Emerging Infectious Disease Threats

Influenza A, Dengue Fever, Chikungunya Fever, and Ebola

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Disclosures
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- Research
  - Cubist
  - Durata
- Consultancy
  - Pfizer
  - Activis
  - Astellas
  - Merck

What I hope to achieve…

- Influenza A
  - Seasonal and pandemic
  - Treatment
  - Vaccines
- Dengue and Chikungunya
  - Epidemiology
  - Diagnosis
  - Prevention
- Ebola

What I Hope to Avoid!!!!

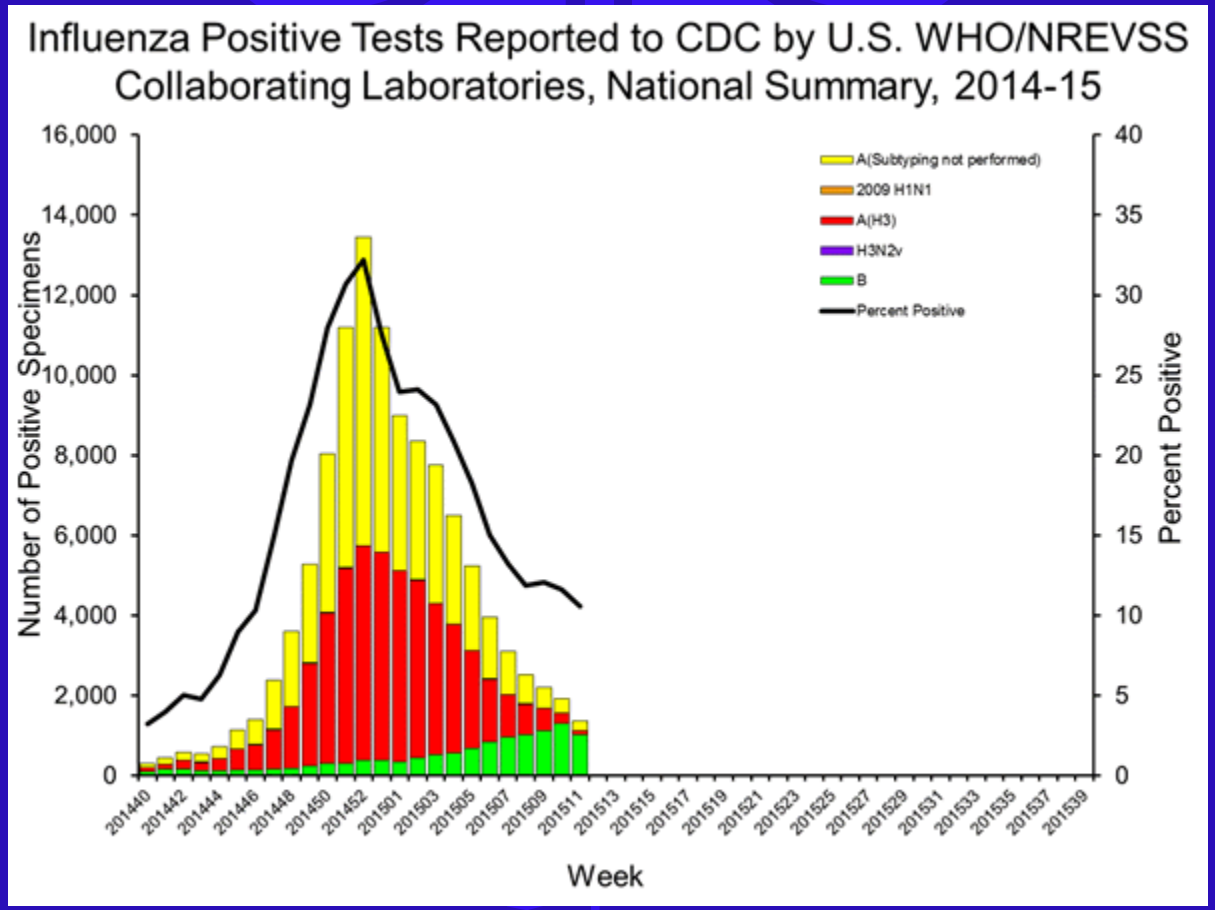
Influenza Viruses

- RNA virus
- *Orthomyxoviridae* family
- Types A, B or C based on antigenic differences of their nucleo- and matrix proteins
- Avian influenza viruses (AIV) belong to type A
- On the basis of the antigenicity of these glycoproteins, influenza A viruses currently cluster into **sixteen H** (H1 - H16) and **nine N** (N1 - N9) subtypes.

Circulating Influenza Viruses

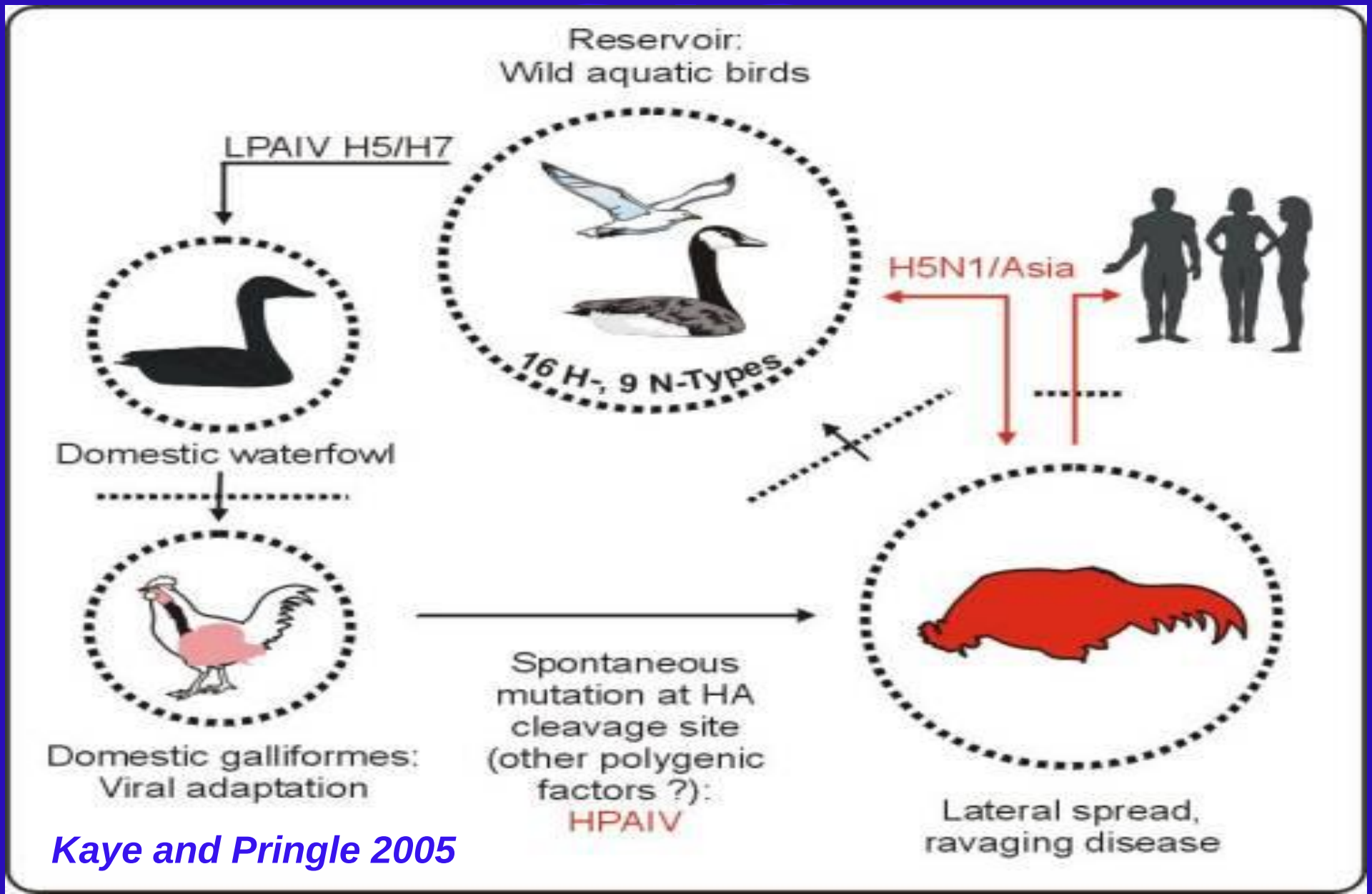
- Seasonal influenza
  - A(H3N2), A(H1N1), B
- Avian influenza (‘bird flu’)
  - A(H5 and H7, e.g. HPAI H5N1)
- Swine influenza (‘swine flu’) -> variant flu
  - A(H1N1v) - 2009 pandemic strain
  - A(H3N2v) – 2011-2012 US strain

