A black and white electron micrograph of an Ebola virus particle. The virus is a long, thin, filamentous structure with a distinct outer envelope and a darker, more textured inner core. It is shown in a curved, looping configuration against a grainy, light-colored background.

Joseph P. Iser, MD, DrPH, MSc
Southern Nevada Health District

EBOLA VIRUS DISEASE

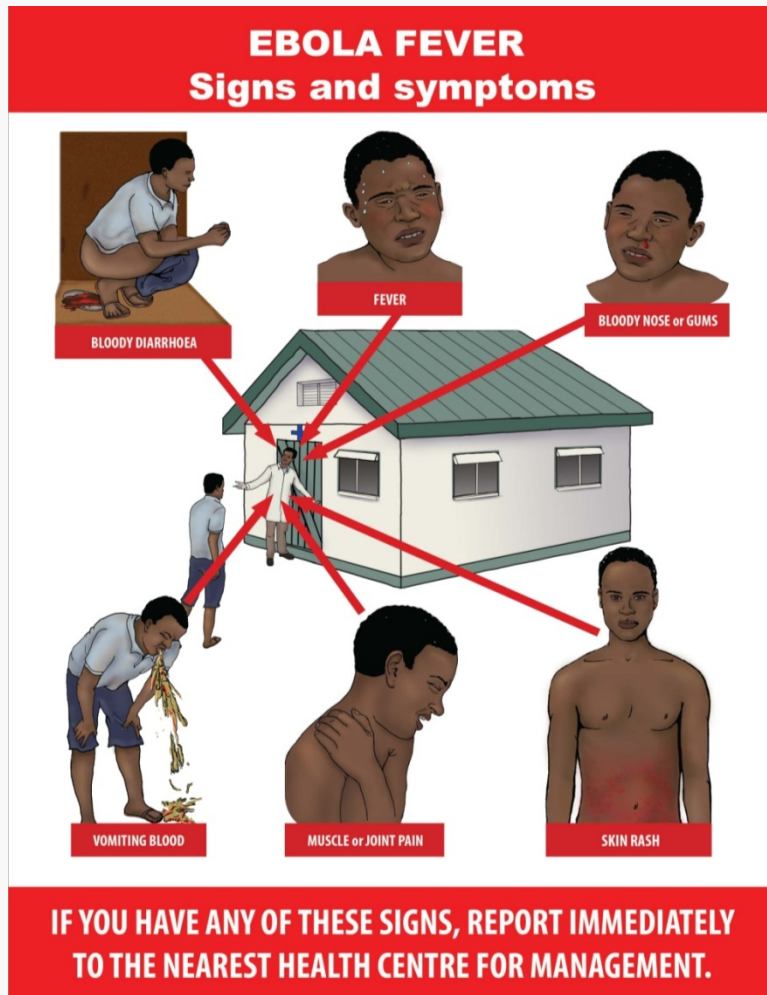
EBOLA BASICS



Ebola virus

