EPIDEMIOLOGY UPDATE FOR COLLEGES

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DISCLOSURE STATEMENT

I have no relevant financial relationships with any commercial supporters.

Unlabeled/investigational products and/or services will not be mentioned in this talk.

OBJECTIVES

• Understand the definition of an emerging infectious disease and general actions to take when evaluating patients with a highly contagious illness
• Understand the importance of a travel history in evaluating patients who may have a communicable disease
• Understand the signs, symptoms and evaluation process for mumps, measles, pertussis, and meningococcal disease
• Understand the epidemiology of Zika virus and the steps to take to prevent illness, especially amongst those at highest risk for morbidity – the developing fetus

CDC DEFINITION

An emerging infectious disease – a disease whose incidence in humans has increased in the past two decades or threatens to increase in the near future.

• New infections resulting from changes or evolution of existing organisms
• Known infections spreading to new geographic areas or populations
• Previously unrecognized infections appearing in areas undergoing ecologic transformation
• Old infections reemerging as a result of antimicrobial resistance in known agents or breakdowns in public health measures

CONTRIBUTING FACTORS

• Microbial adaption and change
• Changing human susceptibility
• Climate and weather
• Changing ecosystems
• Changes in human demographics and behavior
• Economic development and land use
• International travel and commerce
• Technology and industry
• Breakdown of public health measures
• Poverty and social inequality
• War and famine
• Intent to harm (bioterrorism)
• Lack of political will
• 2001 literature review showed 1,415 species of infectious organisms known to be pathogenic for humans, 61% zoonotic (transmitted from animals to people):
  • 217 viruses and prions
  • 538 bacteria and rickettsia
  • 307 fungi
  • 66 protozoa
  • 287 helminths
• 175 considered to be “emerging”, 75% of these zoonotic

Only a plane (or boat) ride away…

A GENERAL APPROACH
IDENTIFY

A GENERAL APPROACH
ISOLATE

A GENERAL APPROACH
INFORM

TOPICS
Mumps
Pertussis
Measles
Meningococcal Disease
Zika
Mumps

Photo: CDPH

Mumps virus is the only cause of epidemic parotitis.

Parotitis – especially sporadic cases – may be due to viruses other than mumps.

Parotitis can also be caused by
- Epstein-Barr virus
- Human herpesvirus B6 (the cause of roseola)
- Cytomegalovirus
- Parainfluenza virus types 1 and 3
- Influenza A virus
- Coxsackieviruses and other enteroviruses
- Lymphocytic choriomeningitis virus
- Human immunodeficiency virus
- Staphylococcus aureus
- Non-tuberculous Mycobacterium

Mumps Exposure

Mumps exposure
- Unprotected face-to-face (<3 feet) contact with an infectious person for at least 5 minutes.

Incubation period
- Usually 16 to 18 days, but cases may occur 12 to 25 days after exposure.

Period of communicability
- Communicability is probably highest from 2 days before to 5 days after onset of parotitis; mumps virus has been isolated in saliva from 7 days before through 9 days after onset of swelling.

Mumps Symptom

Prodromal symptoms are nonspecific, may include myalgia, anorexia, malaise, headache and low-grade fever.

Unilateral or bilateral swelling of one or more salivary glands, usually the parotid glands (parotitis), which occurs in 30%-40% of infected persons.

Parotitis tends to occur within the first 2 days and may be first noted as earache and tenderness on palpation of the angle of the jaw.

Symptoms tend to decrease after 1 week and usually resolve after 10 days.

40-50% may only have nonspecific or respiratory symptoms.

Up to 20% are asymptomatic.

Mumps Complication

Orchitis (testicular swelling) is a common complication and may occur in as many as 50% of postpubertal males.

Central nervous system (CNS) involvement is common but fewer than 10% have symptoms of CNS infection.

Other rare complications include arthritis, mastitis, glomerulonephritis, myocarditis, endocardial fibroelastosis, thrombocytopenia, cerebellar ataxia, transverse myelitis, ascending polyradiculitis, pancreatitis, oophoritis, and hearing impairment.

Mumps during the first trimester is associated with an increased rate of spontaneous abortion, but although mumps virus can cross the placenta, there is no evidence that this results in congenital malformation.
Live-attenuated mumps vaccine is given as part of measles, mumps
and rubella (MMR) vaccine in the U.S.
Post-licensure data estimate the effectiveness of 1 dose of mumps
vaccine at approximately 80% (64%-95%) and two doses at 90% (88%-92%).
In recent large outbreaks, mumps infections have occurred in many
persons with a history of 2 doses of MMR
~10% drop in efficacy against mumps for each decade after last
vaccination.