US Influenza Activity, 2013-2014



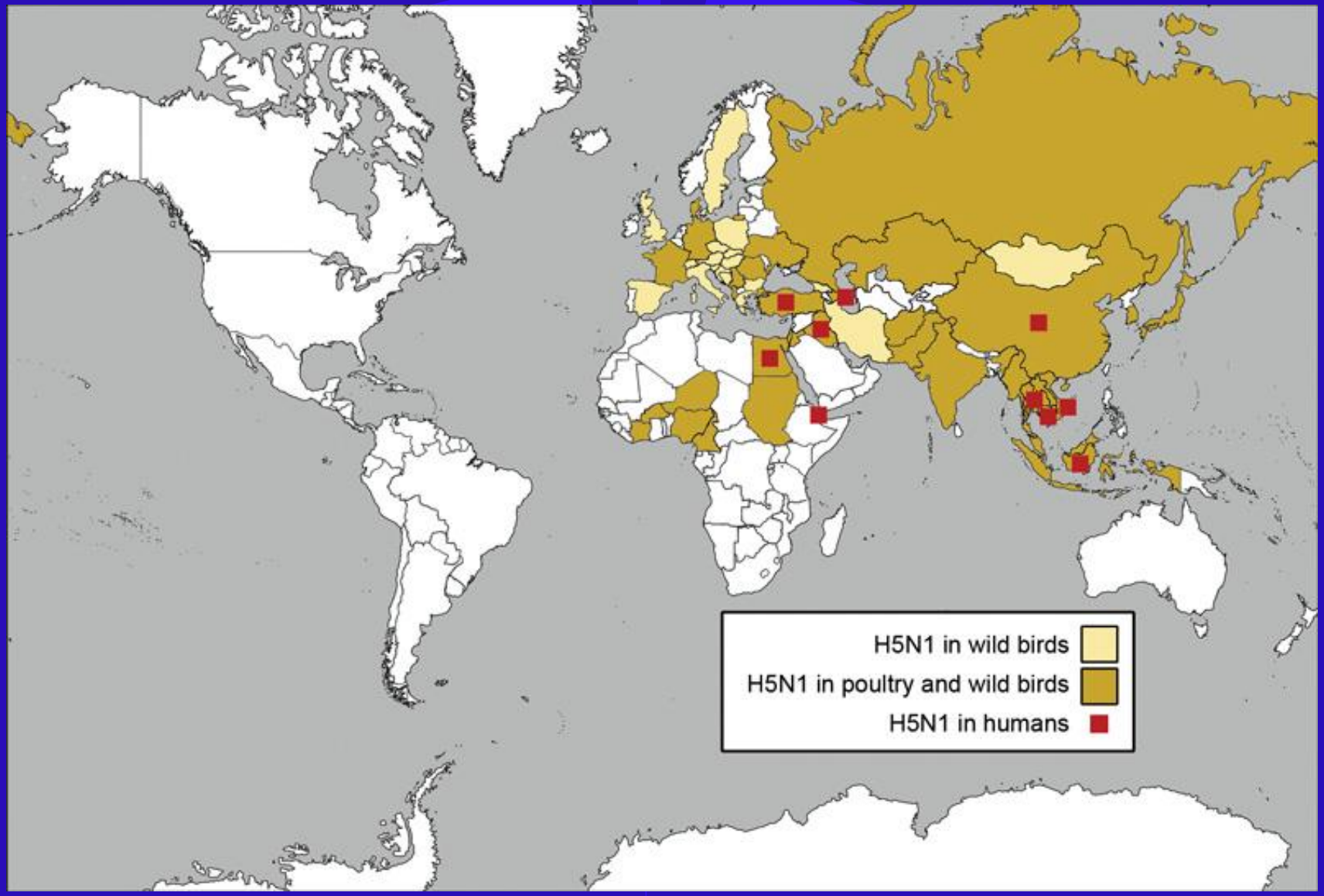
http://www.cdc.gov/flu/weekly/

Avian Influenza Viruses



Kaye and Pringle 2005

Countries with H5N1 Human Cases



Virologic Diagnosis

- Culture
- Antigen detection (Rapid tests, ELISA, IFA)
- RT-PCR
- Serology
- All studies more likely to be positive if collected in first 3 days of illness

Influenza Virus Testing Methods

Method	Acceptable Specimens	Test Time
Viral cell culture (conventional)	NP swab, throat swab, NP or bronchial wash, nasal or endotracheal aspirate, sputum	3-10 days
Rapid cell culture (shell vials; cell mixtures)	As above	1-3 days
Immunofluorescence, Direct (DFA) or Indirect (IFA) Antibody Staining	NP swab or wash, bronchial wash, nasal or endotracheal aspirate	1-4 hours
RT-PCR (singleplex and multiplex; real-time and other RNA-based) and other molecular assays	NP swab, throat swab, NP or bronchial wash, nasal or endotracheal aspirate, sputum	1-6 hours
Rapid Influenza Diagnostic Tests (antigen)	NP swab, (throat swab), nasal wash, nasal aspirate	<30 min.

http://www.cdc.gov/flu/professionals/diagnosis/rapidlab.htm

Antiviral Medications Recommended for Treatment and Chemoprophylaxis of Influenza

Antiviral Agent	Activity Against	Use	FDA Approved For	Not Recommended for Use in	Adverse Events
Oseltamivir (Tamiflu®)	**Influenza A and B**	**Treatment**	2 wks and older	N/A	**Adverse events:** nausea, vomiting. Sporadic, transient neuropsychiatric events (self injury or delirium) mainly reported among Japanese adolescents and adults.
		Chemo-prophylaxis	1 yr and older	N/A	
Zanamivir (Relenza®)	**Influenza A and B**	**Treatment**	7 yrs and older	people with underlying respiratory disease (e.g., asthma, COPD)	**Allergic reactions:** oropharyngeal or facial edema. **Adverse events:** diarrhea, nausea, sinusitis, nasal signs and symptoms, bronchitis, cough, headache, dizziness, and ear, nose and throat infections.
		Chemo-prophylaxis	5 yrs and older	people with underlying respiratory disease (e.g., asthma, COPD)	

Influenza vaccine information, by age group --- United States, 2012--13 influenza season

TABLE. Influenza vaccine information, by age group — United States, 2012–13 influenza season*

Vaccine	Trade name	Manufacturer	Presentation	Mercury content (µg Hg per 0.5 mL dose)	Ovalbumin content (µg per 0.5mL dose)†	Age group	No. of doses	Route
TIV	Fluzone	Sanofi Pasteur	0.25 mL prefilled syringe	0.0	—§	6–35 mos	1 or 2¶	IM**
			0.5 mL prefilled syringe	0.0	—§	≥36 mos	1 or 2¶	IM**
			0.5 mL vial	0.0	—§	≥36 mos	1 or 2¶	IM**
			5.0 mL multidose vial	25.0	—§	≥6 mos	1 or 2¶	IM**
TIV	Agriflu****	Novartis Vaccines	0.5 mL prefilled syringe	0	<0.4	≥18 yrs	1	IM**
TIV	Fluvirin	Novartis Vaccines	0.5 mL prefilled syringe	≤1	≤1	≥4 yrs	1 or 2¶	IM**
			5.0 mL multidose vial	25.0	≤1			
TIV	Fluarix	GlaxoSmithKline	0.5 mL prefilled syringe	0	≤0.05	≥3 yrs	1 or 2¶	IM**
TIV	FluLaval	ID Biomedical Corporation of Quebec (distributed by GlaxoSmithKline)	5.0 mL multidose vial	<25.0	≤0.3	≥18 yrs	1	IM**
TIV	Afluria	CSL Biotherapies (distributed by Merck)	0.5 mL prefilled syringe	0.0	≤1	≥9 yrs††	1	IM**
			5.0 mL multidose vial	24.5	≤1			
TIV high-dose§§	Fluzone High-Dose	Sanofi Pasteur	0.5 mL prefilled syringe	0.0	—§	≥65 yrs	1	IM**
TIV intradermal¶¶	Fluzone Intradermal	Sanofi Pasteur	0.1 mL prefilled microinjection system	0.0 (per 0.1 mL)	—§	18–64 yrs	1	ID
LAIV	FluMist***	MedImmune	0.2 mL prefilled intranasal sprayer	0.0 (per 0.2 mL)	<0.24 (per 0.2mL)†††	2–49 yrs§§§	1 or 2¶	IN

