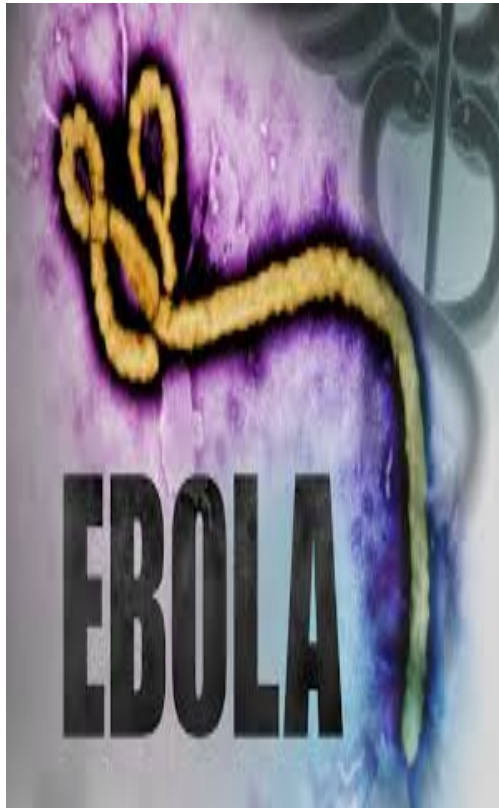


**BRINGING NEW VIRILITY TO
STERILITY**

**RE-TOOLING DECONTAMINATION
FOR EMERGING EPIDEMICS**

Jon Jui MD, MPH

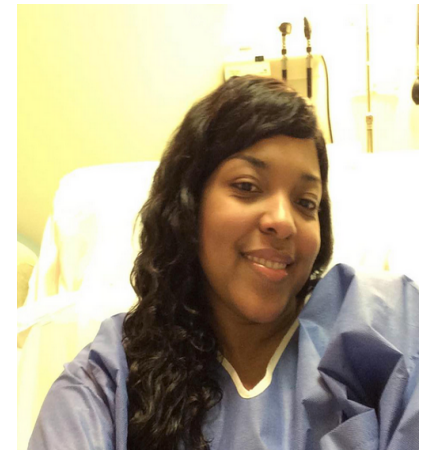
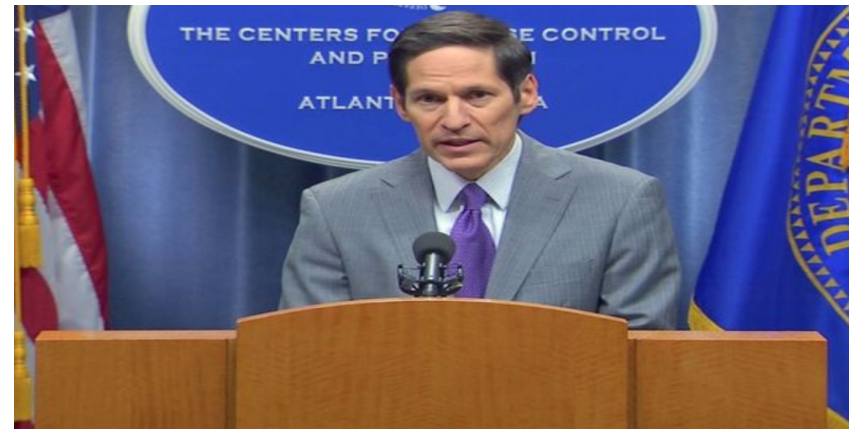
Upcoming Attractions



Teaching Points

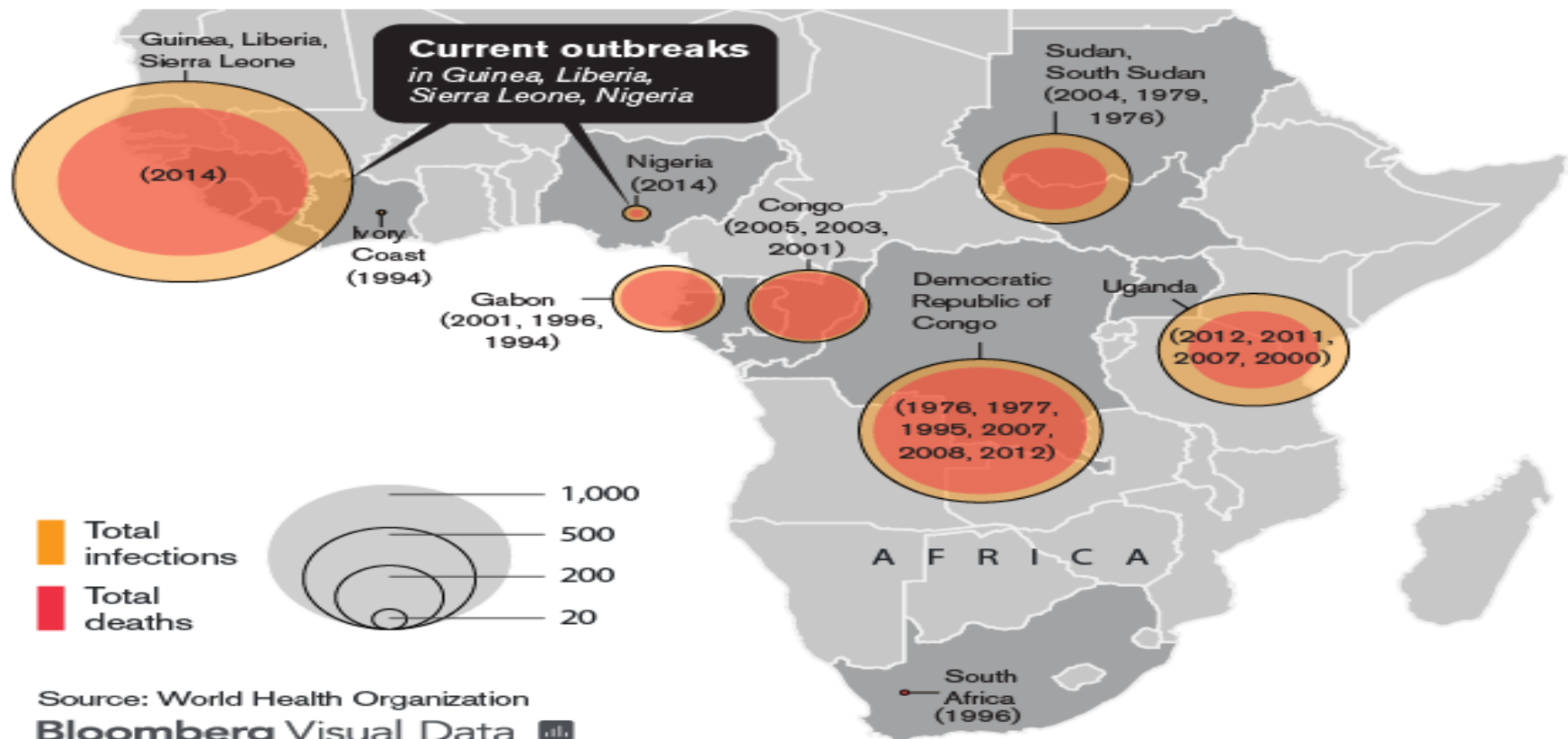
- What lessons can we learn from the recent Ebola outbreak?
- Are you and your agency ready for the next epidemic?

