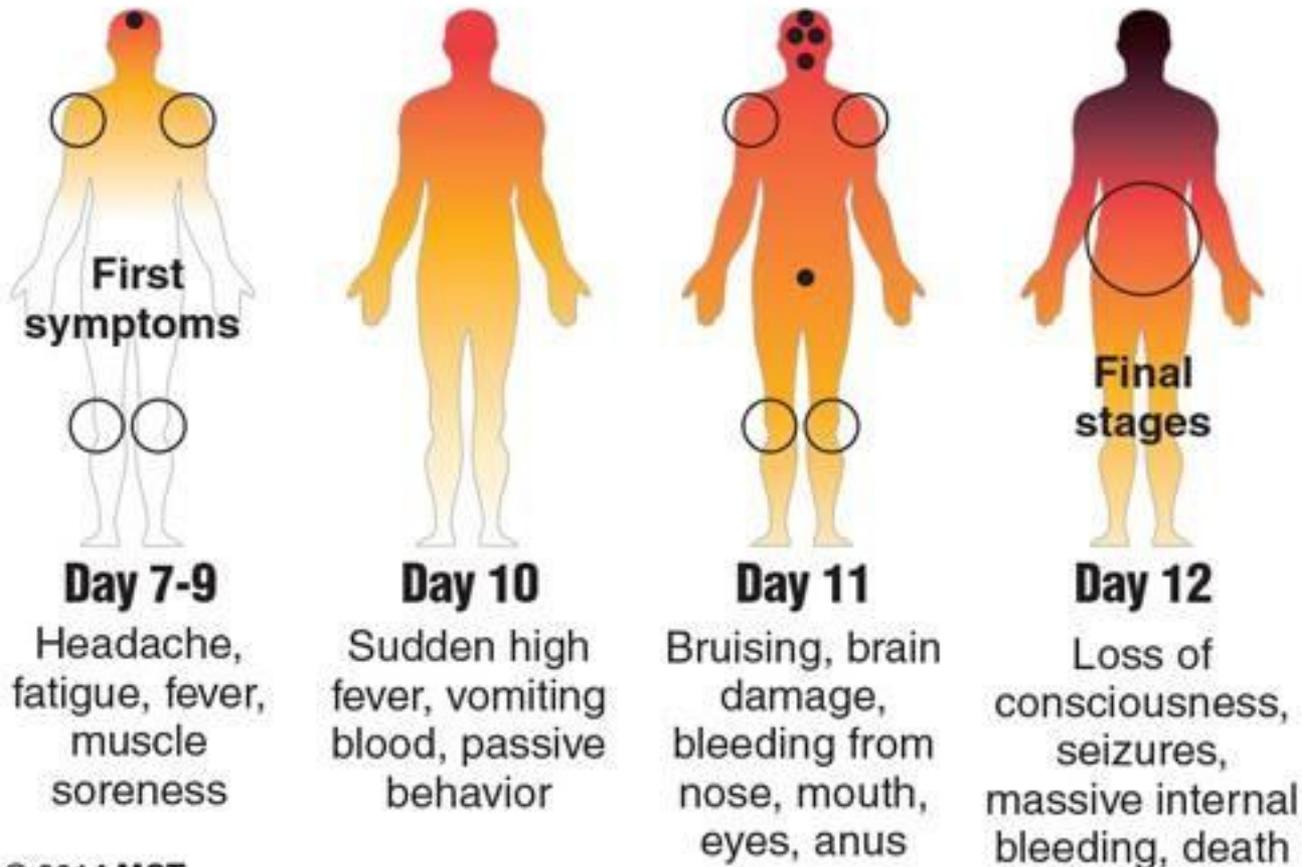
# EBOLA VIRUS: Symptoms

- Sudden fever, often as high as 103°-105°
- Intense weakness, sore throat and headache
- Maculopapular rash (mostly trunk) (15%)
- Conjunctivitis
- Profuse vomiting and diarrhea (occurs 1-2 days after the previous symptoms).

# EBOLA VIRUS: Symptoms

- More severe symptoms,
  - development of coagulopathy with thrombocytopenia, can develop in as soon as 24-48 hour
    - bleeding from the nasal or oral cavities, along with hemorrhagic skin blisters.
    - Development of renal failure, leading to multisystem organ failure along with disseminated intravascular coagulation, can then rapidly ensue over 3-5 days, along with significant volume loss.
- Patients who develop a fulminant course often die within 8-9 days. Those who survive beyond 2 weeks have a better prognosis for survival.
- Patients who die of Ebola viral infection do not develop a humoral immune response

## Ebola virus' typical path through a human being



© 2014 MCT

Source: U.S. Centers for Disease and Control, BBC

Graphic: Melina Yingling

# A suspected patient arrives in an Emergency Department

- Fever  $>38$  and travel within 21 days to endemic/epidemic area
- Universal precautions
- A protocol to quarantine and isolate such patients,
- Healthcare providers to wear personal protective equipment, including eyewear or goggles, facemask, gloves, and a gown.

# EBOLA VIRUS: TREATMENT

- Any testing should be discussed with Laboratory service before doing bloods etc.
- No aerosol generating procedures (P2 mask and negative pressure)
- Supportive care
  - intravenous fluids;
  - blood
  - platelet transfusions

# EBOLA VIRUS: POTENTIAL TREATMENT

- Transfusing blood or plasma from those patients who have recently recovered from Ebola virus infection.
- Premise that the plasma from recovered patients contains life-saving antibodies.
  - This is an experimental treatment that has been used, according to recent reports during this epidemic, although results of such treatment have not been formally reported.

# EBOLA VIRUS: VACCINE TRIALS

- NIAID Vaccine Research Center,
- Planned trials in September 2014
  - contains no infectious Ebola virus material
  - chimpanzee adenovirus vector vaccine that has incorporated 2 Ebola virus genes.
  - Adenovirus vectors are useful delivery models as vaccines because the virus can be easily manipulated.
  - As a non replicating viral vector, the vaccine works by entering a cell and delivering the new genetic material. The new genes that are inserted cause a protein to become expressed, which in turn produces an immune response in the body. According to NIAID, the vaccine has shown early promise in a primate model.

# EBOLA VIRUS: POTENTIAL TREATMENT

- An experimental compound, BCX4430, was reported in the journal *Nature* in April 2014.
- The compound, an RNA-dependent RNA polymerase inhibitor, has proven successful in a nonhuman primate model, whereby postexposure prophylaxis to BCX4430 prevented death in 17 of 18 macaques studied.
- No human trials have yet been reported.

# Ebola Virus: treatment

- ZMAPP
  - Given to 2 American doctors before transfer to U.S. – they are recovering
  - Priest given it but he died
  - 3 Liberian patients given it as of 15/8/14

# EBOLA VIRUS: LONG TERM SEQUELAE

- Myalgias
- Asymmetric and migratory arthralgias
- Headache
- Fatigue
- Bulimia
- Amenorrhea
- Hearing loss
- Tinnitus
- Unilateral orchitis
- Suppurative parotitis

# MANAGEMENT OF SURVIVORS

- Recovery often requires months
- Delays may be expected before full resumption of normal activities.
- Weight gain and return of strength are slow.
- Ebola virus continues to be present for many weeks after resolution of the clinical illness.
- Semen from men recovering from Ebola infection has been shown to contain infectious virus,- has been transmitted by sexual intercourse

# NSW Health Reference

- [www.health.nsw.gov.au/infectious/alerts/pages/EVD](http://www.health.nsw.gov.au/infectious/alerts/pages/EVD)