Quadrivalent Vaccines

Fluarix Quadrivalent	GlaxoSmithKline	0.5 mL single-dose prefilled syringe	—	≥3 yrs	IM
FluLaval Quadrivalent	ID Biomedical Corp (distributed by GSK)	0.5 mL single-dose prefilled syringe	—	≥3 yrs	IM
		5.0 mL multidose vial	<25	≥3 yrs	IM
Fluzone Quadrivalent	Sanofi Pasteur	0.25 mL single-dose prefilled syringe	—	6–35 mos	IM
		0.5 mL single-dose prefilled syringe	—	≥36 mos	IM
		0.5 mL single-dose vial	—	≥36 mos	IM
		5.0 mL multidose vial	25	≥6 mos	IM

Novel Vaccine Options

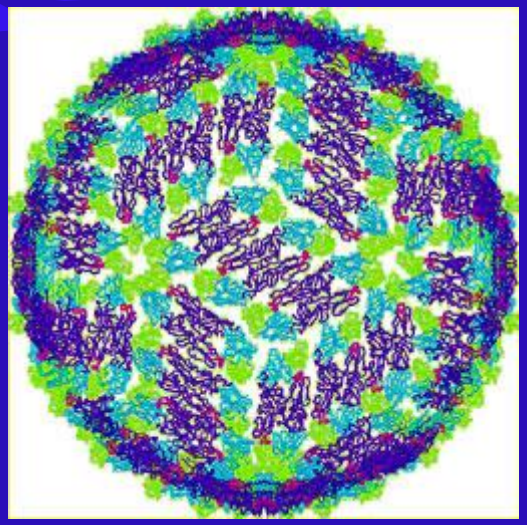
Flucelvax ccIIV3 (dog cell culture)	Novartis	0.5 mL single-dose prefilled syringe	≥18 yrs	IM
Flublok RIV4 (recominant)	Protein Sciences	0.5 mL single-dose vial	≥18 yrs	IM
FluMist LAIV4	MedImmune	0.2 mL single-dose prefilled nasal sprayer	2-49 yrs	IN
FluZone High-Dose IIIV3	Sanofi Pasteur	0.5 mL single-dose prefilled syringe	≥ 65 yrs	IM

Dengue Fever

- Virology
- Epidemiology
  - Transmission
- Clinical syndromes
- Diagnosis
- Management and Prevention

Dengue Fever

- Family: *Flaviviridae*
- Genus: *Flavivirus*
- 5 Serotypes, all cause disease
  - No cross-protection between types
- An *old* disease
  - Jin Dynasty, 265-420 AD
  - Pandemic, 1779-80
  - Severe form first reported in Phillipines, 1953

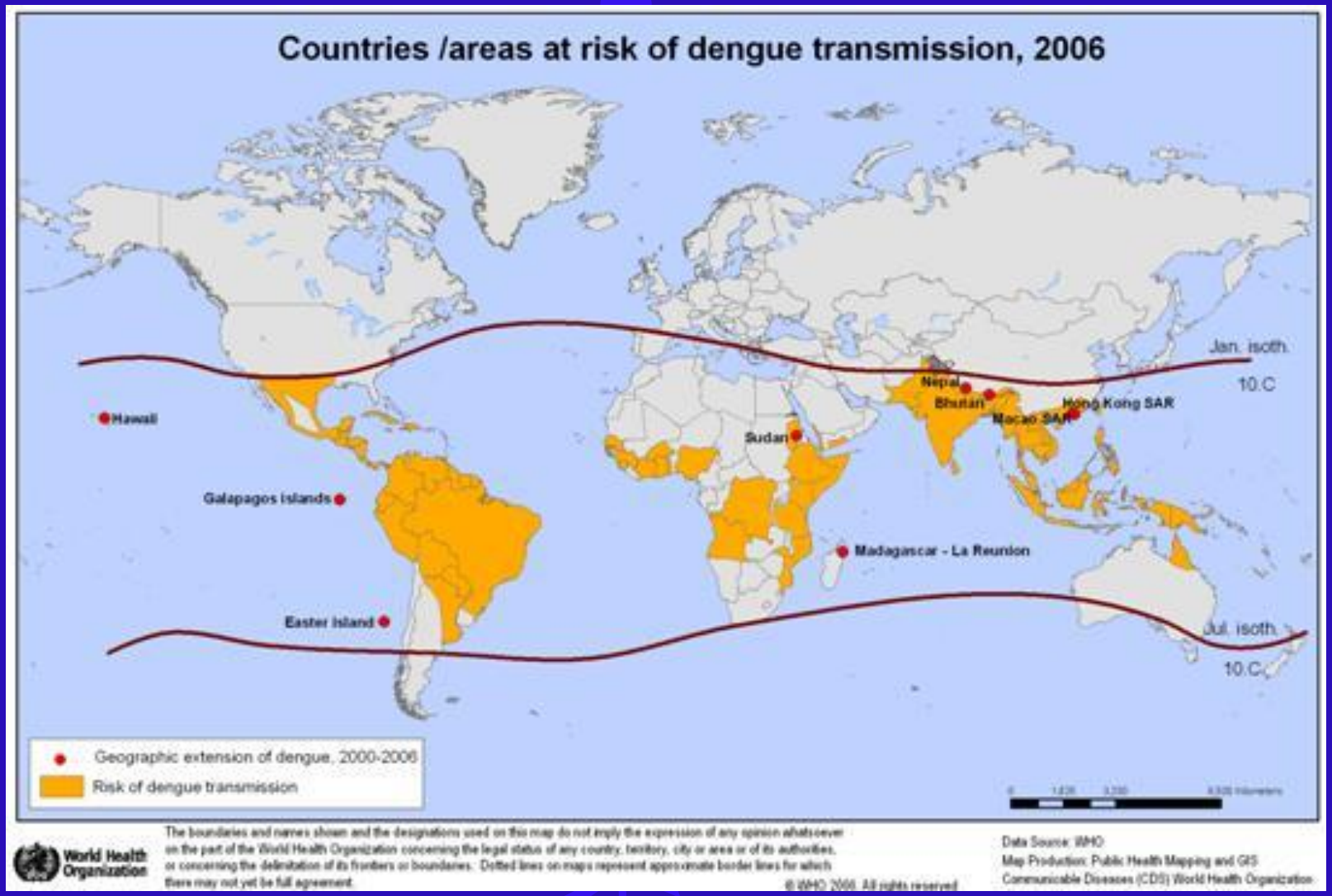


Dengue Fever

- Over 400 million infected annually
- Transmitted from person to person via mosquito is major route
- *Aedes aegypti* and *Aedes albopictus* species
  - Ubiquitous
  - Feed during day as well as dusk and dawn
- Other transmission routes are rare:
  - Vertical transmission
  - Blood product transfusion
- Donor-derived organ transmission

Aedes Mosquitoes

- Appearance
  - Black and white stripes
- Flies dusk till dawn
  - Short flights, e.g. house to house
- Dayfeeder
- Bite often asymptomatic