Ebola : U.S. Wake up call

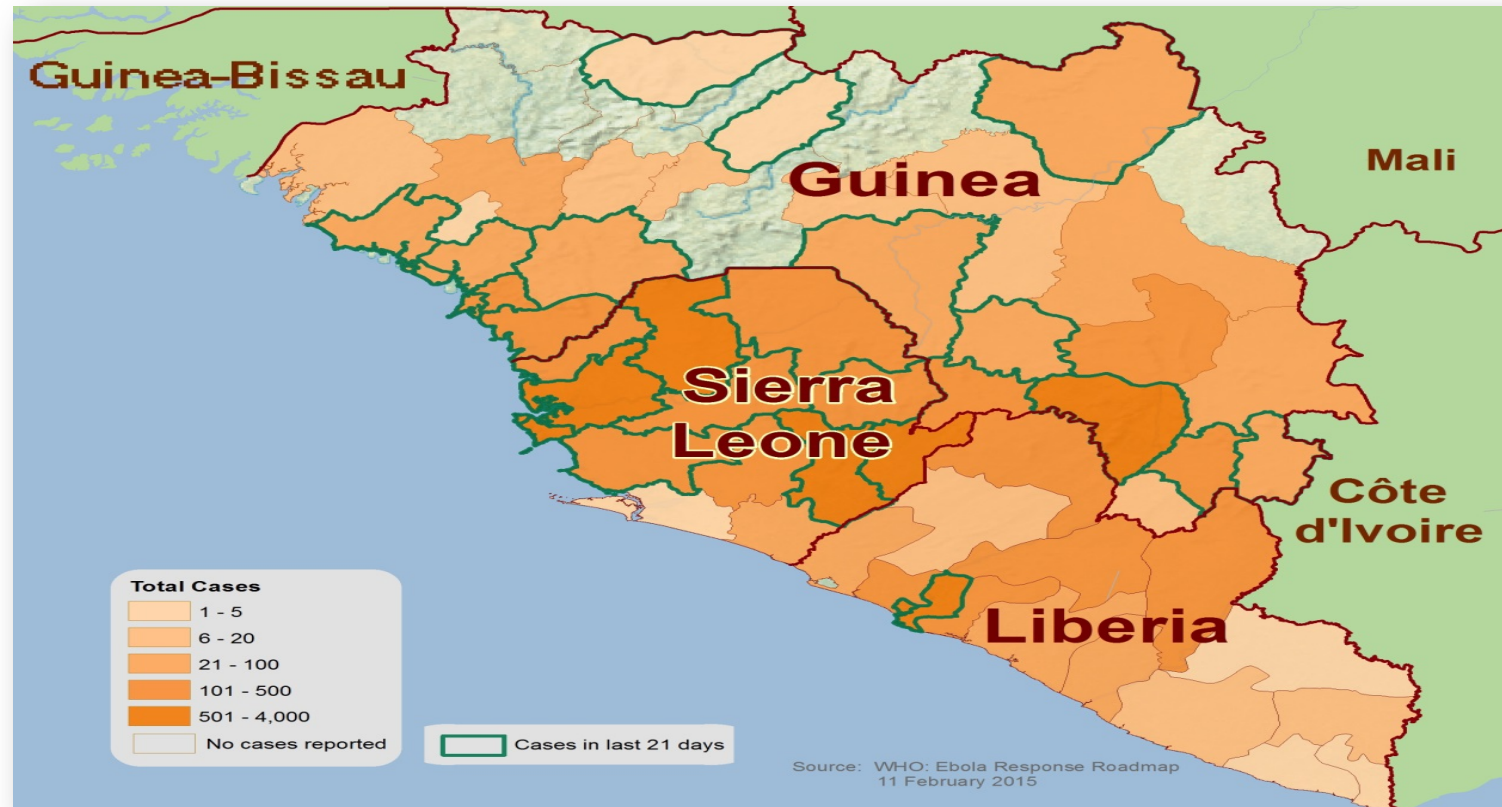


Major Ebola Outbreaks

Confirmed cases and years (as of Aug. 11, 2014).