Acute mumps infection can be laboratory confirmed by:
- the presence of serum mumps IgM,
a significant rise in IgG antibody titer in acute- and convalescent-
phase serum specimens,
- positive mumps virus culture, or
detection of virus from a buccal specimen by reverse
transcriptase polymerase chain reaction (RT-PCR).
Serologically confirming mumps in an immunized person may
be challenging:
- the IgM response may be absent or short lived
- studies have shown that individuals with detectable mumps IgG
titers have still developed mumps infection.

Unimmunized: buccal specimen & acute blood specimen should
be collected; a convalescent specimen may be requested.
Immunized: buccal specimen should be collected; acute and
convalescent blood specimens may also be submitted for IgM
testing and/or detection of IgG rise. Collection of a buccal specimen
within 1 to 3 days of parotitis onset is optimal, however virus may
be detected for up to 9 days after parotitis onset.
Status unknown: buccal & blood specimens should be submitted.
Immunization status of the patient should be clearly indicated on the
laboratory submittal form.
Outbreak: buccal specimen is the preferred specimen for testing.
MUMPS

WHAT CAN YOU DO?
- IDENTIFY  ISOLATE  INFORM
- Maintain a high index of suspicion in appropriate cases
  - Parotitis, Orchitis
  - Aseptic meningitis
- Be aware of increased cases in college and university students
- Be aware of outbreaks in various parts of the country
- Correctly collect buccal PCR to make the diagnosis and send to a public health lab near you!

PERTUSSIS OVERVIEW
- Caused by *Bordetella pertussis* bacteria
- Transmission occurs by close contact via droplets
- Very contagious: approximately 90% of susceptible household contacts become infected
- Cyclic (peaks every 2-5 years)
- Immunity wanes after vaccination or disease
- 92-95% of population must be immune to eliminate transmission
- Infants ≤ 1 year of age are most vulnerable
- Incubation period usually 7 to 10 days, but can be as long as 21 days

PERTUSSIS SYMPTOMS
- Cold-like symptoms
  - Coryza
  - Sneezing
  - Occasional cough
- Fever usually absent or minimal
- Stage lasts for about 1-2 weeks with cough gradually becoming more severe
- Spasms of severe coughing followed by a sudden deep inspiration
- Characteristic “whooping” sound
  - Post-tussive vomiting common in all ages
- Illness may be milder in previously vaccinated people
PERTUSSIS SYMPTOMS

- Coughing, whooping and vomiting decreasing in frequency and severity
- Paroxysms may recur with subsequent respiratory infections
- Classic pertussis is 6-10 weeks, but may last longer in some people

Convalescent Stage

PERTUSSIS SYMPTOMS

Adolescents and adults
- Disease is often milder than infants and children
- Infection may be asymptomatic or present as classic pertussis
- Adults may describe intermittent
- Older persons often source of infection for children
**PERTUSSIS – TREATMENT**

- **Azithromycin** – 5 days (most effective/common)
- **Erythromycin** – 14 days (7-14 days for infants ≥ 6 months & children)
- **Clarithromycin** – 7 days (not recommended for < 1 month of age)
- **Bactrim/Septra** – 10-14 days

Post-exposure prophylaxis (PEP) is **SAME AS TREATMENT.**

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**PREVENTION - IMMUNIZATION**

- **DTaP (Diphtheria, Tetanus, and acellular Pertussis)**
  - Total of 5 vaccinations recommended at:
    - 2, 4, and 6 months of age
    - 15-18 months of age
    - booster at 4-6 years of age
- **Tdap Booster (Tetanus, diphtheria and acellular pertussis)**
  - Everyone 11 years and older should get 1 Tdap
  - No minimum interval between Td and Tdap

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**EXPANDED USE OF TDAP**

- CDPH recommendations for use of Tdap:
  - Adolescents and adults
  - Women of childbearing age with each pregnancy in 3rd trimester (weeks 27-36)
  - Households contacts of pregnant women
  - Households contacts of infants (<12 months of age)
  - Routine wound management in Emergency Departments
  - Healthcare Personnel
  - Persons > 64 years of age
  - No minimum interval between Td and Tdap

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**PRIORITY CONTROL STRATEGY**

*EVERY PREGNANT WOMEN RECEIVES TDAP BOOSTER FOR EVERY PREGNANCY AT 27-36 WEEKS EGA!*
PERTUSSIS

WHAT CAN YOU DO?

