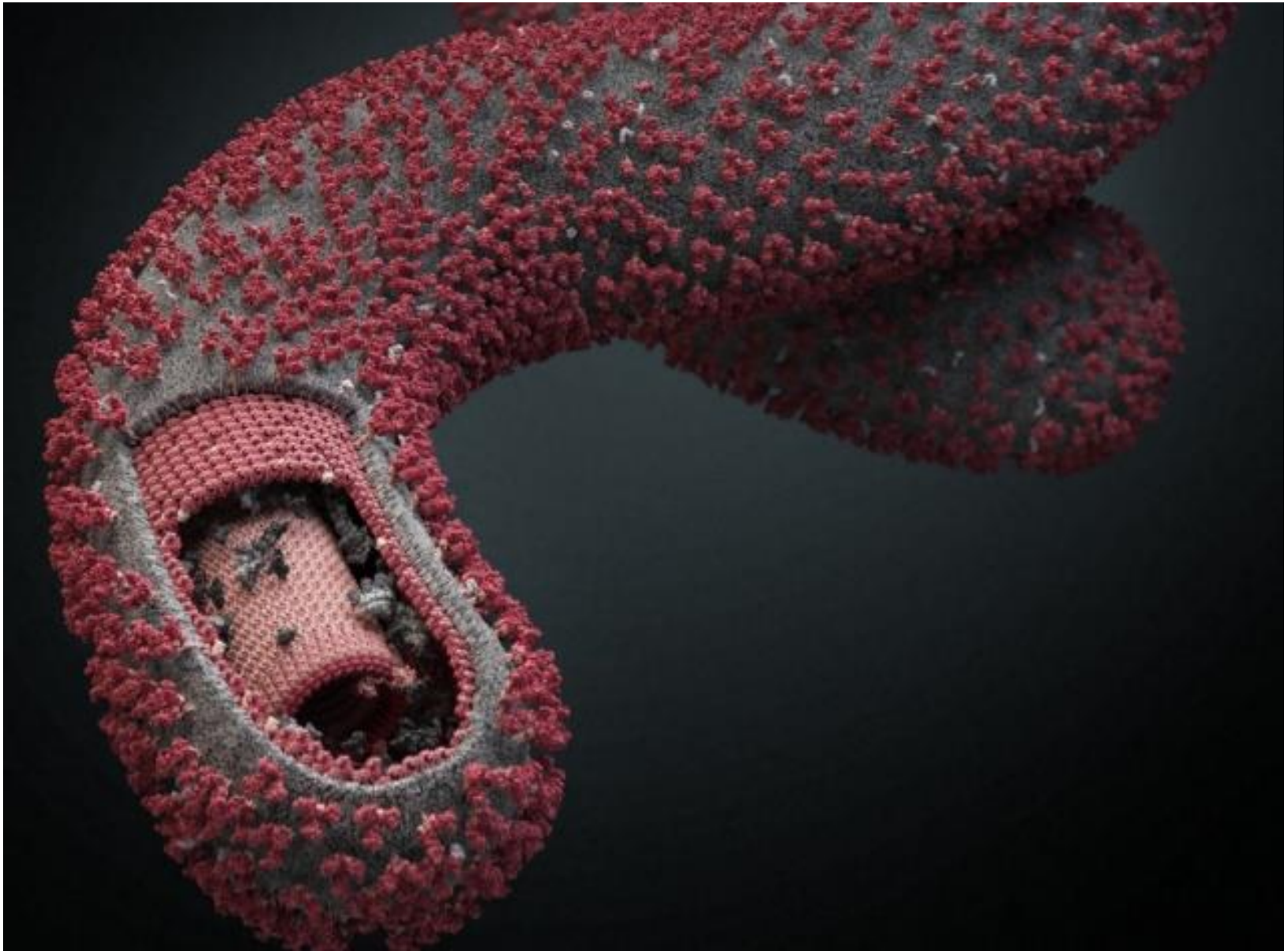
PREVENTION AND CONTROL OF EBOLA VIRUS DISEASE: LESSONS LEARNT FROM THE WEST AFRICAN EXPERIENCE

Presented at NAATs Regional Conference Opening Ceremony, UNIOSUN 2015.