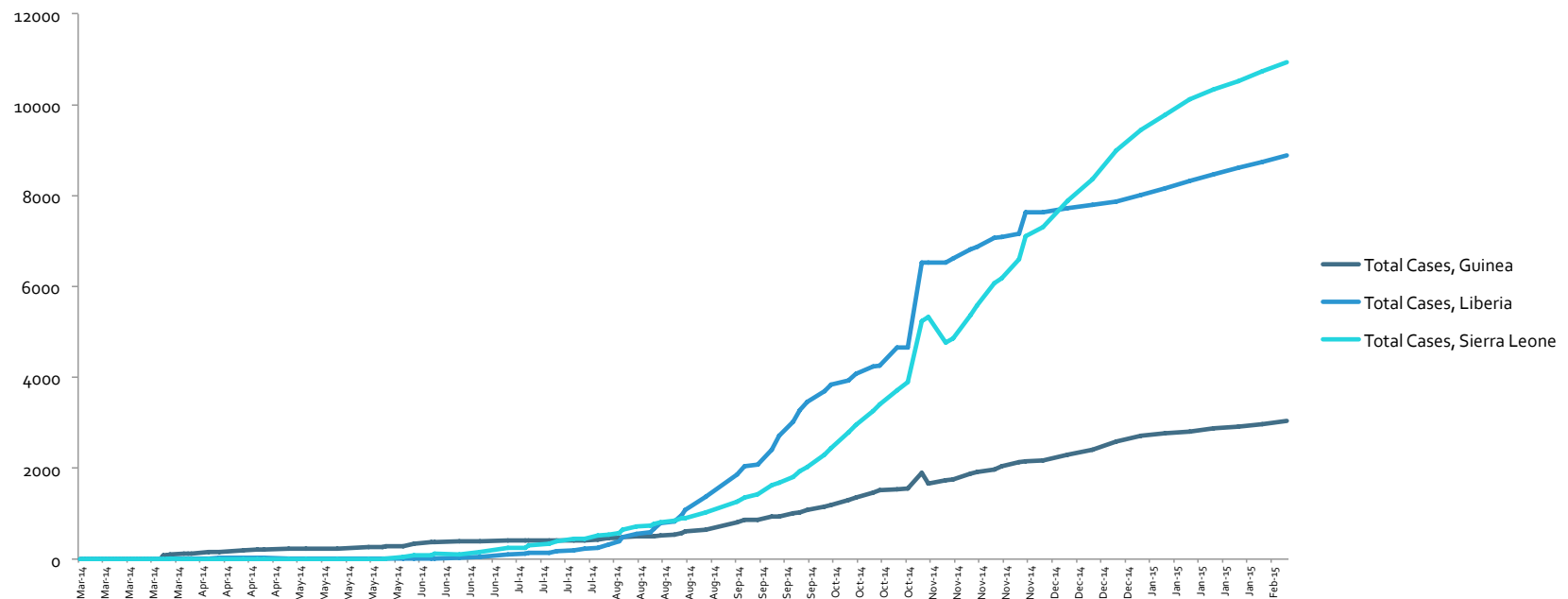


Outbreak Distribution — West Africa, February 11, 2015



Map includes total confirmed EVD cases reported to WHO

2014 Ebola Outbreak : Reported Cases (Suspected, Probable, and Confirmed) in Guinea, Liberia, and Sierra Leone

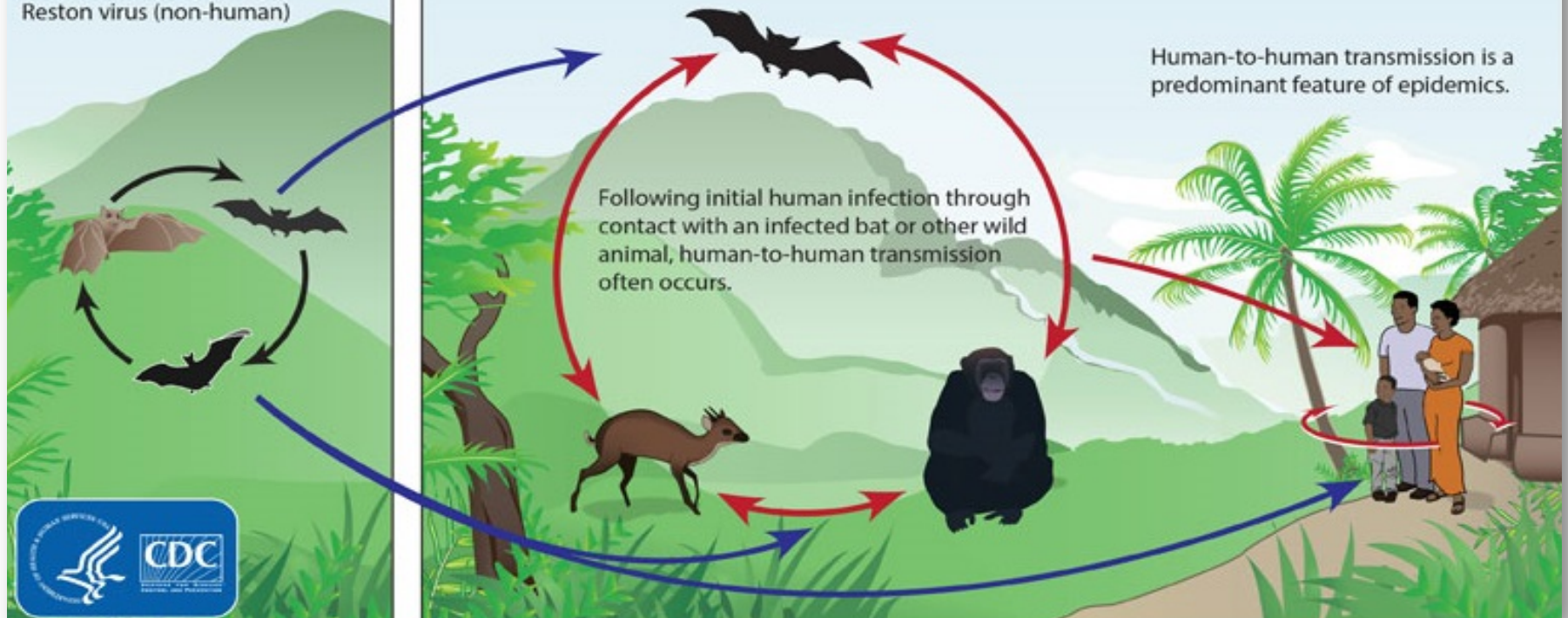


This graph shows the total reported cases (suspected, probable, and confirmed) in Guinea, Liberia, and Sierra Leone provided in [WHO situation reports](#) beginning on March 25, 2014 through the most recent situation report on February 11, 2015.

Ebola Virus Reservoir

Ebolaviruses:

- Ebola virus (formerly Zaire virus)
- Sudan virus
- Tai Forest virus
- Bundibugyo virus
- Reston virus (non-human)



EBV MODE OF TRANSMISSION

EBV Mode of Transmission

- Personal direct contact with infected patient
- Body fluids
- Ebola does not penetrate skin

** Airborne transmission in weaponized Ebola demonstrated in Lab.

EBV IN THE ENVIRONMENT

EBV in the Environment

- Q: How long does the virus live in the environment?
- A: Not very long
 - < 24 hours
 - On hard surfaces very short < 12 hours.

