Ebola Virus Disease
West Africa, 2014
Preparing for and Responding to Potential Cases in NYC

New York City Department of Health
and Mental Hygiene

Note: Information contained in these slides is constantly changing and updated every Friday
Presentation Overview

- Ebola virus
- Reservoir and Transmission
- Clinical Features
- 2014 Outbreak
- NYC Public Health Response
- Screening and Management of Suspect Cases
- Key Messages
Ebola virus
Ebola Virus

- Family of zoonotic enveloped RNA viruses
  - Filoviridae

- Ebola virus discovered in 1976 near the Ebola River in what is now the Democratic Republic of Congo (Ebola Zaire), and simultaneously in Sudan (Ebola Sudan)
Ebola Virus

- Five Ebolavirus species; 5 different case fatality rates (CFR)
  - Zaire: CFR generally 60-90%
    - Current outbreak strain – Reported CFR 50-90%
  - Sudan: CFR 40-60%
  - Taï Forest - formerly called Ivory Coast
  - Bundibugyo: CFR 25%
  - Reston - not generally found in humans; infected individuals are asymptomatic
Transmission of Ebola
Reservoir and Transmission

- Unclear reservoir, possibly fruit bats
- Infection of chimpanzees, gorillas, forest antelopes, porcupines
- Humans: handle and eat uncooked bush meat (bats, chimpanzees, gorillas)
- Infected humans transmit from person to person
Ebola Transmission

- Direct contact (broken skin or unprotected mucous membranes) with a sick person’s blood or other bodily fluids (e.g., urine, saliva, feces, vomit, or semen)
- Percutaneous contact with contaminated objects (e.g., needle-stick) or infected animals (e.g., handling of bushmeat)
- Not contagious until symptoms appear
- Not airborne
Ebola Transmission
Household Contacts

- No infection control precautions
- 173 household contacts of 27 patients: transmission rate: 16%
  - Of 78 household contacts reporting no physical contact with patients, none were infected
  - Of 95 persons with direct physical contact, 27 (28%) became infected
- Risk highest after contact with patients’ blood

Clinical and Environmental Sample Testing

- 54 clinical specimens from 26 Ebola cases
  - Virus found in 16 specimens, including saliva, stool, semen, breast milk, tears, blood, and skin swabs
- 33 environmental samples – None positive
  - Stethoscope, bed frame, chair, food bowl, spit bowl, floor, IV tubing, skin of 3 attendants
- Only 2 extracorporeal specimens positive
  - MD’s blood-stained glove
  - Bloody IV insertion site on patient

Ebola Transmission – Hospitals

South Africa: demonstration of effectiveness of current recommendations

- Anesthetic assistant diagnosed with Ebola 12 days after unrecognized index case was hospitalized
- > 300 health care personnel exposed to assistant and index case, no nosocomial transmission with use of standard precautions

Ebola Transmission – Hospitals

- United States: Several previous viral hemorrhagic fever cases in US, initially unrecognized, no nosocomial transmission
- Nosocomial transmission in current outbreak likely occurring in settings with inadequate or no PPE
Clinical Features
Incubation period and Symptoms

- Incubation period: 8-10 days (range 2-21)
- Signs and Symptoms of Ebola Virus Disease (EVD)
  - Fever
  - Headache
  - Myalgias
  - Nausea and vomiting
  - Diarrhea
  - Abdominal pain
  - Bleeding, unexplained hemorrhage
  - Macular erythematous eruption, eventual desquamation
Clinical Course

- Abrupt onset of symptoms
  - Non-specific – including fever, chills, myalgias

- GI symptoms often develop soon afterward
  - Profuse watery diarrhea, nausea, vomiting, abd pain

- Bleeding manifestations may occur later, but are not universal
  - Petechiae, ecchymoses, oozing from venipuncture sites
  - Frank hemorrhage less common
Laboratory Findings

- Leukopenia, subsequent neutrophilia
- Thrombocytopenia
- Increased AST and ALT (AST>>ALT)
- Abnormal coagulation indices (DIC)
- Proteinuria
Differential Diagnosis