Countries /areas at risk of dengue transmission, 2006
Jan. isoth. 10.C
Jul. isoth. 10.C
Nepal
Bhutan
Hong Kong SAR
Macao SAR
Sudan
Hawaii
Galapagos Islands
Madagascar - La Reunion
Easter Island
Geographic extension of dengue, 2000-2006
Risk of dengue transmission
World Health Organization
The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.
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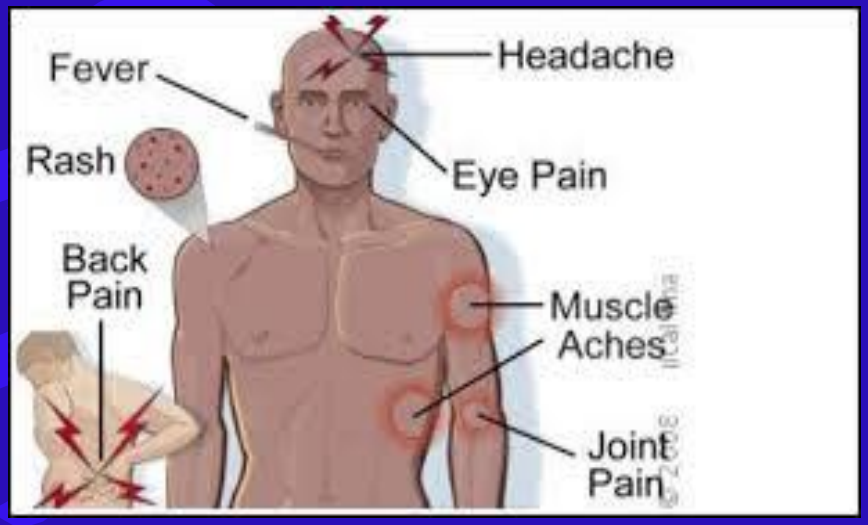
Data Source: WHO
Map Production: Public Health Mapping and GIS
Communicable Diseases (CDS) World Health Organization

Dengue Syndromes

- Dengue fever
  - "Breakbone fever"
  - Incubation range 2-15 d
  - Bimodal fever
  - Maculopapular rash 3-4 d
- Dengue hemorrhagic fever (DHF)
- Dengue shock syndrome (DSS)

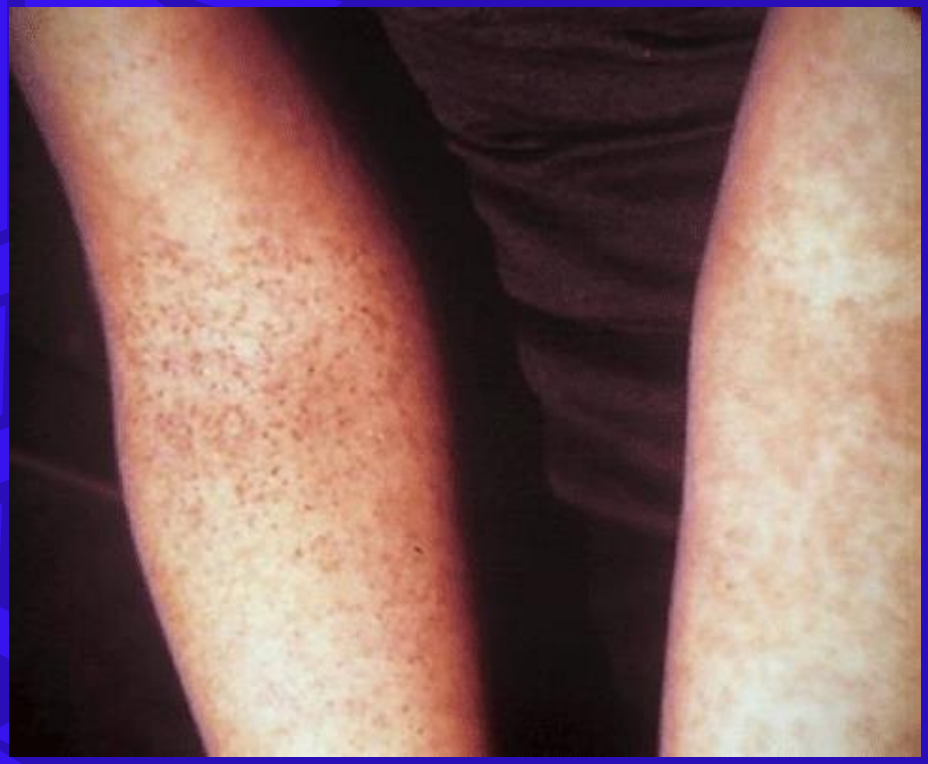


Differential Diagnosis

- Influenza
- Measles
- Rubella
- Leptospirosis
- Meningococcemia
- Rickettsial infections (e.g. RMSF)
- Bacterial sepsis
- Malaria
- Chikungunya fever
- Typhoid fever
- Other hemmhoragic fevers (e.g. Ebola)

Tourniquet Test

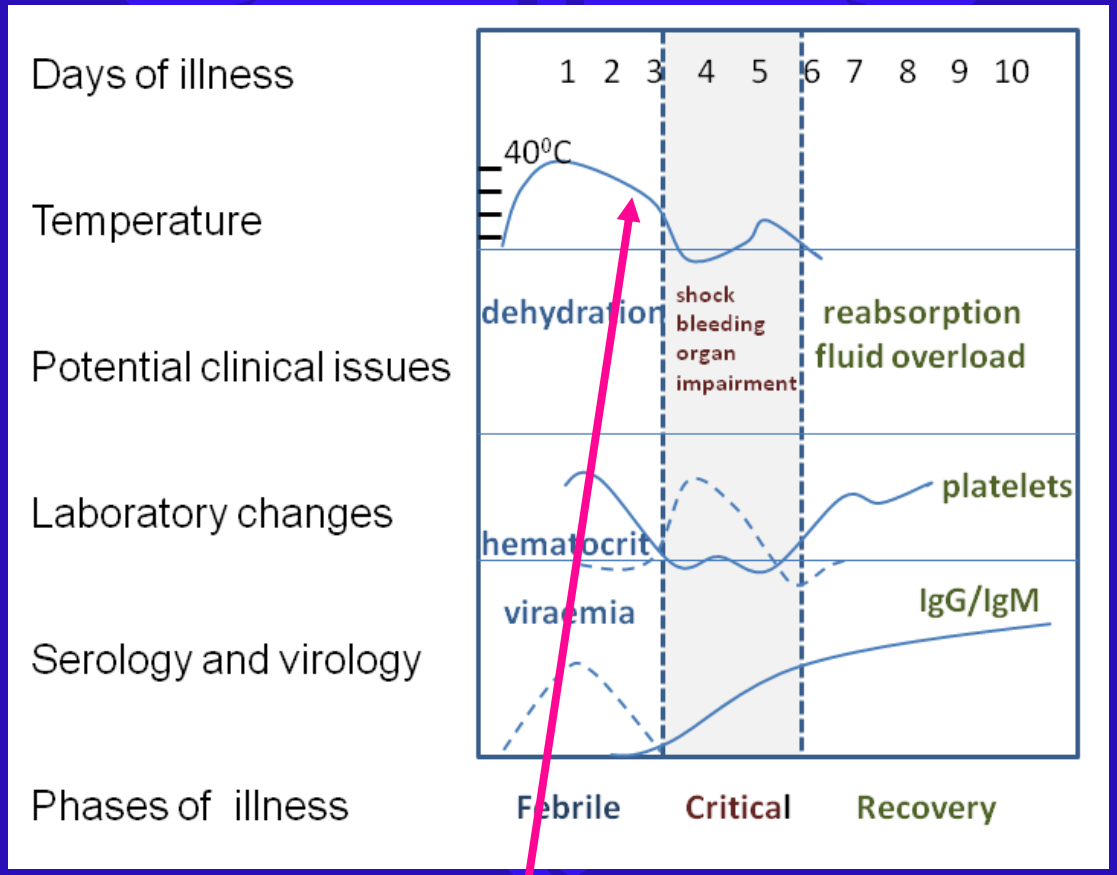
- Inflate BP cuff to pressure roughly halfway between SBP and DBP for 5 minutes
- POSITIVE:
  - > 20 petechiae per sq. in (6.25 cm^2)



Dengue Fever: Diagnosis

- WHO 2009 Case Definitions available at http://www.cdc.gov/dengue/clinicalLab/caseDef.html
- Laboratory diagnosis:
  - RT-PCR
  - IgM MAC-ELISA (may be positive with other flaviviruses like WNV)
- **EARLY DIAGNOSIS** can decrease case mortality from 10% to < 0.1%