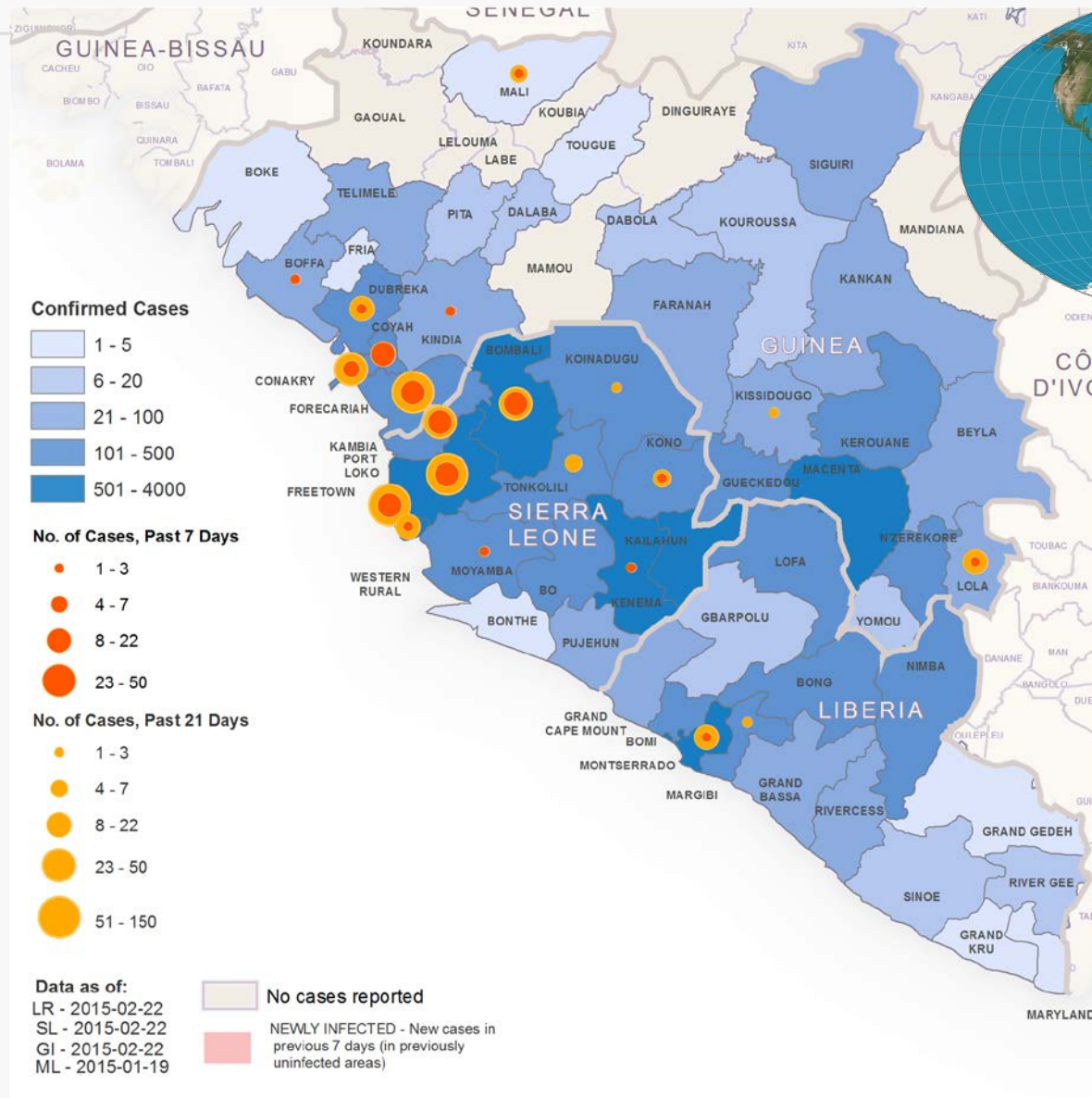
- Causes a viral hemorrhagic fever
- Incubation period 2-21 days, normally 8-10 days
- Not infectious until person is symptomatic

SIGNS AND SYMPTOMS



- Initially: **fever (100.4°F or higher)**, headache, fatigue, sore muscles, sore throat
- Progresses to: diarrhea, vomiting, stomach pain, rash, bleeding
- Fatality rate: 25%-90%, normally ~50%

COUNTRIES WITH WIDESPREAD ACTIVITY (THROUGH FEBRUARY 25, 2015)