- Vague clinical presentation necessitates broad differential diagnosis

- Consider
  - Malaria
  - Typhoid
  - Bacterial sepsis
  - Leptospirosis
  - Cholera
  - Shigellosis
  - Other viral hemorrhagic fevers (Lassa, yellow fever, dengue, etc.)
Treatment

- No cure, treat symptomatically
  - Fluid management is particularly important
- Several experimental vaccines in development
- Several experimental drugs - none proven to work in humans (good results in animal models); limited supplies
- Convalescent serum used with unknown success rate
Investigational Therapy


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<th>Treatment approach</th>
<th>Success in animals</th>
<th>Issues and concerns</th>
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<td>Antibody therapy</td>
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<td>Inflammatory modulators</td>
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<td>Type I interferons</td>
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<td>Manipulation of immune system</td>
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<td>S-adenosylhomocysteine hydrolase inhibitors</td>
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<td>Coagulation modulators</td>
<td>Efficacy in humans questionable; not tested in animals</td>
<td>Manipulation of coagulation</td>
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<td>Heparin sulfate</td>
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<td>Tissue factor pathway inhibitors</td>
<td>Not tested in rodents; partial protection in non-human primates</td>
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<td>Activated protein C</td>
<td>Not tested in rodents; partial protection in non-human primates</td>
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<th>Vaccination approach</th>
<th>Success in animals</th>
<th>Issues and concerns</th>
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<td>Postexposure vaccination</td>
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<td>Vesicular stomatitis virus</td>
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<td>Pre-exposure vaccination</td>
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<td>Adenovirus type 5</td>
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<td>Human parainfluenza virus type 3</td>
<td>Efficacy in rodents and non-human primates; two doses needed for non-human primates</td>
<td>Pre-existing immunity; safety (replication-competent)</td>
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<tr>
<td>Vesicular stomatitis virus</td>
<td>Efficacy in rodents and non-human primates; one dose</td>
<td>Safety (replication-competent)</td>
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<td>Virus-like particles</td>
<td>Efficacy in rodents and non-human primates; three doses needed for non-human primates</td>
<td>Boost immunisation needed; production</td>
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<td>Recombinant Ebola virus without VP35</td>
<td>Efficacy in rodents</td>
<td>Safety</td>
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Only approaches that have shown in-vivo efficacy have been listed.
Fatality and Recovery

- CFR: 50-90%
- Those who live >1 week more likely to survive
- Patients who recover develop strain-specific antibodies that last for at least 10 years (possibly longer)
Ebola 2014
This is the largest Ebola outbreak in history and the first in West Africa.

The outbreak continues to evolve, but local and international governments are taking steps to help.

The latest map can be found on CDC’s Ebola website: http://www.cdc.gov/vhf/ebola/resources/distribution-map-guineabreak.html
A large Ebola outbreak is now occurring in the West African countries of Guinea, Liberia and Sierra Leone. Currently, there is also limited transmission in Mali (Bamako, Kayes and Kourémalé are considered affected areas).

People traveling to and from these countries could be at risk. Ask about recent travel activity and watch closely for symptoms.

People who traveled to other countries in Africa are not at risk.

For the latest information on affected regions, visit the Centers for Disease Control and Prevention at [www.cdc.gov/vhf/ebola/](http://www.cdc.gov/vhf/ebola/).
Origins of current outbreak

- Initial (suspect) cases occurred in a family in Guéckédou, Guinea
- December 2013 / January 2014
- Spread to a number of HCWs and then among their family members
- January to March 2014: smoldering activity in West Africa
- Early summer: numbers increased at a greater rate in all 3 countries
Ebola 2014 Outbreak Cases & Deaths
(November 19, 2014)

- 15145 suspected or confirmed Ebola cases and 5420 deaths reported
  - Most from Liberia followed by Sierra Leone and Guinea
- Countries reporting cases with secondary transmission include Nigeria, *Spain, US and Mali
- Countries reporting imported cases but no local transmission include Senegal

*Nigeria and Senegal are now designated Ebola-free by WHO


November 21, 2014
EVD Cases in West Africa
Cumulative number of Ebola virus disease cases reported, by epidemiologic week
— three countries, West Africa, March 29–October 18, 2014

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm63e1028a1.htm?s_cid=mm63e1028a1_w

October 29, 2014
Why is the outbreak so large in West Africa?