Outline

- Prevalence and pattern of EVD in West Africa
- Epidemiology of EVD
- Management of EVD
- Prevention and control
- International partnerships in EVD control
- Lessons learnt from the West African experience
- Conclusion

The Virus



Chronological major outbreaks

Dates	Country	Case fatality rate
1976	DRC (Zaire)	88%
1976	Sudan (South Sudan)	53%
1995	DRC, Gabon	60%
2001	Uganda	53%
2003	Republic of Congo	83%
2007	Republic of Congo	71%
2012 Jan	Uganda	71%
2012 Nov	DRC	47%
2014 till date	Multiple countries in West Africa Outside Africa	65-80% depending on country

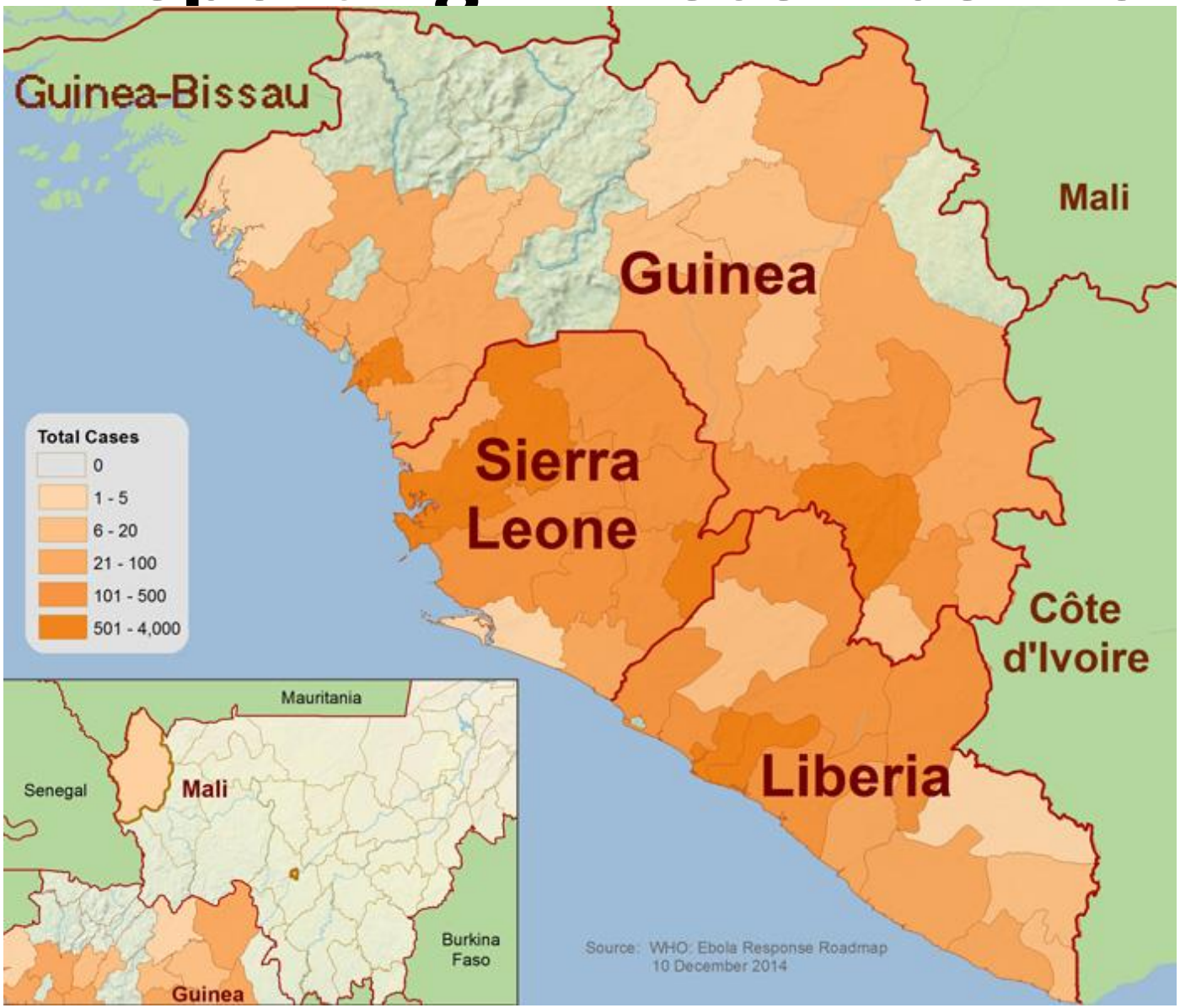
Single/isolated case were reported from many countries of the world since 1976.