Dengue Hemorrhagic Fever



Note: DHF develops 24-48 hours after defervescence

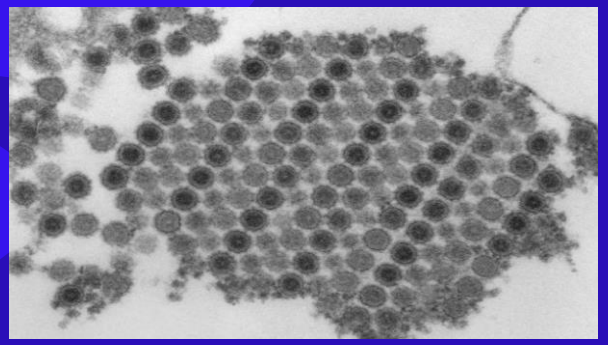
Dengue Fever: Treatment and Prevention

- Treatment
  - Symptomatic treatment alone
  - No antiviral available
  - Fluid management critical to survival
- Prevention
  - Use mosquito repellent
  - Wear long-loose clothing
  - Drain standing water
  - Vaccine in development for years…

Chikungunya Fever

- Virology
- Epidemiology
  - Transmission
- Clinical syndrome
- Treatment and Prevention

Chikungunya Virus

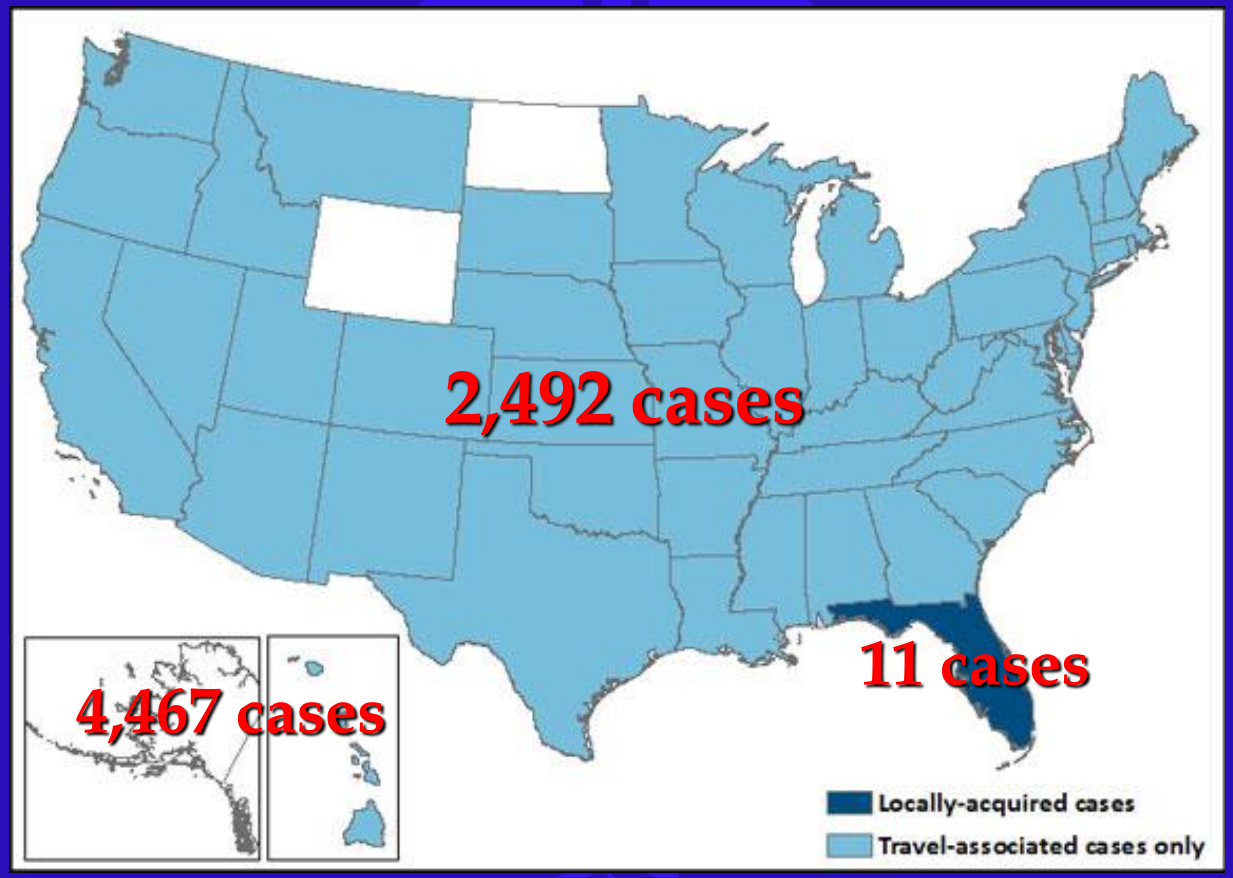


- Family: *Alphavirus*
- Genus: *Togaviridae*
- Related virusus:
  - O'nyong-nyong (ONN) virus
  - Semliki Forest antigenic complex
- Transmitted from person to person via mosquito
  - Blood-borne transmission not yet reported
  - Vertical transmission reported but very rare
- *Aedes aegypti* and *Aedes albopictus* species
  - Ubiquitous
  - Feed during day as well as dusk and dawn

Chikungunya Virus

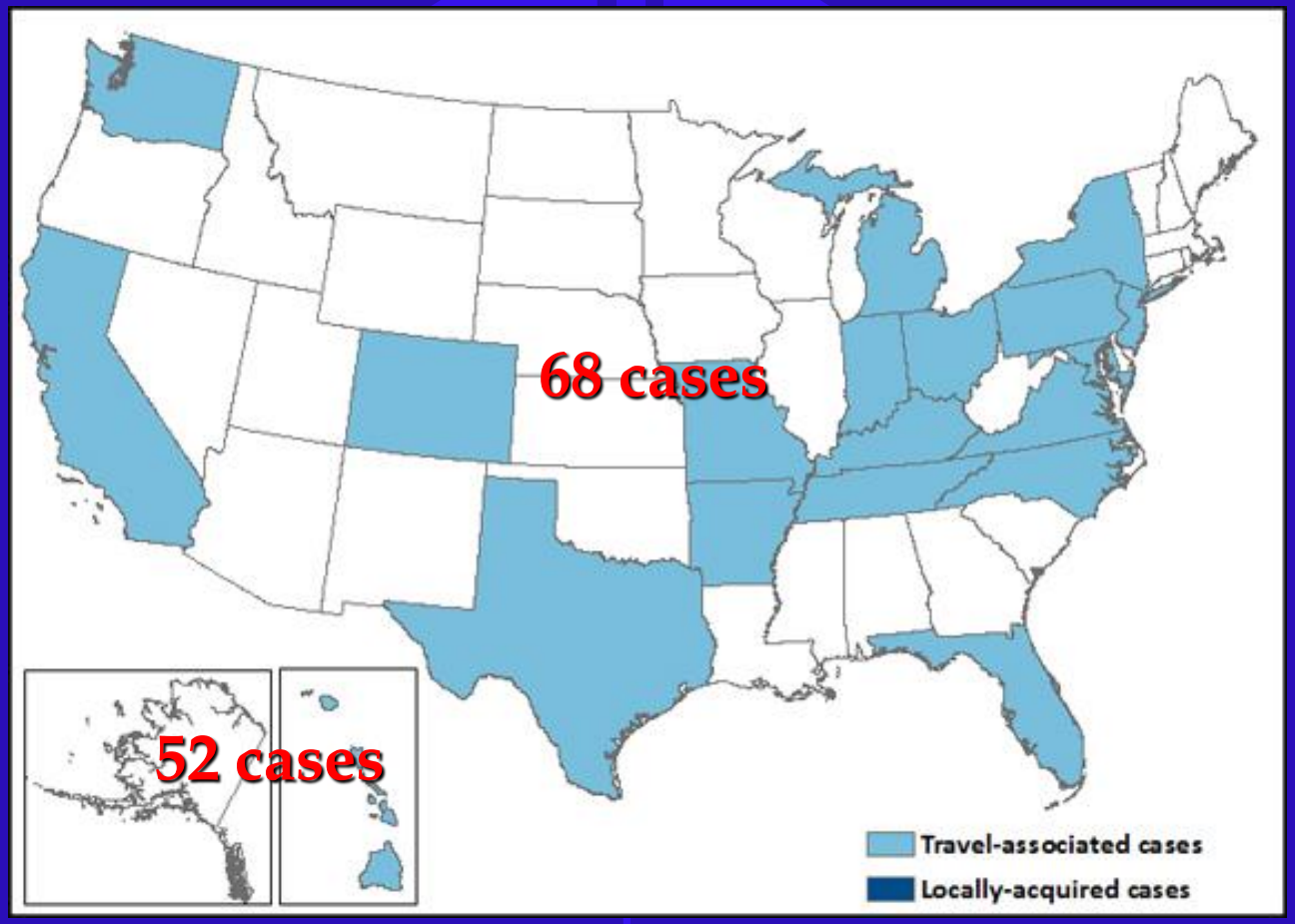
- “That which bends up" or "to be contorted" in the Kimakonde language
- First case detected in Tanzania, 1953
- Since 1953, > million cases in Africa and SE Asia
- 2013-14: 1.2 million cases in 44 countries in Western hemisphere
- In US as of March, 2015
  - >2,500 cases, all acquired in travelers (prior average: 28/yr)
  - Local transmission in southern Florida, Puerto Rico, and USVI