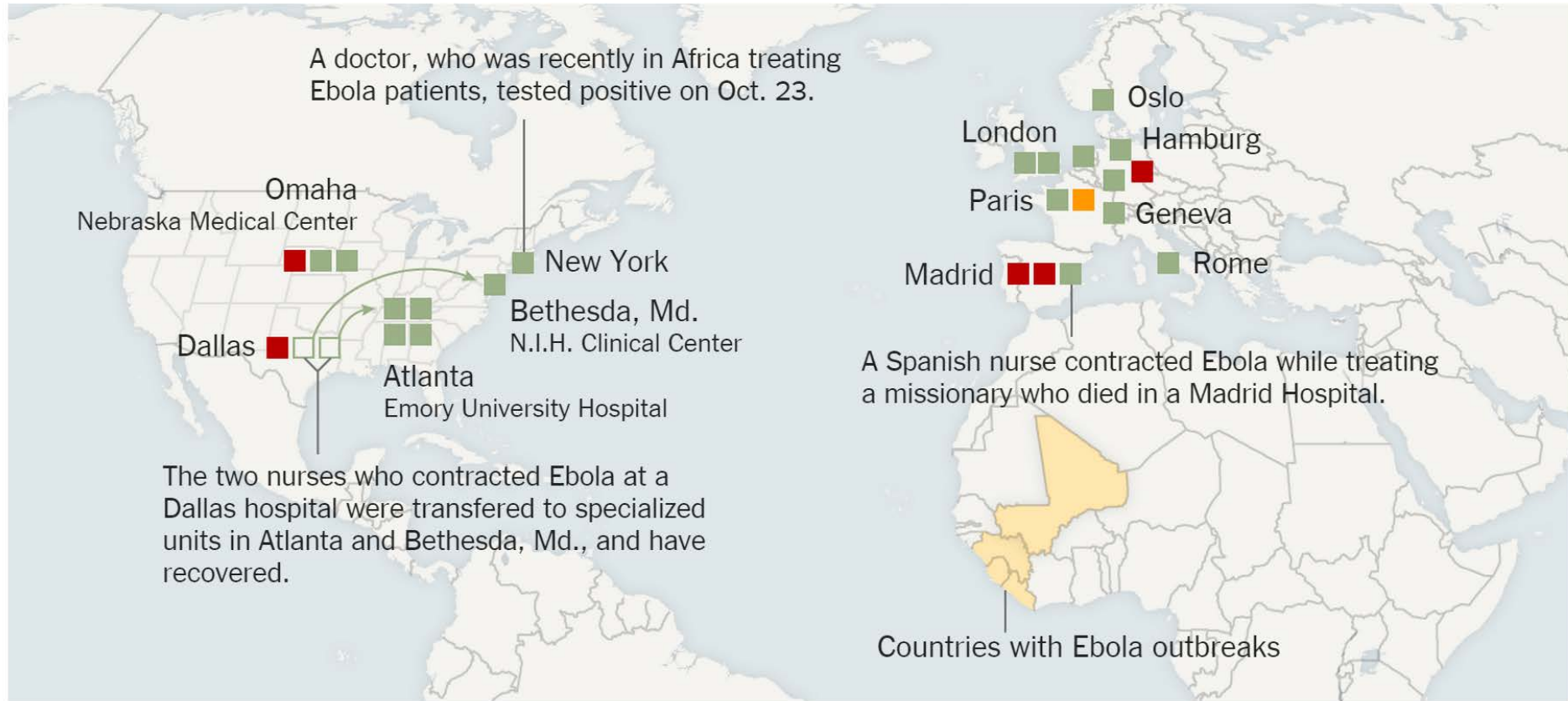
CASE COUNTS

(DATA THROUGH FEBRUARY 25, 2015)

Country	Cases	Deaths	Death Rate
Guinea	3,155	2,091	66%
Liberia	9,238	4,037	44%
Sierra Leone	11,301	3,461	31%
Nigeria	20	8	40%
Senegal	1	0	0%
United States	4	1	25%
Spain	1	0	0%
Mali	8	6	75%
United Kingdom	1	0	0%
Total	23,964	9,589	40%

CASES OUTSIDE WEST AFRICA (THROUGH JANUARY 6, 2015)

■ Recovered ■ In treatment ■ Died



CASES OUTSIDE WEST AFRICA (THROUGH DECEMBER 29, 2014)

Cases of Ebola Outside of West Africa

As of Jan. 5, 2015

United States	Arrival date	
Aid worker	Aug. 2	Recovered
Missionary	Aug. 2	Recovered
Doctor	Sept. 5	Recovered
Doctor	Sept. 9	Recovered
Visitor	Sept. 30*	Died
NBC Cameraman	Oct. 6	Recovered
Nurse	Oct. 11*	Recovered
Nurse	Oct. 15*	Recovered
Doctor	Oct. 23*	Recovered
Doctor	Nov. 15	Died
Spain		
Priest	Aug. 7	Died
Missionary	Sept. 22	Died
Nurse	Oct. 6*	Recovered
Britain		
Nurse	Aug. 24	Recovered
Nurse	Dec. 29*	Recovered

France	Arrival date	
Nurse	Sept. 19	Recovered
Medical worker	About Nov. 2	In treatment
Germany		
Doctor	Aug. 27	Recovered
Physician	Oct. 3	Recovered
U.N. medical official	Oct 9	Died
Norway		
Aid worker	Oct. 6	Recovered
Switzerland		
Doctor	Nov. 21	Recovered
Italy		
Doctor	Nov. 25	Recovered
Netherlands		
Peacekeeper	Dec. 6	Recovered

*Date of Ebola diagnosis.