Most major outbreaks were either the Zaire or Sudan strain of the virus

Prevalence and pattern

- Dec 2013-23rd November 2014:
- >15 000 cases of EVD were reported in eight affected countries -WHO
- There have been >5 500 reported deaths
- WHO believes cases are under reported
- The West African sub-region was badly hit by this outbreak

Still reporting in December 2014



3 types of EVD countries as @ Dec 2014

- Countries with Widespread Transmission
- Countries with an Initial Case or Cases and/or Localized Transmission
- Previously Affected Countries

Countries with Widespread Transmission

Country	Total Cases	Laboratory - Confirmed Cases	Total Deaths
Guinea	2292	2051	1428
Liberia	7719	2830	3177
Sierra Leone	7897	6375	1768
Total	**17908**	**11256**	**6373**

Countries with an Initial Case or Cases and/or Localized Transmission

Country	Total Cases	Laboratory-Confirmed Cases	Total Deaths
United States	4	4	1
Mali	8	7	6
Total	**12**	**11**	**7**

Previously Affected Countries

Country	Total Cases	Laboratory-Confirmed Cases	Total Deaths
Nigeria*	20	19	8
Senegal*	1	1	0
Spain*	1	1	0
Total	**22**	**21**	**8**

Situation in Specific WA Countries by end of 2014

- Reported case incidence seems stable in Guinea,
- stable or declining in Liberia,
- still increasing in Sierra Leone.
- All administrative districts in Liberia and Sierra Leone have reported at least one confirmed or probable case of EVD since the start of the epidemic.

Epidemiology of EVD

The Ebola Virus

- Viral disease
- Flovi group of viruses: Marbug and Ebola causing Viral Haemorrhagic Fever
- Ebola strains: Ebola Zaire, Sudan, Bundibugyo, tail forest, reston
- 1st case: 1976, Congo DRC near Ebola River
- Sporadic outbreaks since then
- It is now the epidemics of our time
- The ongoing epidemic is the largest ever

Epidemiological determinants

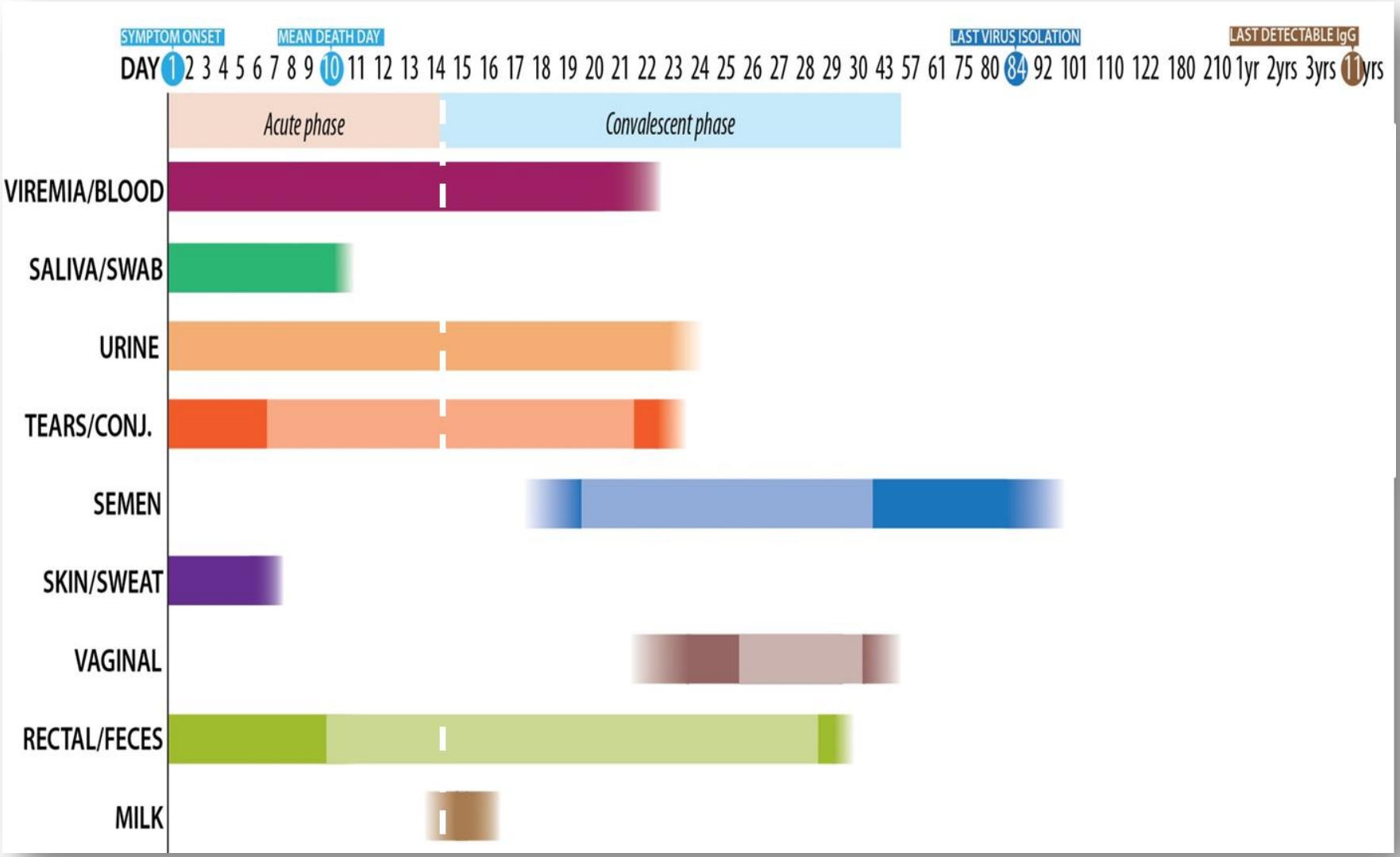
- Incubation: 2-21 days
- High fatality up to 80-90%
- Virus highly infective, even the dead
- Most outbreaks was observed to be associated with person to person transmission
- Host-Agent- Environment concept less clear
- Natural reservoir unknown
- Reservoirs: fruit bats, chimpanzee, gorilla