Chikungunya Virus in US, 2014



http://www.cdc.gov/chikungunya/geo/united-states-2014.html

Chikungunya Virus in US, 2015



http://www.cdc.gov/chikungunya/geo/united-states-2015.html

Chikungunya Fever: Disease

- Incubation time: 3-7 days
- Most exposed people will become symptomatic
- Common:
  - Fever
  - Arthralgias/arthritis
- Less common:
  - Headache
  - Myalgias
  - Rash
- Self-limiting infection, most recover within 7-10 d; rarely fatal
- Severe or chronic disease in elderly, immunosuppressed, chronic medical illnesses including arthritis
- Immunity likely life-long

Chikungunya Fever: Diagnosis, Treatment, and Prevention

- Diagnosis
  - Serum or blood serology, sent to State Dept of Health
    - RT-PCR
    - IgM EIA
  - Contact local health department for instructions
- Treatment
  - Symptomatic treatment alone
  - No antiviral available
- Prevention
  - Use mosquito repellent
  - Wear long-loose clothing
  - Drain standing water

If Lightening Strikes Twice

Contents lists available at ScienceDirect

Journal of Clinical Virology

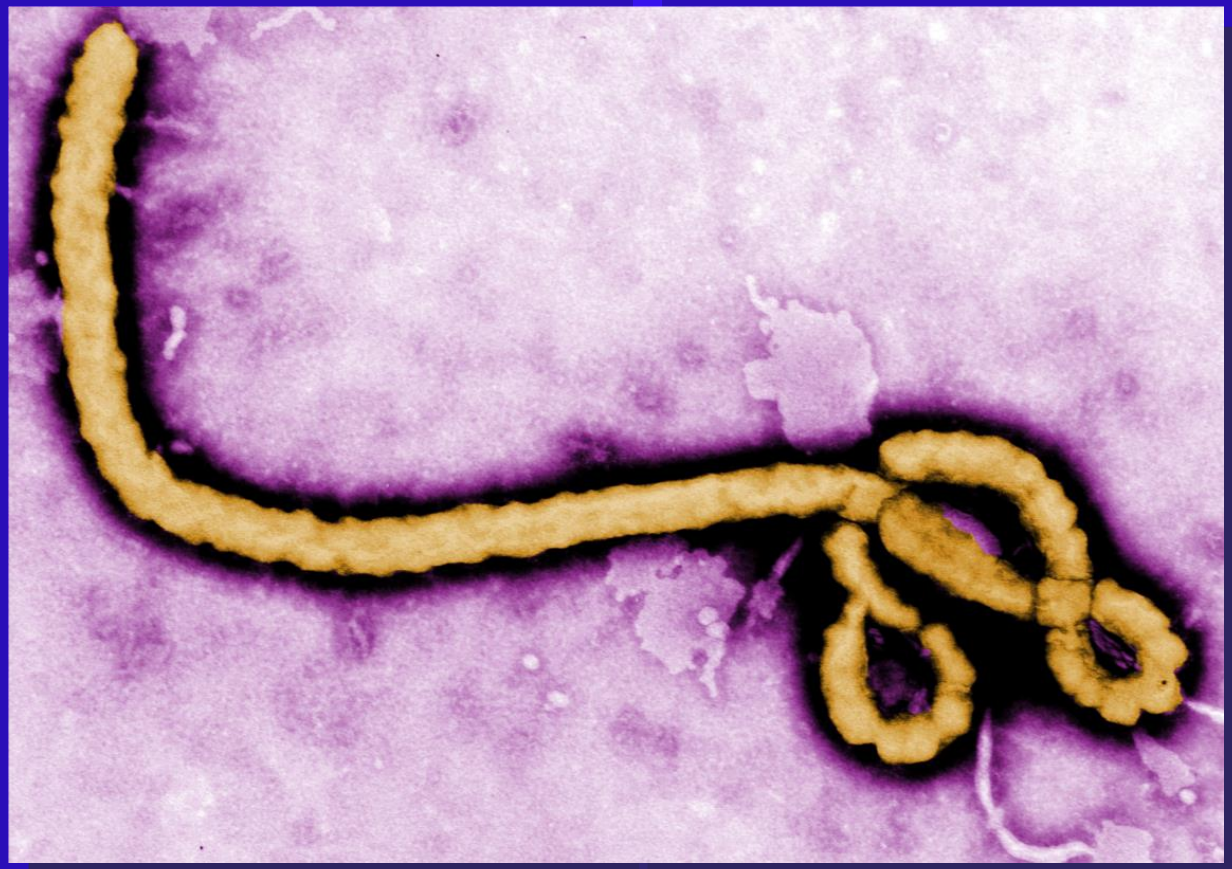
journal homepage: www.elsevier.com/locate/jcv

Virology Question and Answer Scheme (VIROQAS)

Chikungunya and dengue virus antibodies in a traveller with severe arthralgia returning from India

- During the first 5 days of illness
  - Serum RT-PCR for CHIKV or DENV nucleic acid
- After 5 days of illness
  - Serum for anti-CHIKV and anti-DENV IgM antibodies by immunoassay
  - If initial results are negative and dengue or chikungunya is still suspected, collect convalescent serum seven days or more after illness onset and retest for anti-CHIKV and anti-DENV IgM antibodies

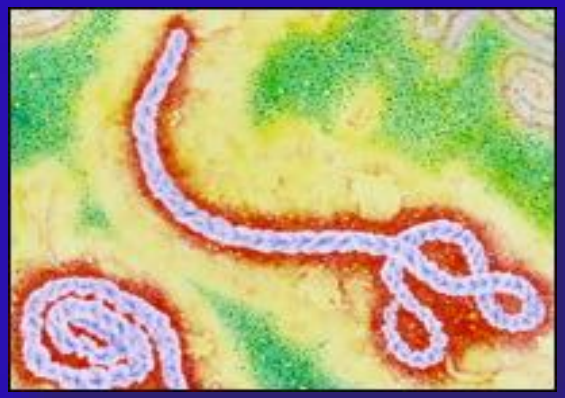
Ebola Virus Disease CDC Slides for U.S. Healthcare Workers