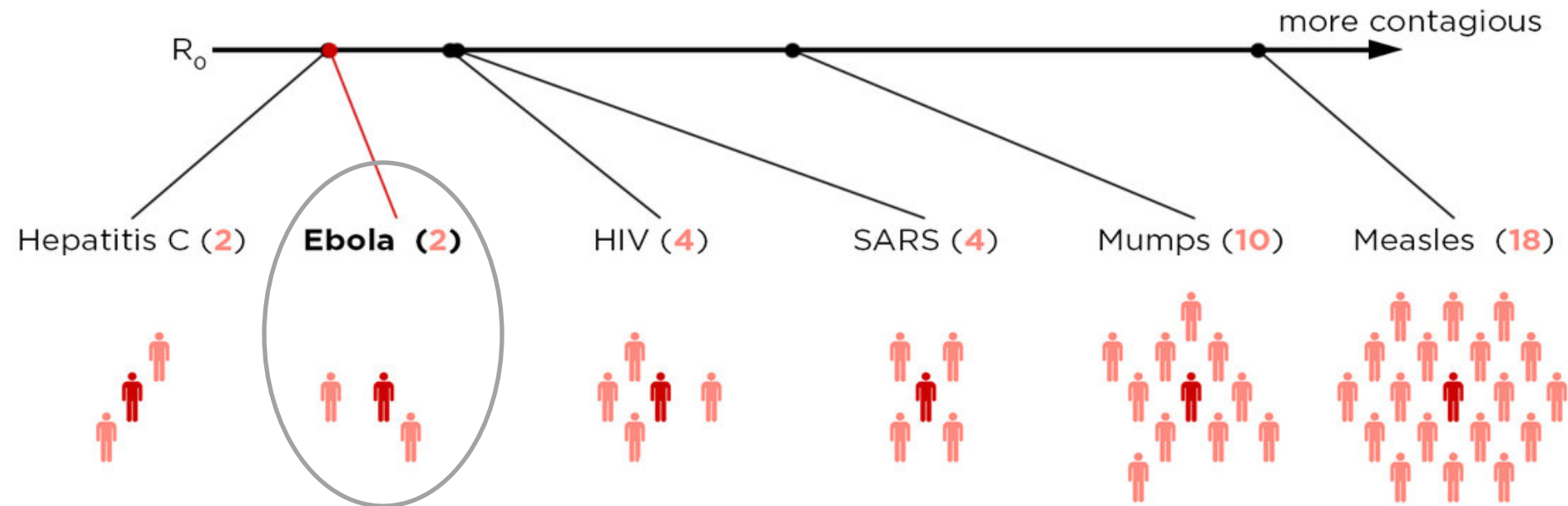
TRANSMISSION



- Direct contact with blood or bodily fluids of ill person
- Contact with objects (such as needles) contaminated with blood or bodily fluids of ill person
- Ebola is **not** airborne
- Ebola is not spread through food or water

CONTAGIOUSNESS

The number of **people** that **one sick person** will infect (on average) is called R_0 . Here are the maximum R_0 values for a few viruses.



TREATMENT



- No Ebola-specific treatment exists
- Ebola does not respond to current antibiotics
- Experimental treatments are being developed but not yet available
- Treatment is supportive

CONTACT TRACING



- Finding everyone who had direct contact with a sick Ebola patient
- Watch for 21 days after last contact occurred

EBOLA VIRUS DISEASE ALGORITHM



Southern Nevada Health District (SNHD) Algorithm for Evaluation of Ebola Virus Disease (EVD) (updated 10/20/14)

Patient traveled from a country with widespread Ebola transmission* or had contact with a confirmed EVD case-patient in the 21 days before illness onset.

Fever (subjective or measured ($\geq 100.4^{\circ}\text{C}$)) **OR** compatible Signs/Symptoms¹ of EVD

No → Report asymptomatic patients with high- or low- risk exposures (see below) to the Southern Nevada Health District Office of Epidemiology (OOE)

Yes

- Isolate patient in a single room with private bathroom and with the door to hallway closed
- Implement CDC recommended PPE for standard, contact, and droplet precautions²
- Ask patient about potential exposures to EVD
- Notify the Infection Control Program and other appropriate staff at your hospital
- Immediately report to SNHD Office of Epidemiology (OOE) for consultation (702) 759-1300 option 2
- The SNHD OOE, in consultation with CDC, will provide guidance on all aspects of patient care and management, including whether the patient should be tested for Ebola.