Risk of exposure: everyone

Ebola Virus Transmission

- Virus present in high quantity in blood, body fluids, and excreta of *symptomatic* EVD-infected patients
- Opportunities for human-to-human transmission
  - Direct contact (through broken skin or unprotected mucous membranes) with an EVD-infected patient's blood or body fluids
  - Sharps injury (with EVD-contaminated needle or other sharp)
  - Direct contact with the corpse of a person who died of EVD
  - Indirect contact with an EVD-infected patient's blood or body fluids via a contaminated object (soiled linens or used utensils)
- Ebola can also be transmitted via contact with blood, fluids, or meat of an infected animal
  - Limited evidence that dogs become infected with Ebola virus
  - No reports of dogs or cats becoming sick with or transmitting Ebola

Detection of Ebola Virus in Different Human Body Fluids over Time



Ebola Virus Pathogenesis

- Direct infection of tissues
- Immune dysregulation
- Hypovolemia and vascular collapse
  - Electrolyte abnormalities
  - Multi-organ failure, septic shock
- Disseminated intravascular coagulation (DIC) and coagulopathy

Lancet. Mar 5, 2011; 377(9768): 849–862.

Why is EVD so important

- No effective treatment or cure:
- No preventive human vaccines
- Contagious, bloody, deadly, high case fatality
- Direct and indirect consequences on the economy and productivity are diverse
- Real natural reservoir not yet identified
- Diagnostic facilities limited in West Africa
- Health Care Workers and systems are afraid
- Many ‘Nigerian factors’ favours transmission

The Nigerian predisposing factor

- Huge interacting population, so cross infection possible e.g in Lagos with population of 20m
- Porous borders
- Huge travel population
- Weak health systems: strike, PPE poor
- Highly religious and traditional group
- Myths and misconceptions
- Habits such as burial ceremony
- Management concepts such as quarantine, contact tracking, isolation are new or alien to us in Nigeria
- Stigma and discrimination easily occurred

Recognition of EVD

- High incidence of suspicion, EVD mimics other febrile illnesses
- Long incubation period: led to lengthy period of diagnosis
- Abrupt onset
  - Fever, headache, chills, weakness, and body aches
  - GI symptoms common: vomiting, diarrhea, abdominal pains
  - Hemorrhagic symptoms in ~ 45% of cases
    - Mild: bruising, nose bleed, etc.
    - Severe: bloodily stools, multi-organ shock
  - Less commonly seen: rash (trunk, shoulders), red eyes, sore throat, cough, hiccups
- Early reporters/ clients may recover with symptomatic treatments