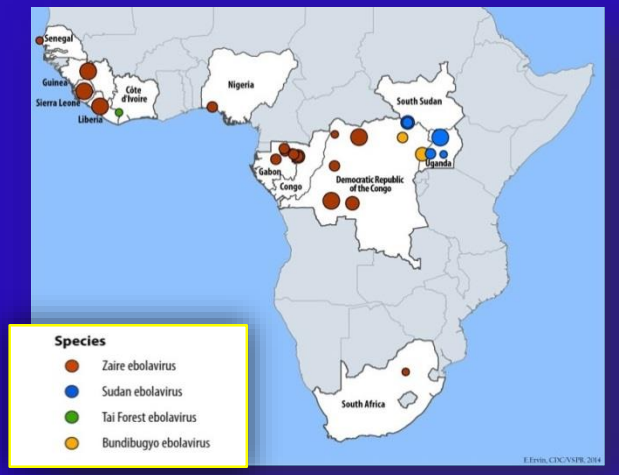


Current through April 3, 2015; updated every Friday by 5pm. www.cdc.gov/ebola

Ebola Virus Disease

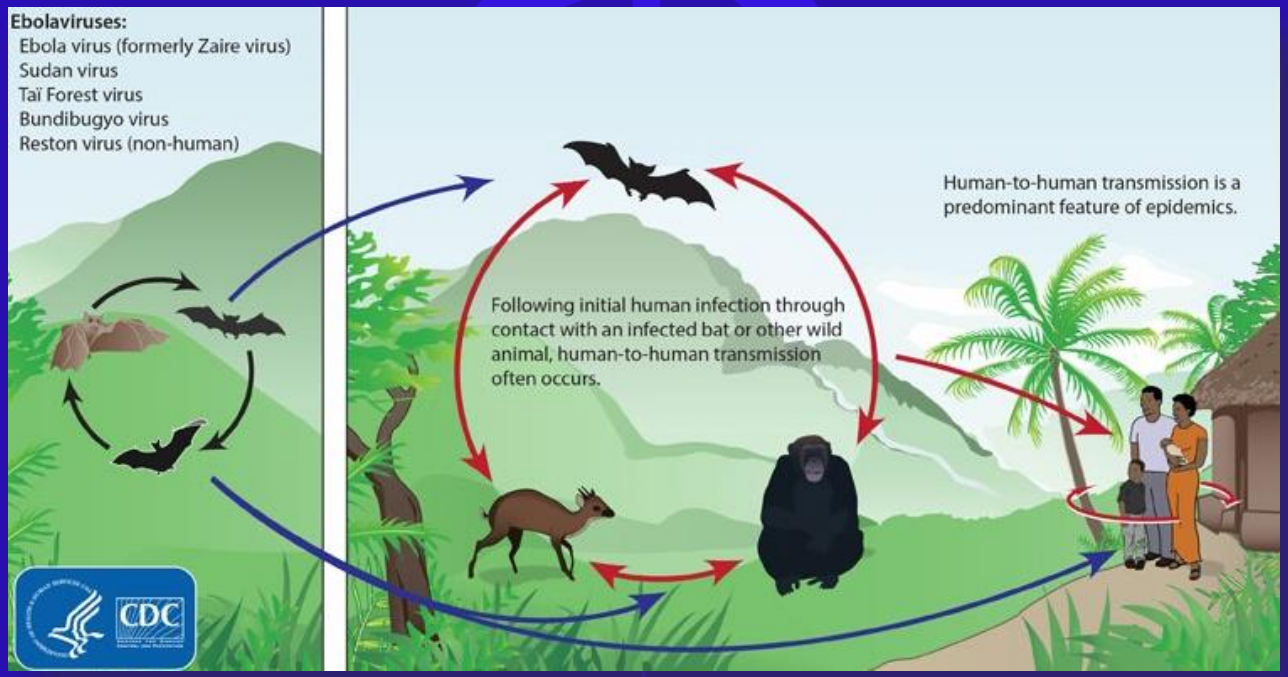
- Prototype Viral Hemorrhagic Fever Pathogen
  - *Filovirus*: enveloped, non-segmented, negative-stranded RNA virus
  - Severe disease with high case fatality
  - Absence of specific treatment or vaccine
- >20 previous Ebola and Marburg virus outbreaks
- 2014 West Africa Ebola outbreak caused by *Zaire ebolavirus* species (five known Ebola virus species)





Proposed Ebola Virus Disease Epidemiology

- Zoonotic virus – bats the most likely reservoir
- Spillover event from infected wild animals (e.g., fruit bats, monkey, duiker) to humans, followed by human-human transmission



EBV Cases and Deaths*

	Reporting Date	Total Cases (Suspected, Probable, and Confirmed)	Confirmed Cases	Total Deaths
Guinea	31 Mar 15	3,494	3,073	2,320
Liberia	29 Mar 15	9,712	3,151	4,332
Sierra Leone	31 Mar 15	12,022	8,547	3,810
United Kingdom**	29 Dec 14	1	1	0
Nigeria**	15 Oct 14	20	19	8
Spain**	27 Oct 14	1	1	0
Senegal**	15 Oct 14	1	1	0
United States**	24 Oct 14	4	4	1
Mali**	23 Nov 14	8	7	6
TOTAL		25,228	14,804	10,462

- Total cases include probable, suspected, and confirmed cases. Reported by WHO using data from ministries of health.

**There is currently no Ebola virus transmission in Senegal, Nigeria, Spain, the United States, the United Kingdom, and Mali.

EBV Cases in the US

- EVD has been diagnosed in the United States in four people: one (the index patient) who traveled to Dallas, Texas from Liberia, two healthcare workers who cared for the index patient, and one medical aid worker who traveled to New York City from Guinea
  - **Index patient** – Symptoms developed on September 24, 2014 approximately four days after arrival, sought medical care at Texas Health Presbyterian Hospital of Dallas on September 26, was admitted to hospital on September 28, testing confirmed EVD on September 30, patient died October 8.
  - **TX Healthcare Worker, Case 2** – Cared for index patient, was self-monitoring and presented to hospital reporting low-grade fever, diagnosed with EVD on October 10, recovered and released from NIH Clinical Center October 24.
  - **TX Healthcare Worker, Case 3** – Cared for index patient, was self-monitoring and reported low-grade fever, diagnosed with EVD on October 15, recovered and released from Emory University Hospital in Atlanta October 28.
  - **NY Medical Aid Worker, Case 4** – Worked with Ebola patients in Guinea, was self-monitoring and reported fever, diagnosed with EVD on October 24, recovered and released from Bellevue Hospital in New York City November 11.

Information on U.S. EVD cases available at http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/united-states-imported-case.html.

EBV Cases in the US

- During this outbreak, 6 health workers and one journalist have been infected with Ebola virus while in West Africa and transported to hospitals in the United States.
  - One of the health workers died on November 17 after being transported from Sierra Leone to Nebraska Medical Center.
- On March 13, an American health worker volunteering in Sierra Leone was evacuated to the United States for treatment after testing positive for Ebola.

EBV 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)
- Also be transmitted via contact with blood, fluids, or meat of an infected animal
  - No reports of dogs or cats becoming sick with or transmitting Ebola

EBV Human-to-Human Transmission

- Infected persons are not contagious until onset of symptoms
- Infectiousness of body fluids (e.g., viral load) increases as patient becomes more ill
  - Remains from deceased infected persons are highly infectious
- Human-to-human transmission of Ebola virus via inhalation (aerosols) has not been demonstrated

EBV Risk Assessment

HIGH-RISK EXPOSURE

Percutaneous (e.g., needle stick) or mucous membrane exposure to blood or body fluids of a person with Ebola while the person was symptomatic

OR

Exposure to the blood or body fluids (including but not limited to feces, saliva, sweat, urine, vomit, and semen) of a person with Ebola while the person was symptomatic without appropriate personal protective equipment (PPE)

OR

Processing blood or body fluids from an Ebola patient without appropriate PPE or standard biosafety precautions

OR

Direct contact with a dead body without appropriate PPE in a country with widespread transmission or cases in urban areas with uncertain control measures*

OR

Having lived in the immediate household and provided direct care to a person with Ebola while the person was symptomatic

SOME RISK EXPOSURE

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

- Direct contact while using appropriate PPE with a person with Ebola while the person was symptomatic or with the person's body fluids
- 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

- Close contact is defined as being for a prolonged period of time while not wearing appropriate PPE within approximately 3 feet (1 meter) of a person with Ebola while the person was symptomatic

*CDC website to check current affected areas: http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/distribution-map.html

EBV Risk Assessment

LOW (but not zero) RISK EXPOSURE

Having been in a country with widespread transmission or cases in urban areas with uncertain control measures* within the past 21 days and having no known exposures

OR

Having brief direct contact (e.g. shaking hands) while not wearing appropriate PPE, with a person with Ebola while the person was in the stage of disease

OR

Brief proximity, such as being in the same room for a brief period of time, with a person with Ebola while the person was symptomatic

OR

In countries without widespread transmission or cases in urban settings with uncertain control measures*: direct contact while using appropriate PPE with a person with Ebola while the person was symptomatic or with the person's body fluids

OR

Traveled on an aircraft 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

*CDC website to check current affected areas: http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/distribution-map.html

EBV 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.