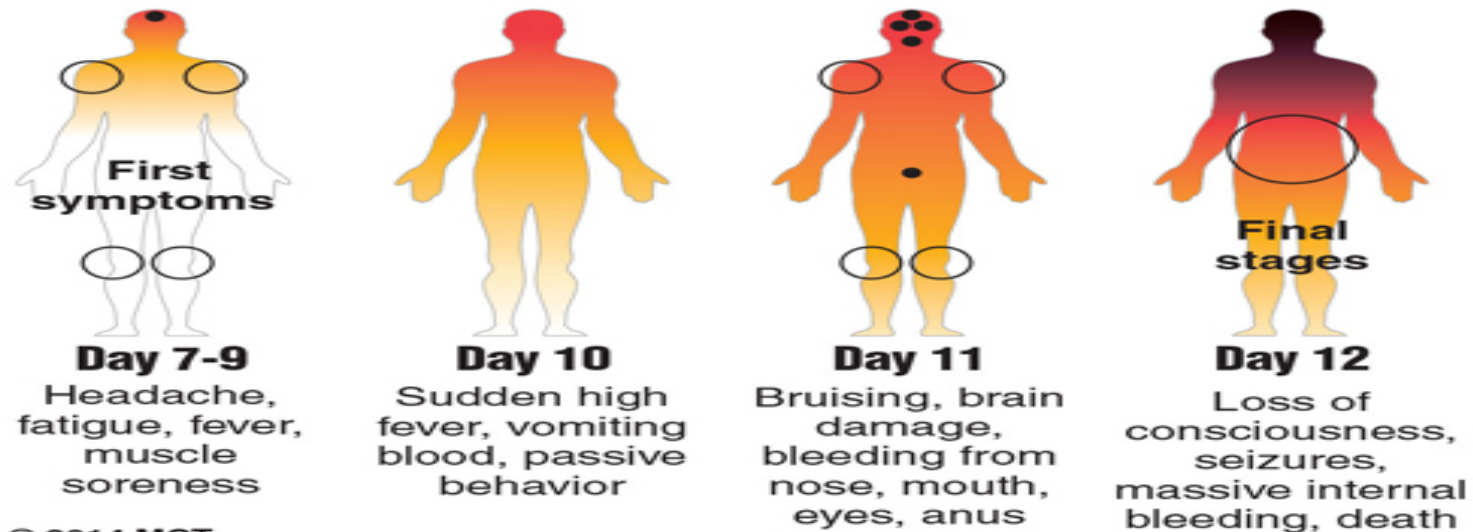
EBOLA SYMPTOMS

Ebola outbreak

An outbreak of the deadly Ebola virus has killed at least 59 people in Guinea. Ebola is spread by close contact and kills between 25 and 90 percent of victims; there is no cure or vaccine.