High Risk Exposure

Does patient meet ANY of the following within 21 days before symptom onset?

- Percutaneous or mucous membrane exposure or direct skin contact with body fluids of a person with a confirmed or suspected case of EVD without appropriate personal protective equipment (PPE**)?
- Processing body fluids of confirmed EVD patients without appropriate PPE** or standard biosafety precautions (e.g. Laboratory worker, healthcare worker)?
- Participation in funeral rites which include direct exposure to human remains in the geographic area where outbreak is occurring without appropriate PPE**?

Low Risk Exposure

Does patient meet EITHER of the following within 21 days before symptom onset?

- Providing patient care (without known high-risk exposure) or contact with EVD patients in health care facilities in outbreak-affected countries*?
- Household member or close contact³ of an EVD patient?

No Known Exposure

Travel from a country with wide-spread Ebola transmission* without High- or Low-risk exposure?

Review Case with SNHD OOE Using Additional Evaluation Criteria:

- What is the severity of illness
- Is there abnormal blood work⁴
- Is there a likely alternative diagnosis⁵

EVD Suspected-Testing Indicated

- SNHD OOE will arrange specimen transport and testing via SNPHL
- SNHD OOE, in consultation with Nevada Division of Public and Behavioral Health and CDC, will provide guidance to the hospital on all aspects of patient care and management

EVD Unlikely, Testing Not Currently Indicated

If patient requires in-hospital management:

- Admit to single patient room with private bathroom
- Implement standard, contact and droplet infection control precautions
- Decisions regarding infection control precautions should be based on the patient's clinical situation and in consultation with hospital infection control and SNHD OOE
- If patient's symptoms progress or change, re-assess need for testing with SNHD OOE

If patient does not require in-hospital management:

- Provide patient contact info to SNHD OOE for 21 day fever and symptom watch.

DEFINITIONS

Other Signs/Symptoms Include:

- Intense weakness
- Muscle Pain
- Headache and sore throat
- Vomiting
- Diarrhea
- Abdominal pain
- Impaired kidney and liver function
- Internal or external bleeding

Abnormal Blood Work:

- Platelet count $< 150,000$
- Prolonged PT/PTT
- AST/ALT elevation

*Outbreak affected areas: Sierra Leone, Guinea, Liberia (areas may be updated) refer to <http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/distribution-map.html#areas>
 **Appropriate PPE guidance can be found at: <http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html>

³Close contact is defined as a.) being within approximately 3 feet (1 meter) of an EVD patient or within the patient's room or care area for a prolonged period of time while not wearing recommended PPE or b.) having direct brief contact (e.g. shaking hands) with an EVD patient while not wearing recommended PPE. Brief interactions, such as walking by a person or moving through a hospital, do not constitute close contact.

⁵EVD can often be confused with other more common infectious diseases such as malaria, typhoid fever, meningococemia, and other bacterial infections (e.g., pneumonia). These diseases should be considered. A positive malaria test alone does not rule out EVD.

LABORATORY TESTING

- Ebola testing is performed at CDC
- Prior consultation with CDC required before samples are submitted for testing

INTERIM GUIDANCE FOR Specimen Collection, Transport, Testing, and Submission for Patients with Suspected Infection with Ebola Virus Disease

NOTIFICATION & CONSULTATION

Hospitals should follow their state and/or local health department procedures for notification and consultation for Ebola testing requests before contacting CDC. CDC cannot accept any specimens without prior consultation.

FOR CONSULTATION, CALL THE EMERGENCY OPERATIONS CENTER AT 770-488-7100

WHEN SPECIMENS SHOULD BE COLLECTED FOR EBOLA TESTING

Ebola virus is detected in blood only after onset of symptoms, most notably fever. It may take up to three days after onset of symptoms for the virus to reach detectable levels. Virus is generally detectable by real-time RT-PCR between 3 to 10 days after onset of symptoms.

Ideally, specimens should be taken when a symptomatic patient reports to a healthcare facility and is suspected of having an Ebola virus exposure. However, if the onset of symptoms is less than three days after potential exposure, a subsequent specimen will be required to rule out Ebola.

PREFERRED SPECIMENS FOR EBOLA TESTING

A minimum volume of 4 milliliters of whole blood preserved with EDTA, clot activator, sodium polyanethol sulfonate (SPS), or citrate in plastic collection tubes can be submitted for Ebola virus disease testing.