EBV Early Clinical Features

- Acute onset; typically 8–10 days after exposure (range 2–21 days)
- Signs and symptoms
  - Initial: Fever, chills, myalgias, malaise, anorexia
  - After 5 days: GI symptoms, such as nausea, vomiting, watery diarrhea, abdominal pain
  - Other: Headache, conjunctivitis, hiccups, rash, chest pain, shortness of breath, confusion, seizures
  - Hemorrhagic symptoms in 18% of cases
- Differential diagnosis
  - Malaria, typhoid fever, meningococcemia, Lassa fever and other bacterial infections (e.g., pneumonia) – all very common in Africa

EBV Clinical Features

- Nonspecific early symptoms progress to:
  - Hypovolemic shock and multi-organ failure
  - Hemorrhagic disease
  - Death
- Non-fatal cases typically improve 6–11 days after symptoms onset
- Fatal disease associated with more severe early symptoms
  - Fatality rates of 70% have been historically reported in rural Africa
  - Intensive care, especially early intravenous and electrolyte management, may increase the survival rate

EBV Clinical Features by Organ System

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

EBV Laboratory Diagnosis

- Real Time PCR (RT-PCR)
  - For acute infection
  - More sensitive than antigen ELISA
  - 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)

Interpreting Negative Ebola RT-PCR Result

- If symptoms started ≥3 days before the negative result
  - EVD is unlikely → consider other diagnoses
  - Infection control precautions for EVD can be discontinued unless clinical suspicion for EVD persists
- If symptoms started <3 days before the negative RT-PCR result
  - Interpret result with caution
  - Repeat the test at ≥72 hours after onset of symptoms
  - Keep in isolation as a suspected case until a repeat RT-PCR ≥72 hours after onset of symptoms is negative

Investigational Therapies for EVD

- No approved Ebola-specific prophylaxis or treatment
  - Ribavirin has no in-vitro or in-vivo effect on Ebola virus
  - Therapeutics in development with limited human clinical trial data
    - Convalescent serum
    - Therapeutic medications
      - ZMapp – three chimeric human-mouse monoclonal antibodies
      - Tekmira – lipid nanoparticle small interfering RNA
      - Favipiravir – oral RNA-dependent RNA polymerase inhibitor
  - Vaccines – in clinical trials
    - Chimpanzee-derived adenovirus with an Ebola virus gene inserted
    - Attenuated vesicular stomatitis virus with an Ebola virus gene inserted

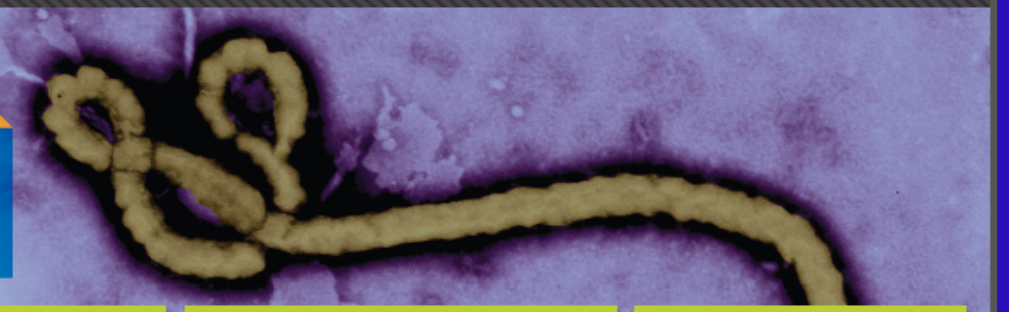
References: [1]Huggins, JW et al. *Rev Infect Dis* 1989; [2]Jarhling, P et al. *JID* 2007; [3]Mupapa, K et al. *JID* 1999 S18; [4]Olinger, GG et al. *PNAS* 2012; [5]Dye, JM et al. *PNAS* 2012; [6]Qiu, X et al. *Sci Transl Med* 2013; [7]Qiu, X et al. *Nature* 2014; [8]Geisbert, TW et al. *JID* 2007; [9]Geisbert, TW et al. *Lancet* 2010; [10]Kobinger, GP et al. *Virology* 2006; [11]Wang, D et al. *J Virol* 2006; [12]Geisbert, TW et al. *JID* 2011; [13]Gunther et al. *JID* 2011; [14]Oestereich, L et al. Antiviral Res. 2014.

Practical Considerations for Evaluating Patients for EVD in the United States

- CDC encourages all U.S. healthcare providers to
  - Ask patients with Ebola-like symptoms about travel to West Africa or contact with individuals with confirmed EVD in the 21 days before illness onset
  - Know the signs and symptoms of EVD
  - Know the initial steps to take if a diagnosis of EVD is suspected
- CDC has developed documents to facilitate these evaluations
  - Evaluating International Travelers for Level of Risk
    - Available at http://www.cdc.gov/vhf/ebola/pdf/ebola-guidance-travelers.pdf
  - Think Ebola: Early recognition is critical for infection control
    - Available at http://www.cdc.gov/vhf/ebola/pdf/could-it-be-ebola.pdf

Think EBOLA

Early recognition is critical for infection control



INITIATE

Think Ebola when you approach a patient. Start the steps for basic infection control before assessing the patient for risks.

- Always use standard precautions
- If there are concerns that the patient could meet the criteria for Ebola, immediately separate the patient from others

IDENTIFY

Assess your patient for:

- Travel to a country with widespread transmission or uncertain control measures (Guinea, Liberia, or Sierra Leone) within the last 21 days

OR

- Contact with someone with Ebola within the last 21 days

AND

- Had a fever at home, or has a current temperature ≥100.4°F (≥38°C)
- Other symptoms:
  - Severe headache
  - Muscle pain
  - Weakness
  - Fatigue
  - Diarrhea
  - Vomiting
  - Abdominal (stomach) pain
  - Unexplained hemorrhage (bleeding or bruising)
- If the patient has both exposure and symptoms, immediately isolate the patient and inform others (see INFORM)

ISOLATE

If assessment indicates possible Ebola virus infection, take action.

- Isolate the patient in a private room with a private bathroom or covered, bedside commode and close the door
- Wear appropriate personal protective equipment (PPE): http://go.usa.gov/szgB
- Limit the healthcare personnel who enter the room
- Keep a log of everyone who enters and leaves the patient's room
- Consider alternative diagnoses, and evaluate appropriately
- Only perform necessary tests and procedures
- Avoid aerosol-generating procedures
- Follow CDC guidelines for cleaning, disinfecting, and managing waste: http://go.usa.gov/szYA

INFORM

Alert others, including public health authorities.

- Notify your facility's infection control program and other appropriate staff
- Contact your state or local public health authorities
- Consult with state or local public health authorities about testing for Ebola
- For a list of state and local health department numbers, visit: http://go.usa.gov/f74V

For more information, visit: www.cdc.gov/vhf/ebola/hcp

http://www.cdc.gov/vhf/ebola/pdf/could-it-be-ebola.pdf

EVD Summary

- The 2014 Ebola outbreak is the largest in history and has affected multiple countries
- ***Think Ebola***: U.S. healthcare providers should be aware of clinical presentation and risk factors for EVD
- Human-to-human transmission by direct contact
  - No human-to-human transmission via inhalation (aerosols)
  - No transmission before symptom onset
- Early case identification, isolation, treatment and effective infection control are essential to prevent Ebola transmission

Re-Emerging Infectious Diseases

- Measles
- Enterovirus D68
- Pertussis – ongoing epidemic in US NOW!
- Syphilis – increasing rates in Bay Area
- Invasive Group A streptococci
- Tuberculosis, drug resistant
- MERS-CoV
- Cholera
- Diphtheria
- Malaria

Resources for Emerging Infectious Diseases

- Emerging Infectious Diseases Journal, www.cdc.gov/ncidod/EID/index.htm
- Public Health 150: Contemporary Issues in Public Contemporary Issues in Public Health www.ph.ucla.edu/epi/faculty/detels/emerging_infecdis_10-03_RK-F.pdf
- Public Health Laboratories of the Ohio Department of Health www.odh.state.oh.us/Resources/MultiMedia/EI_Slide/EIMAIN.HTM

Only One Flight Away from a Global Microbial Threat

Behind Mask


Thank You!