Clinical Manifestations by Organ System in West African Ebola Outbreak

Organ System	Clinical Manifestation
General	Fever (87%), fatigue (76%), arthralgia (39%), myalgia (39%)
Neurological	Headache (53%), confusion (13%), eye pain (8%), coma (6%)
Cardiovascular	Chest pain (37%),
Pulmonary	Cough (30%), dyspnea (23%), sore throat (22%), hiccups (11%)
Gastrointestinal	Vomiting (68%), diarrhea (66%), anorexia (65%), abdominal pain (44%), dysphagia (33%), jaundice (10%)
Hematological	Any unexplained bleeding (18%), melena/hematochezia (6%), hematemesis (4%), vaginal bleeding (3%), gingival bleeding (2%), hemoptysis (2%), epistaxis (2%), bleeding at injection site (2%), hematuria (1%), petechiae/ecchymoses (1%)
Integumentary	Conjunctivitis (21%), rash (6%)

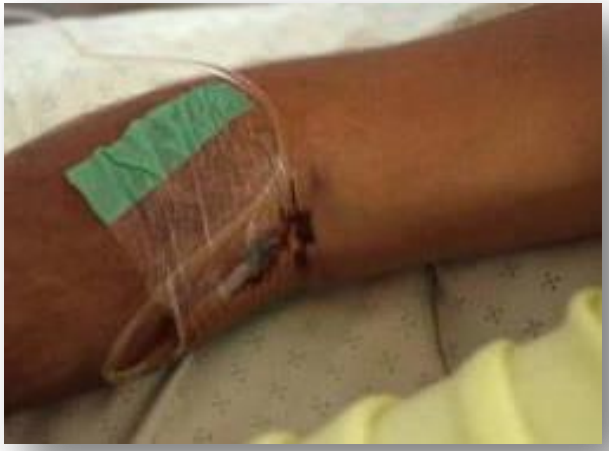
WHO Ebola Response team. *NEJM*. 2014

Examples of Hemorrhagic Signs

Hematemesis

Gingival bleeding

Bleeding at IV Site



Ebola Virus Diagnosis

- Real Time PCR (RT-PCR)
  - Used to diagnose acute infection
  - More sensitive than antigen detection ELISA
  - Identification of specific viral genetic fragments
  - Performed in select CLIA-certified laboratories
- RT-PCR sample collection
  - Volume: minimum volume of 4mL whole blood
  - Plastic collection tubes (not glass or heparinized tubes)
  - Whole blood preserved with EDTA is preferred
    - Whole blood preserved with sodium polyanethol sulfonate (SPS), citrate, or with clot activator is acceptable

Other Ebola Virus Diagnostics

- Virus isolation
  - Requires Biosafety Level 4 laboratory;
  - Can take several days
- Immunohistochemical staining and histopathology
  - On collected tissue or dead wild animals; localizes viral antigen
- Serologic testing for IgM and IgG antibodies (ELISA)
  - Detection of viral antibodies in specimens, such as blood, serum, or tissue suspensions
  - Monitor the immune response in confirmed EVD patients

EVD case definitions

- Alert case: Sudden onset of high fever or sudden death or any bleeding tendencies.
- Suspected case: Acute onset of fever, malaise, myalgia, headache, followed by pharyngitis, vomiting, diarrhea, maculo-papular rash and may OR may not be accompanied by any of the following signs:
- Probable case: A case with symptoms compatible with clinical illness and a history within the 3 weeks before onset of fever of some sort
- Confirmed case: Clinical illness with laboratory confirmation of infection or a probable case with laboratory confirmation of infection.

Drugs used to support conservative treatments

Zmapp

- Experimental drug
- Biotech firm (Mapp Biopharm Inc.).
- The drug consists of an anti-Ebola antibody that is part mouse-part human antibody.
- shown to protect the monkeys from early Ebola virus exposure.
- Successfully reducing or eliminating Ebola viral symptoms in monkeys
- Ongoing safety or effectiveness human trials
- Used in the Nigerian epidemic

Some other drugs

Nanosilver

- Discovered in August 2014:
- Discovered by a Nigerian in the Diaspora
- Experimental drug
- Slows down disease progression??
- Ethical issues : FMoH 1st disallows it

BCX4430

- USA
- Some proven effectiveness
- Even among Marburg, other viruses

Since no effective treatment, so whats next ?