- IDENTIFY  ISOLATE  INFORM
- Consider pertussis, especially in patients with cough complaints out of proportion to findings on exam
- Test for pertussis in patients with cough who can expose "at-risk" individuals, public health will act on results!
- Use Tdap as a routine booster instead of Td for all patients
- Ensure EVERY pregnant women gets a TdaP in EVERY pregnancy early in the third trimester!

MEASLES

Rash illness, historically childhood infection with 2-4 year epidemic cycle; most cases in winter and spring

Complications may include otitis media, pneumonia, encephalitis, miscarriage, and death

Airborne spread - probably the most infectious communicable disease; $R_0=15-18$

Two doses of MMR vaccine offer >99% protection from disease; however, requires very high population immunity to interrupt transmission (92-95%)

Source: CDC.


Cases as of December 31, 2016
**Cases as of January 28, 2017

Downloaded 2.18.17 from: https://www.cdc.gov/measles/cases-outbreaks.html

Cases as of December 31, 2016
**Cases as of January 28, 2017

Number of measles cases by year since 2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Cases</th>
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<td>2010</td>
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<tr>
<td>2011</td>
<td>220</td>
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<td>2015</td>
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<td>2016*</td>
<td>70</td>
</tr>
<tr>
<td>2017**</td>
<td>23</td>
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</tbody>
</table>

Source: CDC. Downloaded 2.18.17 from https://www.cdc.gov/measles/cases-outbreaks.html
Most U.S. measles cases are related to international travel or contact with ill travelers.

Clinical Features
- Prodrome – onset 8 to 12 days after exposure (range=7-21 days)
  - Stepwise increase in fever to 101º F or higher
  - Dry cough, coryza, conjunctivitis
  - Koplik spots (rash on mucous membranes)

Koplik spots in mouth due to pre-eruptive measles on day 3 of illness. Classically described as appearing like "grains of salt on a wet background."
MEASLES

Clinical Features - Rash
- 2-4 days after prodrome, 14 days after exposure
- Maculopapular, becomes confluent (not itchy, except late in rash)
- Begins on face and head (not on face, not measles!)
- Occurs with fever
- Persists 5-6 days
- Fades in order of appearance
Maculopapular Rashes of Childhood

<table>
<thead>
<tr>
<th>Disease</th>
<th>Cause</th>
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<tr>
<td>First</td>
<td>measles rubeola</td>
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<tr>
<td>Second</td>
<td>scarlet fever group A streptococcus</td>
</tr>
<tr>
<td>Third</td>
<td>German measles rubella</td>
</tr>
<tr>
<td>Fourth</td>
<td>scarletina, Duke's Same as #2</td>
</tr>
<tr>
<td>Fifth</td>
<td>erythema infectosa human parvovirus B19</td>
</tr>
<tr>
<td>Sixth</td>
<td>roseola infanticum human herpesvirus 7</td>
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**COMPLICATIONS**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percent reported*</th>
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<tr>
<td>Diarrhea</td>
<td>8</td>
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<tr>
<td>Otitis media</td>
<td>7</td>
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<tr>
<td>Pneumonia</td>
<td>6</td>
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<tr>
<td>Encephalitis</td>
<td>0.1</td>
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<td>Hospitalization</td>
<td>18</td>
</tr>
<tr>
<td>Death</td>
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</table>

*Based on 1985-1992 surveillance data

**MEASLES**

**TREATMENT**

- No specific antiviral treatment available
- Vitamin A once daily for 2 days – World Health Organization (WHO) recommends for all children with acute measles, regardless of their country of residence.
- Supportive

**POST-EXPOSURE PROPHYLAXIS**

- MMR vaccine may be given <72 hours of exposure to persons ≥6 months of age with 1 or no documented doses of MMR, if not contraindicated.
- Immune globulin (IG) may be given to exposed susceptible people* of any age 56 days of exposure to prevent infection
- CALL COUNTY!

**MEASLES LAB DIAGNOSIS**

- Serum measles IgM antibody positive test result (may be negative in the first 72 hours)
- Significant rise in serum measles IgG antibody between acute and convalescent titers
- Isolation of measles virus from clinical samples (blood, urine or NP secretions)
- Detection of viral RNA by reverse transcription polymerase chain reaction (RT-PCR).

**INFECTION CONTROL**

- Infectious Period: 4 days before rash onset through 4 days after rash onset (day of rash onset is day 0)
- Incubation Period: 8-12 days after exposure (day 0) and rash onset is typically 14 days (range 7-21 days) after exposure
- Exposure: sharing the same airspace with an infectious person (during the 4 days prior through the 4 days after rash onset) = same classroom, home, clinic waiting room, airplane, store, etc. up to 2 hours after the person was present.