Specimens should be shipped at 4°C. Do not submit specimens to CDC in glass containers. Do not submit specimens preserved in heparin tubes.

Specimens other than blood may be submitted upon consult with the CDC.

Standard labeling should be applied for each specimen. The requested test needs to be identified only on the requisition and CDC specimen submission forms.

DIAGNOSTIC TESTING FOR EBOLA PERFORMED AT CDC

Several diagnostic tests are available for detection of Ebola virus disease. Acute infections will be confirmed using a real-time RT-PCR assay (CDC test directory code CDC-10309 Ebola Identification) in a CLIA-accredited laboratory. Virus isolation may also be attempted. Serologic testing for IgM and IgG antibodies will be completed for certain specimens and to monitor the immune response in confirmed Ebola virus disease patients (CDC-10310 Ebola Serology).

Lassa fever is also endemic in certain areas of West Africa and may show symptoms similar to early Ebola virus disease. Diagnostic tests including but not limited to RT-PCR, antigen detection, and IgM serology may be utilized to rule out Lassa fever in patients who test negative for Ebola virus disease.

TRANSPORTING SPECIMENS WITHIN THE HOSPITAL / INSTITUTION

In compliance with 29 CFR 1910.1030, specimens should be placed in a durable, leak-proof secondary container for transport within a facility. To reduce the risk of breakage or leaks, do not use any pneumatic tube system for transporting specimens from a patient with suspected Ebola virus disease.

PACKAGING & SHIPPING CLINICAL SPECIMENS TO CDC

TRIPLE PACKAGING SYSTEM

Specimens collected for Ebola virus disease testing should be packaged and shipped without attempting to open collection tubes or aliquot specimens.

Specimens for shipment should be packaged following the basic triple packaging system, which consists of a primary receptacle (a sealable specimen bag) wrapped with absorbent material, secondary receptacle (watertight, leak-proof), and an outer shipping package.

THE SUBMISSION PROCESS

Contact your state and/or local health department and CDC (770-488-7100) to determine the proper category for shipment based on clinical history and risk assessment by CDC and to obtain detailed shipping guidance and required CDC submission documents. State guidelines may differ and state or local health departments should be consulted before shipping.

INFORMATION ON SHIPPING & TRACKING IS AVAILABLE AT www.cdc.gov/ebola

ENVIRONMENTAL SURVIVAL



- Ebola virus is killed with hospital-grade disinfectants (such as household bleach) and UV
- Ebola virus on surfaces such as doorknobs and countertops can remain infective for several hours
- Ebola virus in body fluids (such as blood) can remain infective up to several days at room temperature

PERSONAL PROTECTIVE EQUIPMENT (PPE) FOR HEALTHCARE WORKERS



Putting it on

- Droplet, standard, and contact precautions are recommended for a patient-care setting where a patient with Ebola is present
- Additional PPE might be required for special situations (e.g. aerosol-generating procedures)

PERSONAL PROTECTIVE EQUIPMENT (PPE) FOR HEALTHCARE WORKERS



Taking it off

- Removal of used PPE needs to be performed carefully and in a specific sequence to avoid exposing the wearer to materials containing Ebola

PPE FOR OTHER (NON-HEALTHCARE) WORKERS



- Use the safety precautions you would normally use when dealing with a potentially sick or bloody person
- Avoid direct contact with the blood or bodily fluids of ill persons

EMS PREPAREDNESS



- Public Safety Answering Points (9-1-1 Dispatch Centers) uses screening tool to determine Ebola risk based on travel history and presence of symptoms of Ebola
- EMS crew notified of any positive screening results