Ebola virus' typical path through a human being



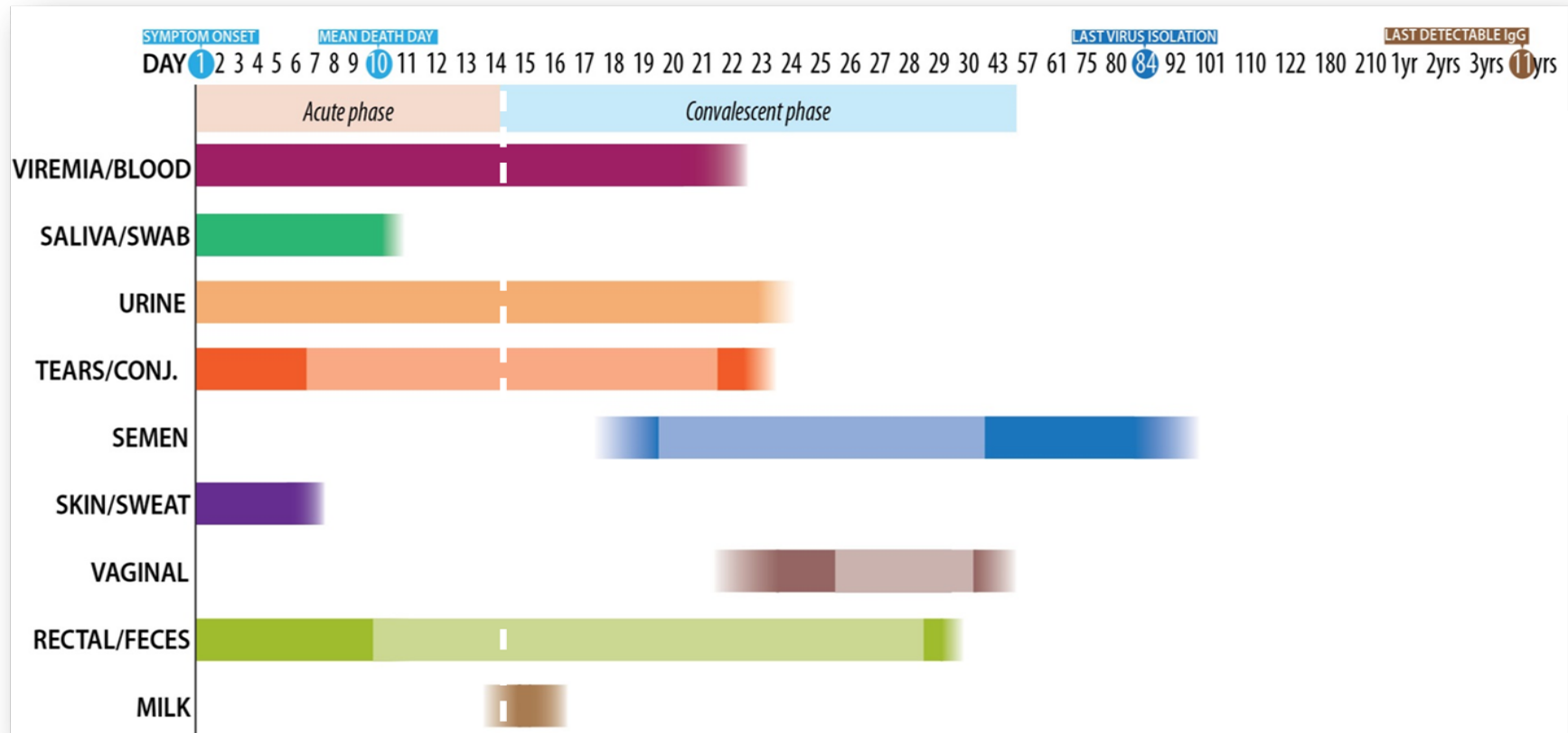
© 2014 MCT

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

Graphic: Melina Yingling

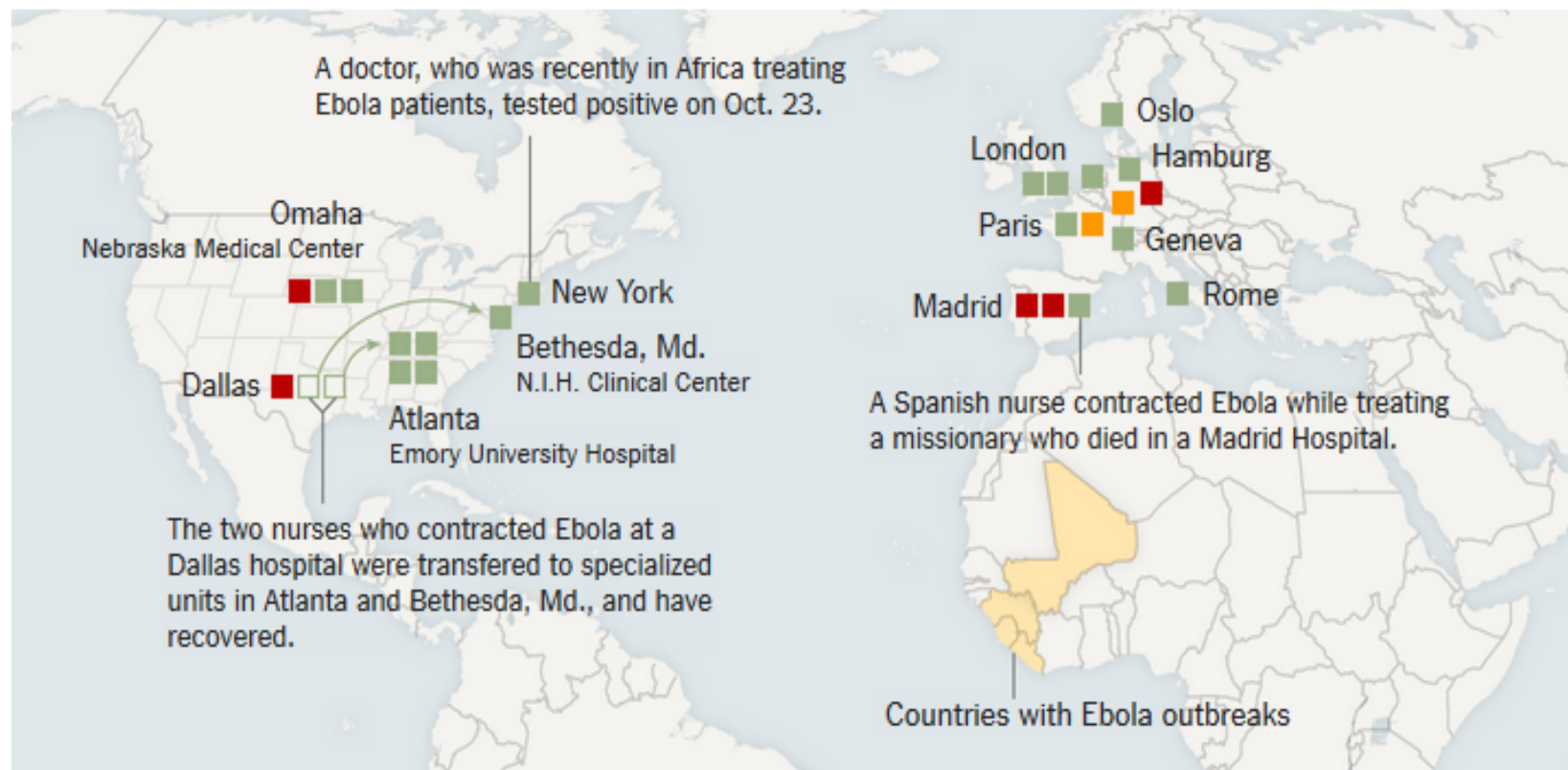


Detection of Ebola Virus in Different Human Body Fluids over Time

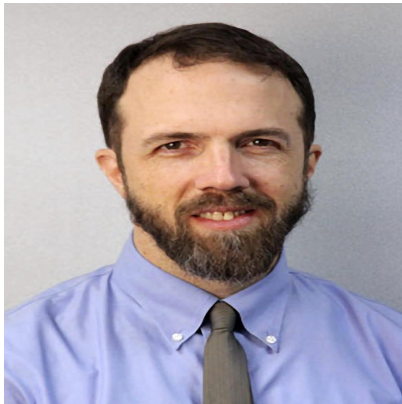


Ebola Patients Treated Outside of Africa

■ Recovered ■ In treatment ■ Died



US Ebola Survivors

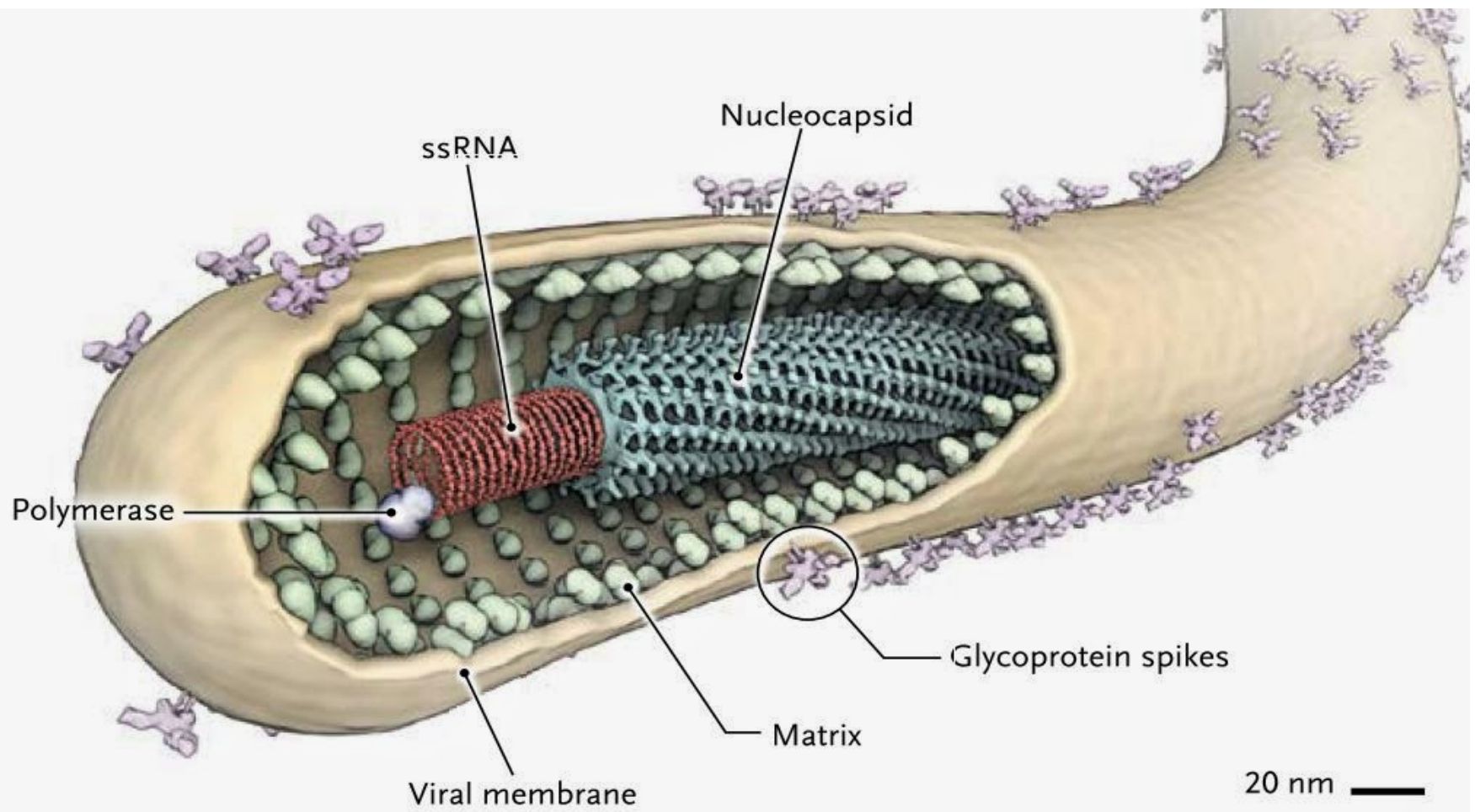


US Treated Ebola Patients

| | Care after onset of symptoms | Symptoms at time of presentation to hospital | Outcome | Days in hospital |
|-------------------|--------------------------------|--|----------|------------------|
| Thomas Duncan | Sept 24 (hospitalized Sept 28) | Diarrhea, abdominal pain and fever | Died | Died Oct 8 |