**VACCINE REACTIONS**

- Rash that occurs days 5-12 post MMR vaccination
- Patients can have symptoms comparable to those associated with wild type measles
- PCR on the patient’s urine and throat swab will likely be positive for measles
- Additional testing (genotyping) is needed to discriminate between vaccine and wild type strains
  - Vaccine strain is genotype A
  - Additional testing takes several days
- In some cases the level of virus is too low to successfully genotype

**ALL CASES OF SUSPECTED MEASLES SHOULD BE REPORTED IMMEDIATELY TO THE HEALTH DEPARTMENT WITHOUT WAITING FOR RESULTS OF DIAGNOSTIC TESTS.**
MEASLES – OUTREACH

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

- CDPH Facility Infection Control Guidelines
  http://www.cdph.ca.gov/HealthInfo/discond/Documents/CDPHHCFacilityICRecsfor
  SuspectMeaslesPatients.pdf
- CDPH Measles Investigation Quick Sheet
  http://www.cdph.ca.gov/programs/immunize/Documents/CDPHMeaslesInvestigatio
  nQuicksheet.pdf
- CDPH Measles Laboratory Testing Guidelines
  http://www.cdph.ca.gov/HealthInfo/discond/Documents/CDPHMeaslesLabTesting20
  11-01.pdf
- CDPH-VRDL Guidelines for Laboratory Services
  http://www.cdph.ca.gov/programs/vrdl/Documents/VRDL%20Guidelines%20for%20
  Laboratory%20Services%20manual%204-6-2013%201319.pdf

MEASLES – TOOLS

MEASLES

IDENTIFY      ISOLATE         INFORM

- Consider measles in patients with acute rash illness with fever.
- Institute respiratory and airborne precautions for all persons with a
  measles-like rash and fever.
- Reduce exposures: schedule patients for the end of the day and have
  them enter via a separate entrance. Do not send to the Emergency
  Department unless they require hospitalization and contact first!
- Report suspect cases to Public Health. Do not wait for laboratory
  confirmation.
- Know the immune status of all staff with possible clinical contact.

MEASLES

WHAT CAN YOU DO?

IDENTIFY       ISOLATE       INFORM

- Consider measles in patients with acute rash illness with fever.
- Institute respiratory and airborne precautions for all persons with a
  measles-like rash and fever.
- Reduce exposures: schedule patients for the end of the day and have
  them enter via a separate entrance. Do not send to the Emergency
  Department unless they require hospitalization and contact first!
- Report suspect cases to Public Health. Do not wait for laboratory
  confirmation.
- Know the immune status of all staff with possible clinical contact.

MENINGOCOCCAL

DISEASE
WHAT IS MENINGITIS

- Inflammation of the meninges, the membranes surrounding the brain and spinal cord
- Can be caused by viruses, bacteria, fungi, parasites, and in other systemic illnesses
- Viral (aseptic meningitis) most common
- Most common viral causes are enteroviruses
  - Other viral causes include mumps, influenza, herpes viruses, measles, arboviruses

WHAT IS MENINGOCOCCAL DISEASE?

- Three main strains of *Neisseria meningitidis* (Meningococcus) circulate in the United States - Serogroups B, C and Y
- Serogroup B disease is common in young children and becoming more common in adolescents and adults
- Outbreaks of meningococcal serogroup B at Princeton, UCSB in 2014
- Previously licensed meningococcal vaccines contain serogroups A, C, Y, and W

WHAT IS MENINGOCOCCAL DISEASE?

- Infection by the bacterium *Neisseria meningitidis* (Meningococcus)
- Can infect normally sterile sites, causing invasive disease
  - Meningococcal meningitis – cerebrospinal fluid infection
  - Meningococcemia – blood infection
- Invasive meningococcal disease is a serious, life-threatening illness, requires prompt medical treatment
- Can also cause other diseases, like pneumonia

HOW DANGEROUS IS MENINGOCOCCAL DISEASE?