PREVENTION

CONTROL

SI: Reducing the risk of wildlife-to-human transmission

- Avoid consumption of infected animals. Nigerians unlike Liberians had less fruit-bats
- Handle susceptible animals with protective clothing such as gloves.
- **Fruit bats**, Monkey, chimpanzee, Gorilla etc
- Animal products (blood and meat) should be thoroughly cooked before consumption.
- Eat food of known source. No more bushmeat???

S2: Reducing risk of human-to-human transmission in the community

- Avoid close physical contact with EVD pt
- Personal protective equipment should be worn when taking care of ill patients.
- Avoid areas of known outbreaks
- Avoid sharing clothes with strangers.
- Careful with fomites: handkerchiefs etc
- Avoid sexual contact with EVD persons
- Watch out for symptoms of Ebola around your neighborhood
- Report yourself, Report suspects

Universal precaution/Hand washing

- Regular handwashing
- After visiting patients
- After taking care of patients at home.
- Soap and water
- Sanitizers
- Alcohol based solutions
- Use correct method of hand-washing
- Reduce hand shake or hand contacts
- Culture of handwashing is poor in Nigeria, we look at it as too simple

Personal Protection: Hand hygiene

Alcohol based hand rubs are gold standard in health care settings (if hands not visibly soiled)
Must complement with hand washing with normal soap

Photos: WHO

S3: Improved community awareness

- Nature of disease should be explained to all citizens
- Transmission- modes and non modes
- Ebola containment measures
- Safe burial of the dead
- The media is important here
- What to do
- What not to do

Myths and misconceptions: fueling the epidemic

The following misconceptions are unfounded cure or prevention for EVD

- Hot water bath with salt
- Weekly hot salt water bath
- Bitter cola
- Miracle cola
- Cow urine
- Condensed milk, Onions
- Antibiotics
- Airborne/waterborne

S4: Improved Environmental hygiene

- Regular disinfection of your surrounding
- Fumigate your environment
- Safe disposal of dead carcass of animals
- Wash fruits/vegetables properly
- Burial: infected/suspected
  - Avoid touching
  - Wear protective clothing
  - Deep burial if possible
  - Cremation

S5: Encouraging partnerships

Government: of Nigeria (GoN)

- Near daily appraisal of the epidemic
- Committees set up at all levels of govt
- Stepping up surveillance
- Coordinating response
- Funding by governments
- Relevant policies and pronouncements e.g delayed resumption of schools
- The media carried along
- Establishment of EVD alert and reporting centers, isolation and treatment centers

Partnerships cont…….

Health Care systems

- Doctors urgently resumed from strike
- Protective clothing
- Humanitarian aid by health care workers
- Improved awareness

Other systems: used infrared thermometers, provides handwashing kits, sanitizers

- Airports
- Schools
- Banks

Government

State of Osun:

- Stakeholders presentation and meetings
- State level coordinating committee set up
- Osun festival celebrated low key
- UNIOSUN website: ongoing awareness

WHO/Other Partners: Assessing epidemics response Giving technical inputs

International partnerships in EVD control

WHO objectives for EVD Response

Improved case finding, contact identification and follow up in each country

- Improved database management (Epi Info VHF module utilization)
- Improved health messaging in the affected areas
- Improved coordination with WHO, MSF, Country MoHs, CDC and other USG partners

WHO guidelines, Active surveillance

- During EVD outbreak, disease surveillance is active
- These includes
  - Alert management system/call centers
  - Active case search at community level by trained CH volunteers, Community verbal autopsy
  - Daily active case search at health facility level + prevention
  - Get cases into isolation ward to provide care, prevent transmission and protect health care workers
  - Outbreak investigation
  - Contact tracing and follow up for 21 days. If contact becomes febrile – get him into treatment center; test the person and isolate if positive for EVD

Contact tracking

- What is contact tracking: Identification and follow up of persons who may have come into contact with an infected person
- Who is a contact: one who had physical contact with a case (alive or dead) or the body fluids of a case within the last three weeks. Sharing same room??