EMS PREPAREDNESS



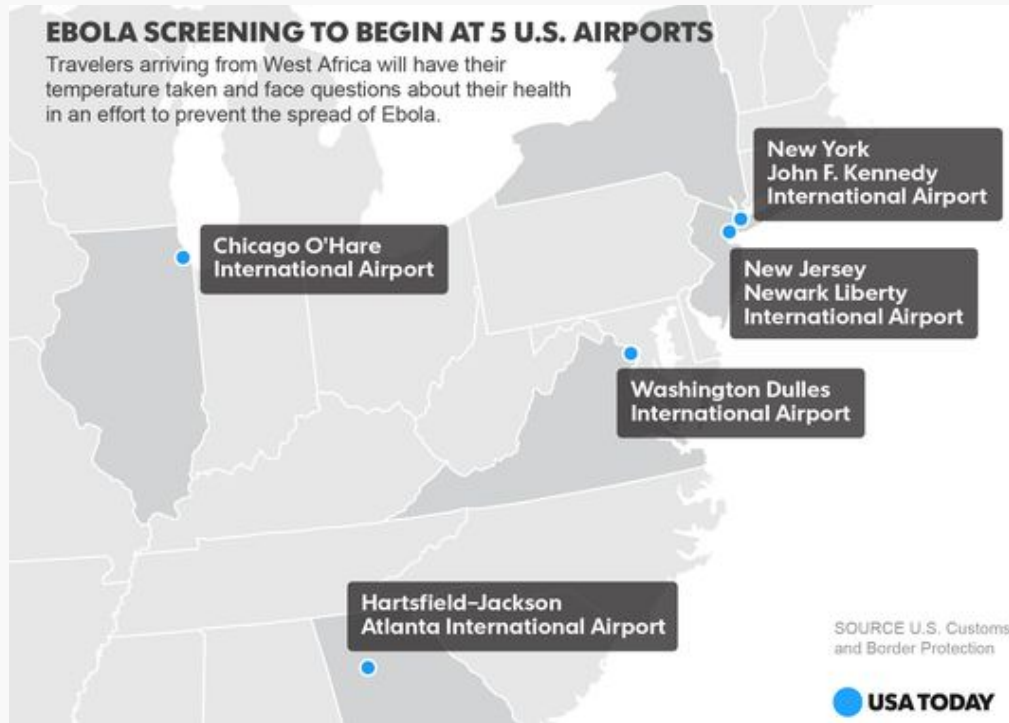
- EMS crews repeat screening, ask each patient about travel history and presence of Ebola symptoms
- If screening indicates potential Ebola, receiving facilities will be pre-notified to allow for safe and efficient transfer of care

COMMUNITY PREPAREDNESS



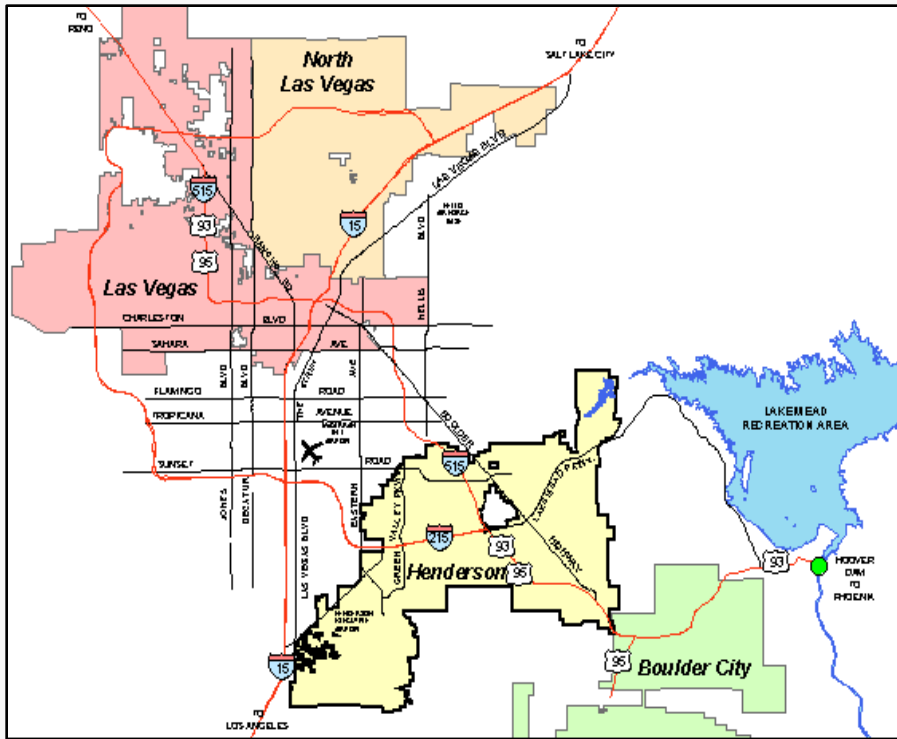
- Clark County Hazard Mitigation Plan and Regional Threat Hazard Identification & Risk Assessment (THIRA) identifies a biological incident as one of top hazards.
- Current plans consider “All-Hazards”
- Joint Training and Exercises