| Nina Pham RN | Oct 10 | Low grade fever | Survived | Oct 10-24 |
| Amber Vinson RN | Oct 15 | fever | Survived | Oct 15-28 |
| Dr. Craig Spencer | Oct 23 (sluggish Oct 21) | Fever, lethargy | Survived | Oct 24-Nov 11 |
| Dr. Kent Brantly | July 23 Tx Aug 2 | fever | Survived | Aug 2 – Aug 21 |
| Nancy Writebol | July 23 Tx Aug 5 | fever | Survived | Aug 5-Aug 21 |
| Dr. Rick Sacra | Sept 4 | Fever + headache | Survived | Sept 4 - 25 |
| Ashoka Mukpo | Oct 2 (fever) | fever | Survived | Oct 6-21 |
| Dr. Martin Salia | Nov 7, + Nov 10 | Fever | Died | Nov 15 - Nov 17 |
| Dr. Ian Corzier | Sept 6 - Tx Sept 8 9 | Fever, headache | Survived | Sept 9 – Oct 19 |

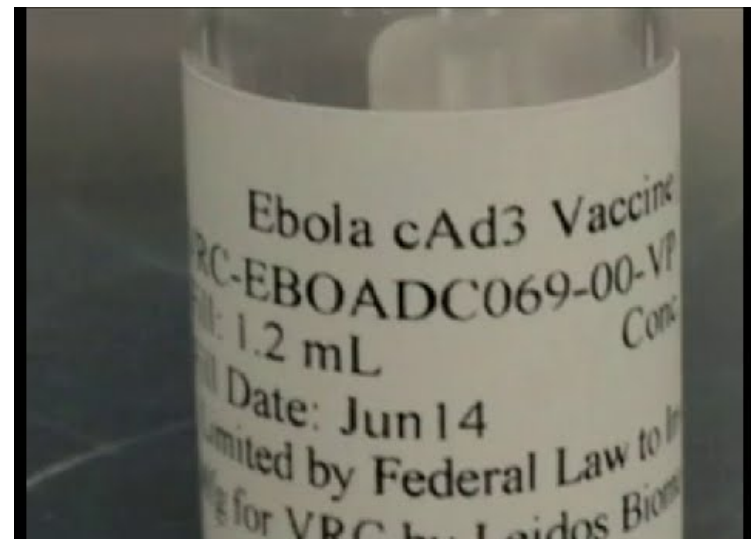
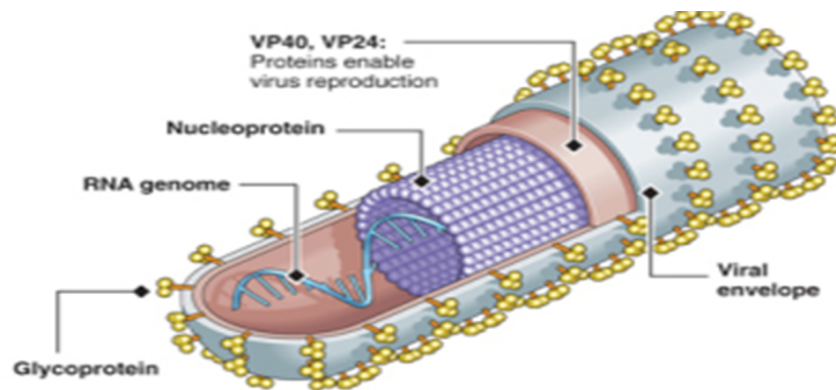
Investigational Therapies for EVD Patients