- 500 to 1000 cases per year reported in the United States.
- Meningococcus bacteria are not as contagious as cold or flu
  - Spread through respiratory secretions
  - Ex: via kissing
- Risk for most people is low
  - Though rare, disease can be devastating.
- Can be fatal in 10-15% of cases
- Results in long-term disabilities in 15% of survivors
THE PROBLEM

- Meningococcal infection is the most rapidly fatal infection known
- There is no time for your immune system to react
- There is no time for your memory T cells to remember
- You have to have circulating levels of antibody all the time to be protected

Data Source: Reported Meningococcal Case Reports
Prepared by County of San Diego, Health & Human Services Agency, Public Health Services, Epidemiology and Immunization Services Branch, 4/4/16

RECOMMENDATIONS

- ACIP recommends either formulation of quadrivalent meningococcal conjugate vaccine (Menactra or Menveo) for all individuals between 11 and 18 years of age, for individuals between 2 and 10 years of age who are at increased risk for invasive meningococcal disease, and for individuals between 19 and 55 years of age who are at increased risk for invasive meningococcal disease.
- ACIP recommends meningococcal vaccination for infants and children from 2 months to 10 years of age who are at increased risk for meningococcal disease. The specific schedule indicated depends upon age, host factors (i.e., type of immunodeficiency), and prior history of vaccination.
- For adults 25 years of age or older in the United States who require vaccination but who are likely to need only one dose, the meningococcal polysaccharide vaccine (Menomune, MPSV4) is preferred. For adults 25 to 55 years of age who are likely to require more than one dose of meningococcal vaccine, a quadrivalent meningococcal conjugate vaccine (Menactra or Menveo) is preferred.

MENINGOCOCCAL VACCINES

- Menomune, MPSV4 - a meningococcal polysaccharide vaccine available for several decades
- Menactra, MenACWY-D - a quadrivalent meningococcal polysaccharide vaccine conjugated to diphtheria toxoid available since 2005
- Menveo, MenACWY-CRM - a quadrivalent meningococcal polysaccharide vaccine conjugated to a mutant diphtheria toxin, CRM197, approved in 2010
- MenHibrix, HibMenCY - a combination vaccine against meningococcal serogroups C and Y and Haemophilus influenzae type b approved in 2012 for infants and children aged 6 weeks to 18 months
- Trumenba, MenB-FHbp - a three-dose serogroup B meningococcal vaccine approved in late 2014
- Bexsero, MenB-4C - a two-dose serogroup B meningococcal vaccine approved in 2015

2017 ADULT RECOMMENDATIONS

Two changes in meningococcal vaccination recommendations for 2017.
First, ACIP recommended that adults with HIV receive a 2-dose primary series of serogroups A, C, W, and Y meningococcal conjugate vaccine (MenACWY).
Second, the ACIP provided updated dosing guidance for one of the serogroup B meningococcal vaccines (MenB) (MenB-FHbp [Trumenba, Pfizer]). Three doses of MenB-FHbp should be administered at 0, 1–2, and 6 months to adults who are at increased risk for meningococcal disease, and those who are vaccinated during serogroup B meningococcal disease outbreaks. When MenB-FHbp is given to healthy adolescents and young adults who are not at increased risk for meningococcal disease, 2 doses of MenB-FHbp should be administered at 0 and 6 months (MenB-FHbp was previously recommended as a 3-dose series at 0, 2, and 6 months, consistent with the original vaccine licensure for this population).
**MENINGOCOCCAL CLUSTERS IN MSM**

- First reported outbreak occurred in Toronto in 2001
- First reported US outbreak in Chicago in 2003
- Subsequent clusters/outbreaks have occurred in:
  - New York City (2010-2013)
  - LA County ((2012-2013)
  - Paris (2013)
  - Belgium (2013)
  - Chicago (2013)
- All outbreaks caused by serogroup C
- Recent outbreak in SoCal (LA & Orange Counties)
  - 27 cases

**MENINGOCOCCAL DISEASE**

**WHAT CAN YOU DO?**

**IDENTIFY**
- Maintain a high index of suspicion in appropriate cases
  (fever + petechial rash or meningismus)
- Report suspected cases immediately to Public Health
- Be aware of cases reported in MSM, especially in SoCal
- Be aware of specific school outbreaks and cases when they occur
- Have a plan for mass immunizations if needed

**ZIKA**

Map credit: Google maps. Downloaded 4/4/16.
2/26/2017


Uganda Virus Research Institute

Map prepared on 4/12/16 using CDC data and software on: http://diymaps.net/


How Zika spread

1947: Discovered in Uganda
1977-78: Pakistan, Indonesia, Malaysia
2004: French Polynesia
2014: Brazil


Where is Zika now?

Countries, territories and areas showing the distribution of Zika virus, 2013 - 2016

ZIKA

- Before 2003, only 14 human cases described!
- 80% of cases are asymptomatic
- Illness usually mild
- Symptoms last several days to a week

Source: CDC.