RISK TO CLARK COUNTY



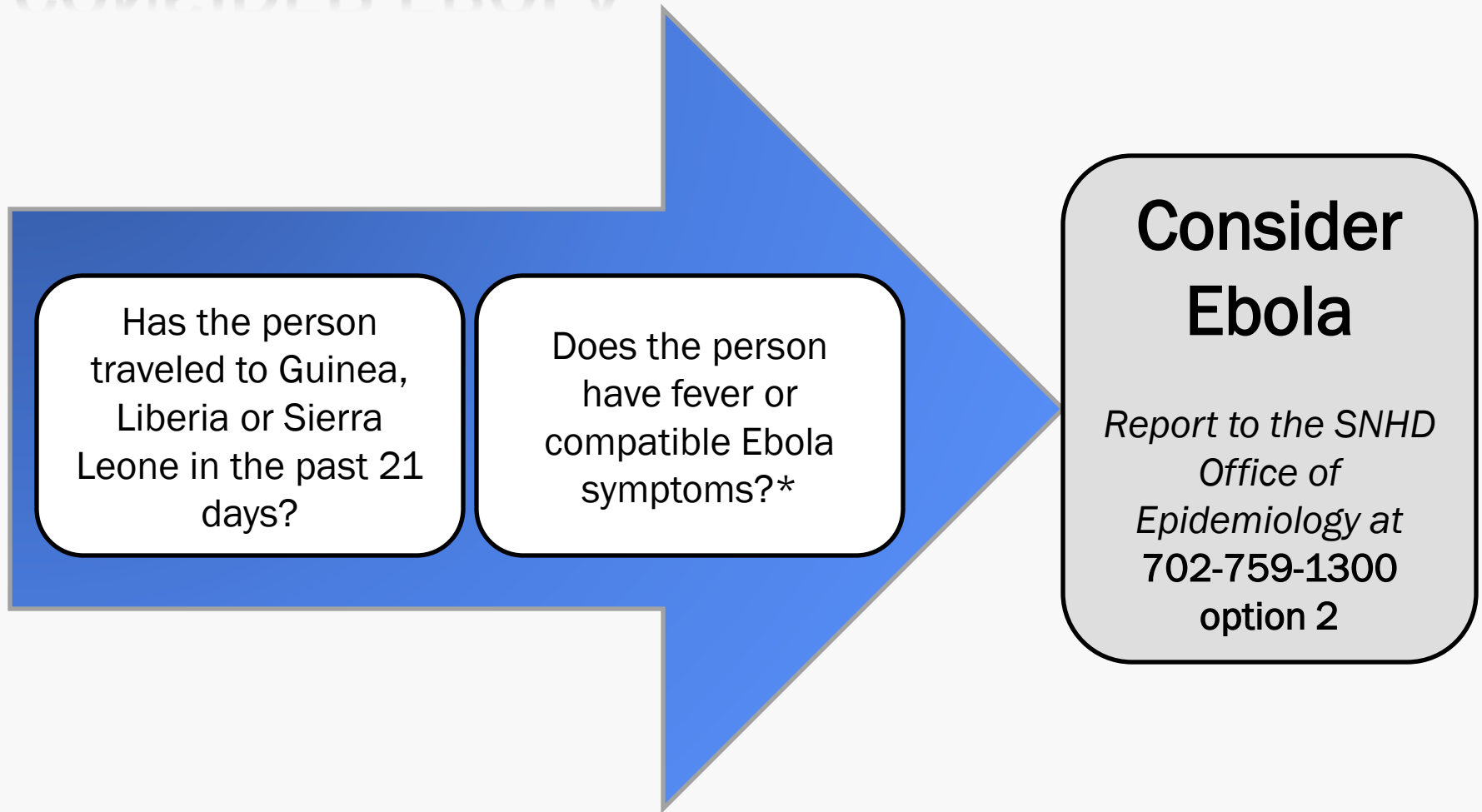
- High volume visitor destination
- McCarran-no direct flights from Africa
- All passengers from Guinea, Liberia, Mali and Sierra Leone are being routed through five US airports for screening

CLARK COUNTY EBOLA VIRUS PLANNING



- Over past months SNHD has been working with hospitals, EMS to prepare for an event
- Created protocols for testing, first responders, and monitoring contacts
- McCarran incident response demonstrated plans work

CONSIDER EBOLA



* headache, weakness, muscle pain, vomiting, diarrhea, abdominal pain, or hemorrhage