- **Convalescent serum**
- **Therapeutic medications**
- **ZMapp** – three chimeric human-mouse monoclonal antibodies
- **Tekmira** – lipid nanoparticle small interfering RNA
- **Favipiravir** – oral RNA-dependent RNA polymerase inhibitor
- **Brincidofovir** (oral precursor for cidofovir)



cAd3 vector vaccine

- Ebola Glycoprotein
- Efficacy in Macaque model



Vesicular Stomatitis Virus EBV Vaccine

- Completely protected 3 macaques against EBV challenge with aerosolized EBV
- All 3 control animals died 6-8 days later



**WHERE DO YOU THINK
THE PROBLEMS WITH
HEALTH CARE WORKERS**





Ebola PPE : Prior to CDC modifications



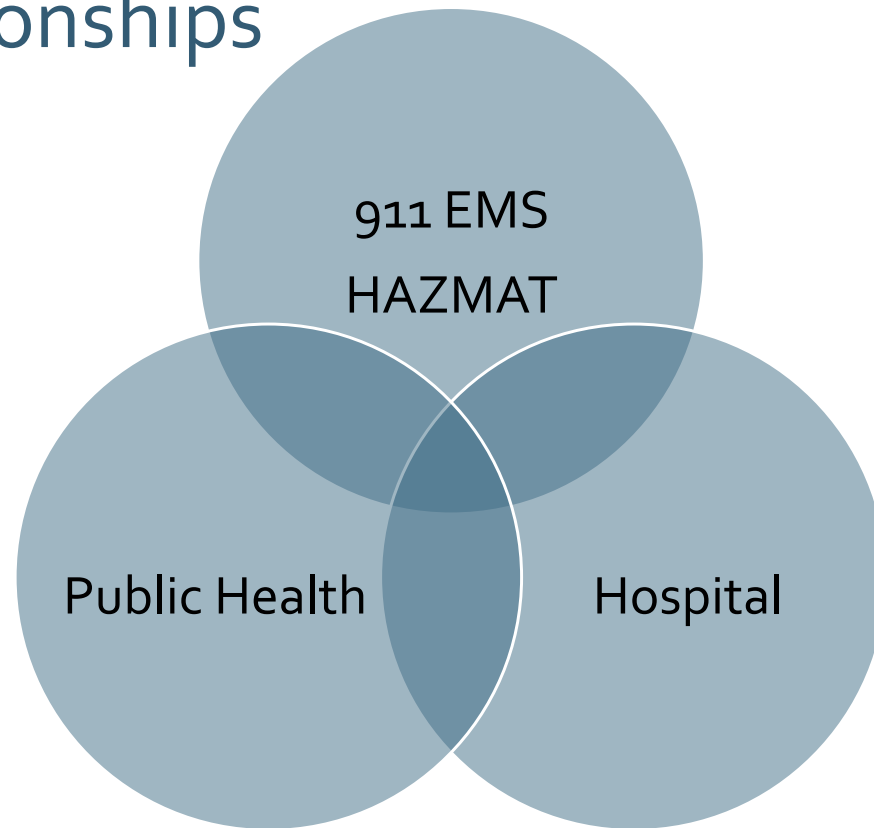
UK Ebola Personal Protective Equipment





CHANGING PARADIGM EMS, HOSPITALS, PUBLIC HEALTH

New Relationships



PUBLIC HEALTH EBOLA RISK CLASSIFICATION

Patient under Monitoring : Asymptomatic Individuals

HIGH-RISK EXPOSURE

Direct Contact with blood or body fluids

Cared for Ebola patient with direct contact (without PPE)

SOME RISK EXPOSURE

In countries with widespread transmission or cases in urban areas with uncertain control measures:

- Direct contact while using appropriate PPE of symptomatic patients
- Any direct patient care in other healthcare settings

OR

Close contact in households, healthcare facilities, or community settings with a person with Ebola while the person was symptomatic

NO IDENTIFIABLE RISK EXPOSURE

Contact with an asymptomatic person who had contact with person with Ebola **OR**

Contact with a person with Ebola before the person developed symptoms

OR

Having been more than 21 days previously in a country with widespread transmission or cases in urban areas with uncertain control measures