- Overwhelmed public health and health care systems
  - Lack of treatment hospitals, HCW PPE and medical supplies, limited contact tracing, lack of adequate isolation and quarantine
- Easy to cross borders; many people travel
- Sick persons not seeking care at hospitals
- Stigma
- Distrust of government and outsiders
- Lack of knowledge of disease and transmission
- Ritual burials
Goal of African Outbreak Response
STOP TRANSMISSION

- **Patient Care**
  - Experienced and/or trained staff
  - Strict use of personal protective equipment (PPE)
  - Able to work in physically and emotionally strenuous conditions

- **Community education**
  - Fact sheets, posters, pamphlets, radio spots, videos in local languages

- **Stop human-to-human transmission**
  - Case identification, contract tracing, infection control
Ebola Cases and Death: U.S.

- Cases transferred to the United States
  - Four health care workers (HCW) and one cameraman infected in West Africa transported to US hospitals
  - No deaths among these cases

- Four Ebola cases diagnosed in the US
  - Liberian man exposed to Ebola traveled to Dallas, TX
  - Two HCWs acquired disease from the Dallas case
  - NYC MD who treated EVD patients in Guinea
    - Treated and released from Bellevue Hospital Center
Public Health Response to Ebola in NYC
DOHMH Preparation and Response Measures

- Educate and prepare medical providers
- Work with hospitals and other groups to prepare for cases of Ebola
  - Guidance for health care providers and facilities
    - How to identify patients who could have Ebola
    - How to isolate and test suspect cases
    - How to protect HCWs
- Work with CDC, NYS DOH and other city agencies
- Test for Ebola at Public Health Laboratory (PHL)
DOHMH Outreach Measures

- Working with numerous West African immigrant communities
- Working with Community-Based Organizations serving these communities
- Developing educational materials
- Giving presentations in several languages
- Working with staff at airports
- Working with staff at EMS
Messaging to people in NYC

- If you have relatives or friends in West Africa – educate them on how to protect themselves
- If you know traveler who has arrived in last 21 days from an affected country – if person develops fever or symptoms consistent with Ebola, s/he should call 911 right away.
  - Immigration status will not be checked
  - People will be seen regardless of ability to pay
Minimizing Stigma

- **Situation**
  - Some Africans report feeling stigmatized as having intentionally and/or ignorantly spread Ebola.
  - Better understanding of disease transmission can help lessen fear and stigma.

- **Solution**
  - Acknowledge that Ebola is a human tragedy for us all. Focus on facts, science and what we know about the disease.
  - Reassure that in New York City, policies and people are in place to ensure that every patient receives quality and timely care.

- Fear and misinformation work against public health and could discourage those who are sick from seeking needed care.
Visit DOHMH or CDC websites for more information

Provider and Health Care Facility Screening of Patients and Management of Suspect Cases
ATTENTION ALL PATIENTS

IF YOU
recently traveled internationally or had close contact with someone who recently traveled internationally and was ill,

AND YOU HAVE
fever, cough, trouble breathing, rash, vomiting or diarrhea,

PLEASE TELL STAFF IMMEDIATELY!

Nyc

注意
所有患者

如果您
最近去了国外旅行，或者与近期去过国外的患者有过密切接触，如果您有以下症状

请您立即告知工作人员

发热、咳嗽、呼吸困难、皮疹、呕吐或腹泻，
Triage Procedures for Travel-Related Infections

- Establish procedures to routinely and immediately ask patients with fever or compatible symptoms about recent travel.