Table 1. Countries and territories that have reported mosquito-borne Zika virus transmission

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<tr>
<th>Country/Region</th>
<th>WHO Region</th>
<th>Zika Virus Transmission</th>
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<tr>
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Source: CDC.
Adapted from CDC diagram

Zika Virus Transmission Cycles

Sexual transmission

Intrauterine/Perinatal transmission

Invasive Aedes California

Source: CDPH. Downloaded 10/18/16 from: http://cdphdata.maps.arcgis.com/apps/webappviewer/index.html?id=57367199287a4d18a2cecf107854255b

GEOGRAPHIC AREAS OF EXPOSURE
CALIFORNIA RESIDENTS DIAGNOSED WITH ZIKA

Source: CDPH. Cases as of 2/18/17

Table. Zika Infections by Country/Territory of Exposure: California, 2015-2017 (N = 499)

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<thead>
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<th>Number</th>
<th>Country/Territory</th>
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<td>Mexico</td>
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<td>Panama</td>
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<td>Guyana</td>
<td>1</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>6</td>
<td>Kiribati</td>
<td>1</td>
</tr>
<tr>
<td>Bolivia</td>
<td>5</td>
<td>Saint Martin</td>
<td>1</td>
</tr>
<tr>
<td>Cuba</td>
<td>5</td>
<td>Senegal</td>
<td>1</td>
</tr>
<tr>
<td>Saint Lucia</td>
<td>5</td>
<td>Singapore</td>
<td>1</td>
</tr>
<tr>
<td>Grenada</td>
<td>4</td>
<td>Turks and Caicos</td>
<td>1</td>
</tr>
<tr>
<td>Haiti</td>
<td>4</td>
<td>Vietnam</td>
<td>1</td>
</tr>
<tr>
<td>Peru</td>
<td>4</td>
<td>Multiple locations</td>
<td>16</td>
</tr>
</tbody>
</table>


Ae. aegypti potential abundance for Jan/July and monthly average number U.S. arrivals from Zika-affected countries

TRAVELERS

- Do travelers know about Zika before they depart?
- Do they know how to protect themselves?
- Do they know the symptoms and when to seek care?
- Where are they getting information?

http://wwwnc.cdc.gov/Travel

Photo: CDC

VIREMIC TRAVELERS

- Will they seek care?
- Will providers evaluate for Zika?
- Will providers report suspected cases to public health?
- Will patients protect themselves from mosquito bites in San Diego?
- Will male patients protect their partners?

Viremic

Photo: CDC

PROVIDER KNOWLEDGE

- Keeping up with new information Zika is a challenge.
- CDC has lead on developing/disseminating national guidelines.
- Local health departments help get the word out and tailor the message as needed.
- San Diego County Health and Human Services Agency has:
  - Sent 6 local health advisories
  - Worked with local systems to develop evaluation protocols
  - Established webpage with resources, Q&As
  - Identified issues that need responses from CDC
  - Maintained consultation for providers/public 24/7

Source: CDC.
**PROVIDER ACTIONS**

- Obtain travel history
- Consider Zika (and other vector-borne diseases) in differential
- Contact public health to obtain tests, report suspected case
- Symptomatic treatment (avoid ASA and NSAID's if dengue in the differential)
- Give patients precautions for mosquito, sexual transmission

**DIFFERENTIAL DX FOR ZIKA**

- Dengue *
- Chikungunya *
- Leptospirosis
- Malaria
- Rickettsia

* Similar clinical features

- Parvovirus
- Group A streptococcus
- Rubella
- Measles
- Adenovirus
- Enterovirus

**DIFFERENTIATING FEATURES**

<table>
<thead>
<tr>
<th>Symptom/Sign</th>
<th>Zika</th>
<th>Dengue</th>
<th>Chikungunya</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Rash</td>
<td>++</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Conjunctivitis</td>
<td>++</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Arthralgia</td>
<td>++</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Myalgia</td>
<td>+</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Headache</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Hemorrhage</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Shock</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>


**CLINICAL SYMPTOMS**

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Number (N=31)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macular or papular rash</td>
<td>28</td>
<td>90%</td>
</tr>
<tr>
<td>Subjective fever</td>
<td>20</td>
<td>65%</td>
</tr>
<tr>
<td>Arthralgia</td>
<td>20</td>
<td>65%</td>
</tr>
<tr>
<td>Conjunctivitis</td>
<td>17</td>
<td>55%</td>
</tr>
<tr>
<td>Myalgia</td>
<td>15</td>
<td>48%</td>
</tr>
<tr>
<td>Headache</td>
<td>14</td>
<td>45%</td>
</tr>
<tr>
<td>Retro-orbital pain</td>
<td>12</td>
<td>39%</td>
</tr>
<tr>
<td>Edema</td>
<td>6</td>
<td>19%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>3</td>
<td>10%</td>
</tr>
</tbody>
</table>