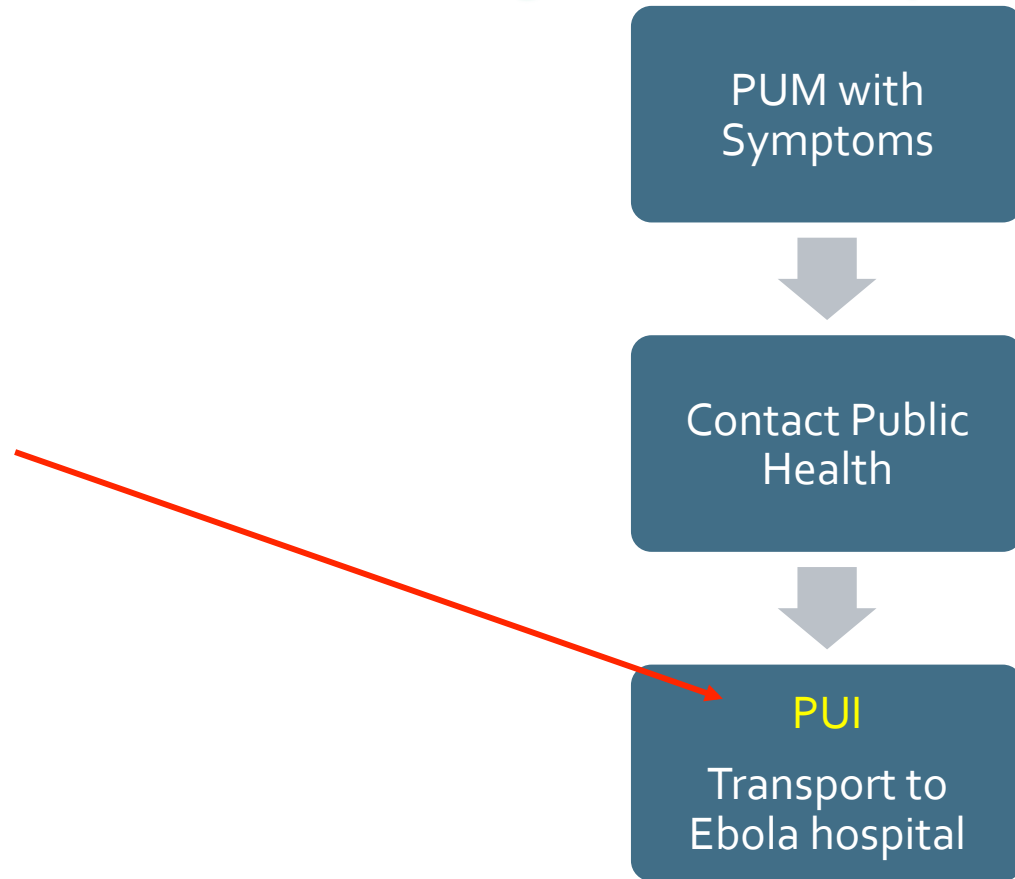
OR

Having been in a country with Ebola cases, but without widespread transmission or cases in urban settings with uncertain control measures, and not having any other exposures as defined above

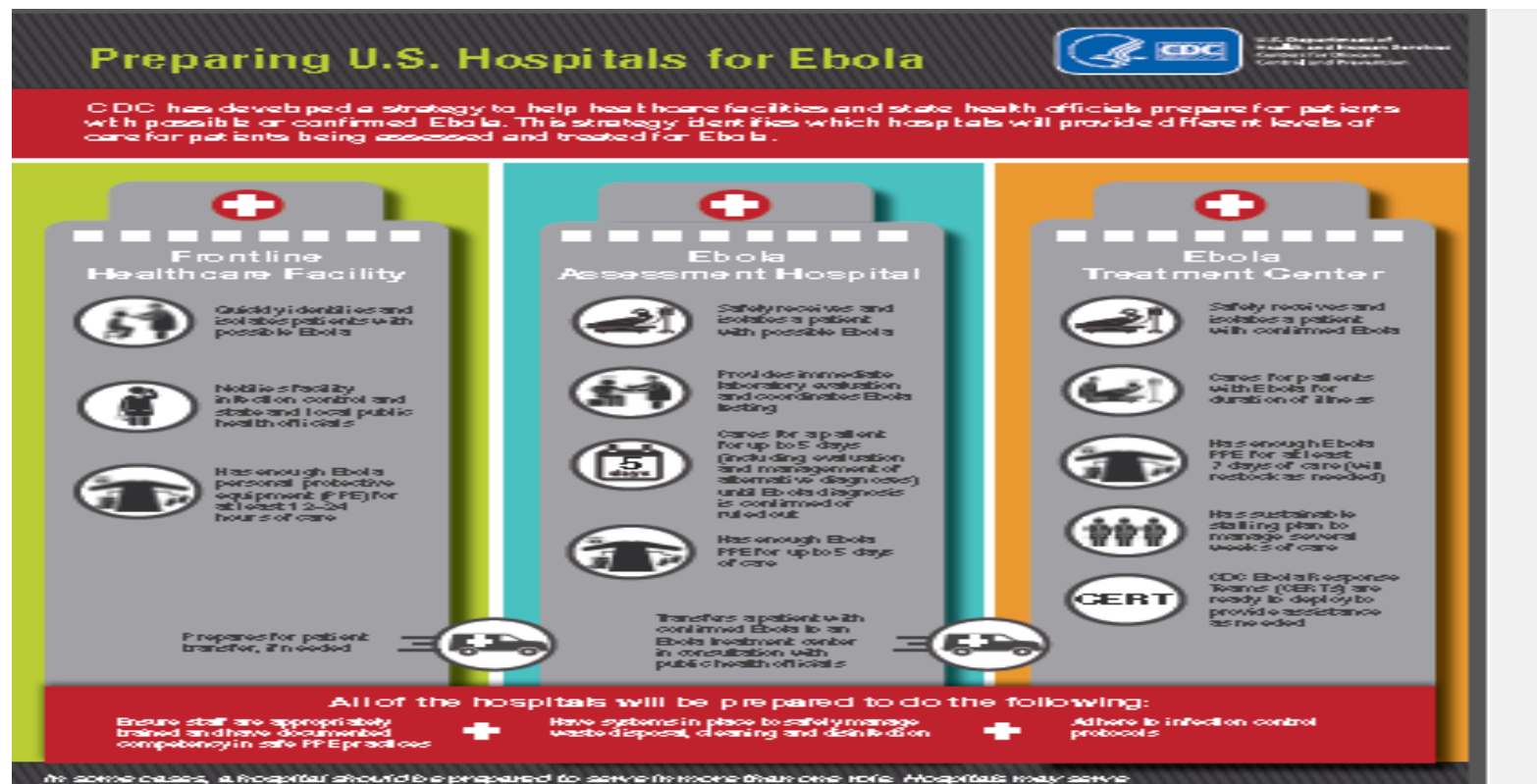
OR

Having remained on or in the immediate vicinity of an aircraft or ship during the entire time that the conveyance was present in a country with widespread transmission or cases in urban areas with uncertain control measures and having had no direct contact with anyone from the community

Evaluation and Management of Suspected Ebola Patients



US Hospital Ebola Classification



EMS BIOCONTAINMENT OPTIONS

MCEMS Recommended PPE





MCEMS Patient Isolation Bag



Patient Isolation Ambulance





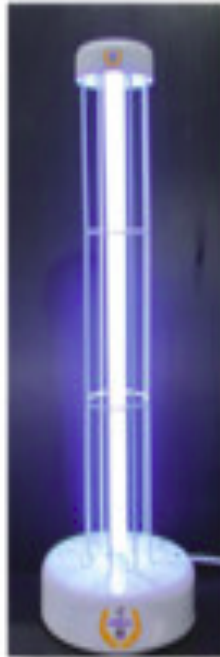
JOHN SPINK/AP



Scene and Hospital Decon



Biological Hazards and UV light



Recommendations

- **Develop your relationships** with your public health and hospital colleagues
- Identify and **acquire (before the event)** your PPE and medical countermeasures
- Identify and integrate your operations with your local HAZMAT providers
- Within your system, **identify and train your personnel** to work in level B / level C PPE environment.
- **Monitor the hospital infectious disease** biological categorization and/or designation

THE END