- If patient reports travel within past 21 days to an area with EVD transmission:
  - Place in private room w/ closed door
  - Implement standard, droplet and contact precautions
  - Notify appropriate facility staff, including Infection Control
  - Minimize number of staff who enter room
  - Interview patient re details on travel history and exposure to EVD while in West Africa
Initial Questions for Patients

- Household member of confirmed or suspected EVD pt?
- Participated in funeral rites or other exposure to human remains in EVD-affected area?
- Had contact with bodily fluids of known or suspected EVD case without appropriate PPE?
- Handled lab specimens of bodily fluids from confirmed or suspected EVD patient?
- HCW in facility treating confirmed or suspect EVD cases?
- Been within 3 feet of EVD patient or had brief physical contact when not wearing PPE?
Ebola Virus Disease (EVD) Evaluation Algorithm

Criteria for Reporting Suspect Cases to NYC DOHMH

Travel within 21 days before illness onset to an EVD outbreak affected area* and

- Fever (subjective or measured) or
- Compatible symptoms (e.g. headache, myalgias, vomiting, diarrhea, abdominal pain, or unexplained hemorrhage)

Report to DOHMH

Provider Access Line

1-866-NYC DOH1 (866-692-3641)

*as defined by CDC: Guinea, Liberia, Sierra Leone (list of affected countries may change)
Diagnostic Testing

- Reverse Transcriptase Polymerase Chain Reaction (RT-PCR)
  - Performed on blood (2 plastic purple top tubes)
  - Done at DOHMH Public Health Lab (Call DOHMH first)
- Enzyme Linked Immunosorbent Assay (ELISA)
  - Early and late Ebola antibodies
  - CDC-Atlanta only, Viral Special Pathogens Branch
Testing, Collection and Transport of Clinical Specimens

- Ebola virus detectable by PCR 3-10 days after illness onset
  - If < 3 days, may need to repeat testing to rule out EVD
- PHL will only accept specimens after approval by DOHMH medical epidemiologist (call DOHMH first)
  - Obtain 2 plastic purple top tubes, minimum volume 4 mL
  - PHL staff will travel to hospital, package specimen and transport to PHL
  - PCR test has 12 hour turn-around time
  - PHL will also send blood to CDC for confirmatory testing
Infection Control

- When evaluating a patient for EVD who is clinically stable, implement standard, contact and droplet precautions including at a minimum;
  - Face Shield and surgical face mask
  - Impermeable gown
  - 2 pairs of gloves
  - If patient’s condition changes, reevaluate PPE needs

- For hospitalized confirmed or highly suspect patients, CDC has new detailed guidance on PPE use
  - [http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html](http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html)
Infection Control for Laboratories

- Refer to NYC/NYSDOH revised guidelines
EVD Referral Hospitals

- Five hospitals identified in NYC area
  - Bellevue Hospital Center, North Shore LIJ Glen Cove Hospital, Mount Sinai Hospital, Montefiore Medical Center and New York Presbyterian Hospital

- Prepared or preparing to receive suspect EVD patients with concerning exposures or confirmed case
Guidance for NYC hospitals

All NYC hospitals are expected to:

- Conduct initial triage and evaluation of any suspect EVD patient who presents for care
- Identify, isolate, and stabilize patient
- Provide care for all suspect EVD patients with no known exposure
Suspect EVD reported to DOHMH

- Since July 31, 2014 DOHMH has received over 100 calls regarding suspect EVD cases
  - Many had not traveled to an Ebola-affected area or did not have symptoms to suggest Ebola

- Several “persons of interest”
  - Many with alternative diagnoses:
    - Malaria
    - Typhoid
    - Cholera

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm63e1014a3.htm?s_cid=mm63e1014a3_e
Key Messages
Key Messages - 1

- Transmitted only by direct contact with bodily fluids
- Only countries currently with widespread outbreaks include Liberia, Sierra Leone and Guinea
- Four cases diagnosed in US, including 1 in NYC
- Providers should report patients with EVD risk, as per the algorithm, to DOHMH
Key Messages - 2

- Remain Alert for Potential Travel-Related Infections
- Obtain travel history for all patients presenting with febrile illness
  - Consider EVD in patients with febrile illness **within 21 days of travel from affected areas in West Africa**
  - Consider MERS in patients with pneumonia/ARDS within 14 days of travel from Arabian peninsula
  - Consider influenza H7N9 within 10 days of travel from mainland China
Public Health is a Partnership

- Call us for consultations
  - Provider Access Line 1-866-NYC DOH1
  - Poison Control Center 212-POISONS
- Register for our NYC Health Alert Network at [www.nyc.gov/health/nycmed](http://www.nyc.gov/health/nycmed)
Questions?