Confirmed Zika Virus Disease Cases Yap Island, 2007

**CLINICAL COURSE & OUTCOME**

- Clinical illness usually mild
- Symptoms last several days to a week.
- Severe disease requiring hospitalization uncommon
- Fatalities are rare
- Guillain-Barré syndrome reported in patients following suspected Zika virus infection
  - Estimated at 2/10,000 cases

Dengue and chikungunya viruses transmitted by same mosquitoes with similar ecology
Dengue and chikungunya can circulate in same area and rarely cause co-infections
Diseases have similar clinical features
Important to rule out dengue, as proper clinical management can improve outcome*


OTHER FLAVIVIRUSES

- Reverse transcriptase-polymerase chain reaction (RT-PCR) for viral RNA in serum collected ≤7 days after illness onset (urine up to 21 days is a better test!)
- Serology for IgM and neutralizing antibodies in serum collected ≥24 days after illness onset
- Plaque reduction neutralization test (PRNT) for ≥4-fold rise in virus-specific neutralizing antibodies in paired sera
- Immunohistochemical (IHC) staining for viral antigens or RT-PCR on fixed tissues

LABS FOR TESTING

- Diagnostic tests now commercially available (cost!)
- Testing performed at CDC and CDPH
- San Diego healthcare providers should contact the County Epidemiology Program to facilitate diagnostic testing through the San Diego County Public Health Laboratory

TESTING FOR ZIKA VIRUS

- No specific antiviral therapy
- Treatment is supportive (i.e., rest, fluids, analgesics, antipyretics)
- Suspected Zika virus infections should be evaluated and managed for possible dengue or chikungunya virus infections
- Aspirin and other NSAIDs should be avoided until dengue can be ruled out to reduce risk of hemorrhage

SEROLOGY X-REACTIONS

- Zika virus serology (IgM) can be positive due to antibodies against related flaviviruses
- Neutralizing antibody testing may discriminate between cross-reacting antibodies in primary flavivirus infections
- Difficult to distinguish infecting virus in people previously infected with or vaccinated against a related flavivirus
- Healthcare providers can work with health departments to ensure test results are interpreted correctly

PUBLIC HEALTH ACTIONS WITH A SUSPECTED CASE

• Obtain records from provider & interview patient
• Provide local prevention advice
  • Avoid mosquito bites, protect against sexual transmission
• Facilitate testing by CDC and CDPH
  • SDPHL can now perform Zika PCR and serology
• Inform vector control
  • Invasive Aedes have been found near the residences of potentially viremic patients in San Diego County

RECOMMENDATIONS FOR PREVENTION OF SEXUAL TRANSMISSION OF ZIKA VIRUS

SEXUAL TRANSMISSION

• Zika virus infection has been confirmed in women (and men) whose only known risk factor was sexual contact with an ill male partner who had recently traveled to an area with local Zika virus transmission
• 44 US cases, two cases in San Diego
• CDC prevention guidelines revised in Sept 2016
• Case report of asymptomatic man passing Zika to a woman who became ill
• Two case reports of symptomatic women passing Zika to male partners, and Zika has been detected in female genital tract

Zika Virus Transmission Cycles

RECOMMENDATIONS FOR PREGNANT WOMEN

Source: CDC. Interim Guidance for Health Care Providers Caring for Pregnant Women with Possible Zika Virus Infection — United States, July 2016

Source: CDC. Interim Guidance for Prevention Counseling and Prevention of Sexual Transmission of Zika Virus for Persons with Possible Zika Virus Exposure — United States, September 2016

Adapted from CDC diagram
Recommended Zika virus testing and evaluation of infants born to mothers with laboratory evidence of Zika virus infection during pregnancy

Adapted from CDC diagram

Zika Virus Transmission Cycles

Prevent – no standing water, dump once a week
Protect – use repellants with DEET, IR3535, oil of lemon eucalytus, picaridin (permethrin in clothes)
Report - dead birds, mosquito breeding sites, green pools, and day biting mosquitoes

www.sdvector.com

Count to Hand-Spray Chula Vista Neighborhood in Travel-related Zika Case

County Vector Control crews plan to hand-spray a neighborhood in Chula Vista this week to kill mosquitoes to prevent them from potentially spreading the Zika virus, after mosquitoes were found near a person who
**PREVENTION**
- No vaccine or medication to prevent infection or disease
- Primary prevention measure is to reduce mosquito exposure
- Pregnant women should consider postponing travel to areas with ongoing Zika virus outbreaks
- Protect infected people from mosquito exposure during first week of illness to prevent further transmission