Three basic elements

- Contact identification ; index to all cases and contacts-pry, sec
- Contact listing for 21 day follow up
- Contact follow up: until suspect test negative

Advise all contacts to adhere to the following:

- Remain as much as possible at home and restrict close contact with other people
- Avoid crowded places, social gatherings, and public transport
- Report any suspicious signs and symptoms immediately such as fever, bleeding ,etc (provide telephone numbers e.g. the Ebola hotline, numbers of the supervisor or the contact follow up team)

LESSONS LEARNT FRON THE WEST AFRICAN EXPERIENCE

LESSONS LEARNT

Nigeria was declared EVD free on 16th October 2014

- More virulent diseases may emerge or re-emerge, the world should be ready for war with infective microorganisms that would cut across countries. EVD is now a re-merging disease. Are we prepared????
- No effective treatment for EVD. Its more or less a death sentence. No known vaccine. There is need for more extensive collaborative research in these areas to discover solutions

Lessons cont….

- International collaboration on public health issue (EVD in this case) in which all stakeholders including the public takes part led to EVD success in Nigeria. Such collaboration should be on-going with WHO coordinating effectively. Liberia felt neglected by the international community
- Volunteer health work needed to be redefined. In the EVD outbreak, many health care workers resigned from work while many refused humanitarian work, Lagos offered incentives of N50,000 per day for volunteer HCW in EVD care

Lessons cont….

- Good political will and leadership was responsible for the Nigerian success. Nigerian FMoH showed concerns. There are standard operating procedures (SOPs) for PPEs use, Home based care kits, EVD screening, contact tracking etc. This is an importance lesson for ongoing epidemics. Seirra Leone sacked the Minister for health for poor leadership
- Improved general awareness would assist any disease control including EVD. Even infected health care workers came out on TV to share testimonies and allay people's fears

Lessons cont….

- There is a need to strengthen our Primary health care and general health systems. Patrick Sawyer (Nigerian index case) left Liberia for Lagos when he found out that the weak health system there may not be able to manage his case
- Liberia, Sierra Leone and Guinea became aid recipient. For how long will some countries continue to live and survive only with the aid of support from developed countries?

Lessons cont….

- Now EVD is over, we are now in post disaster phase. Are the countries planning for another bout of potential outbreak? Are the preventive gadgets on ground and working,
- Stigma and discrimination against those infected could be due to misconceptions about EVD. So there is need to improve awareness about EVD
- EVD outbreak has improved the culture of handwashing in Nigeria

Lessons cont….

- EVD outbreak affected the economy and development. Air-ports and borders closed, economic cooperation suspended, internal business suffered, schools closed. Isolation and quarantine measures and fears of infection would lead to slowing of normal economic activity and cross-border trade
- In the three hardest-hit countries – Liberia, Sierra Leone and Guinea – there are only one to two doctors available per 100, 000 people, with so much concentration in urban areas. There is a need to strengthen the health system

Lessons cont….

- Friendship and international politics may not hold during epidemics as countries economically known to be friends, closed borders against each other during the EVD outbreak for fear of transmission
- Most of the outbreaks are common or point source epidemics, meaning it could be traced to the first case. There is a need to improve our port health system and disease reporting systems

Lessons cont….

- If Nigeria with all attending problems such as insecurity and poverty can do it, other countries should also be. The 1st case in Dallas USA was theoretically managed and outcome was bad. The second case in new York was managed the Nigerian way using the 4 principles (1) trace, isolate and treat (2)detect early,(3) strong leadership and political will (4) community involvement. The American now borrows experience from the Nigerian success.
- Poor access to diagnostic facilities in Senegal, Guinea and Liberia worsened situation, as most cases were not diagnosed early. . EVD diagnosis used a high technology laboratory diagnostics methods

Lessons cont….

- Myths and misconceptions would further fuel the worse impact of any disease
- Self reporting habit is low in Nigeria. Even health care workers refused to notify of their being infected
- Africa's medical resources are very much focused on treatment, which is the most urgent need right now. But we need to invest more in prevention and building health systems that enable us to cope with any eventuality.

Take Home Messages

EVD is deadly

But

The good news is that it is controllable and preventable. There are lots of lessons for the world to learn from the West African/Nigerian experience

Help-lines

- **0802 316 9485**
- **0803 308 6660**
- **0803 306 5303**
- **0805 528 1442**
- **0805 532 9229**
- **www. ebolanigeria.com**

Some references

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THANK YOU
FOR
YOUR ATTENTION