**RECOMMENDATIONS**
- **Evaluate** pregnant women who traveled to areas with Zika virus transmission while pregnant using the CDC Update: Interim Guidance for Health Care Providers Caring for Pregnant Women with Possible Zika Virus Exposure
- **Evaluate** fetuses and infants of women infected with Zika virus during pregnancy for possible congenital infection and microcephaly using the CDC Update: Interim Guidance for the Evaluation and Management of Infants with Possible Congenital Zika Virus Infection

**RECOMMENDATIONS**
- **Suspect** Zika (also consider dengue and chikungunya) in travelers with acute onset of fever, maculopapular rash, arthralgia, or conjunctivitis within 2 weeks after return from a place with local Zika transmission. Patients with microcephaly or Guillain-Barré syndrome regardless of travel history should also be evaluated for Zika.
- **Report** suspected cases of Zika virus with appropriate symptomology and travel history to the local health department using a Confidential Morbidity Report

**RECOMMENDATIONS**
- **Test** patients with appropriate symptomology and travel history.
  - Specimen guidance and the laboratory requisition form can be found on the CDPH website.
  - **Advise** patients to avoid mosquito bites. Refer travelers, particularly pregnant women, to CDC Travel Advisories for current information.
  - **Inform** travelers to Zika-affected countries that Zika can be sexually transmitted and to prevent transmission to women who are or may become pregnant using guidance available in the CDC Update: Interim Guidance for Preconception Counseling and Prevention of Sexual Transmission of Zika Virus for Persons with Possible Zika Virus Exposure

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For more information contact:
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Medical Director, Epidemiology and Immunizations Services
Public Health Services
County of San Diego Health and Human Services Agency
3851 Rosecrans Street (MS-P578)
San Diego, CA 92110
Phone: (619) 692-8436
Fax: (858) 715-6458
<table>
<thead>
<tr>
<th>Targeted group</th>
<th>Primary dose(s)</th>
<th>Booster dose(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>People ages 11 through 18 years</strong></td>
<td>Give patients without HIV infection one dose of Menactra or Menveo; give HIV-infected patients two doses of Menactra or Menveo at least two months apart. Discuss serogroup B meningococcal vaccination (Trumenba or MenBex), which may be administered to adolescents and young adults 16 through 23 years of age; the preferred age for vaccination is 16 through 18 years of age.</td>
<td>Give Menactra or Menveo booster at age 16 through 18 years if primary dose given at age 12 years or younger.</td>
</tr>
<tr>
<td><strong>People ages 19 through 21 years who are first year college students living in residence halls</strong></td>
<td>Give patients without HIV infection one dose of Menactra or Menveo; give HIV-infected patients two doses of Menactra or Menveo at least two months apart. Discuss serogroup B meningococcal vaccination (Trumenba or MenBex), which may be administered to adolescents and young adults 16 through 23 years of age; the preferred age for vaccination is 16 through 18 years of age.</td>
<td>Give Menactra or Menveo booster if previous dose given at age 13 through 15 years.</td>
</tr>
</tbody>
</table>

Adapted from the Immunization Action Coalition (www.immunize.org)

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<th>Targeted group</th>
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<tbody>
<tr>
<td><strong>People present during outbreaks caused by a vaccine serogroup and other people with prolonged increased risk for exposure (e.g., microbiologists)</strong></td>
<td>Give two doses of Menactra or Menveo, 2 through 9 months apart.** Give Menveo at ages 2, 4, 6, and 12 to 15 months.</td>
<td>If risk continues, give initial booster after three years followed by boosters every five years.</td>
</tr>
</tbody>
</table>
| **2 through 18 months** | Give Menveo at ages 2, 4, 6, and 12 to 15 months. | \(\text{Give Menveo at ages 2, 4, 6, and 12 to 15 months.} \)
| **7 through 23 months who have not initiated a series of Menveo or MenBex** | Give two doses, separated by three months, of Menveo (if age 7 to 23 months) or Menactra (if age 9 to 23 months). | \(\text{Give two doses, separated by three months, of Menveo (if age 7 to 23 months) or Menactra (if age 9 to 23 months).} \)
| **2 through 9 years** | Give two doses of Menactra or Menveo, two months apart. | Boost every five years with Menactra or Menveo. |
| **10 through 55 years** | Give two doses of Menactra or Menveo two months apart and either Trumenba (three-dose series) or MenBex (two-dose series). | Boost every five years with Menactra or Menveo. |
| **56 years and older** | Give two doses of Menactra or Menveo two months apart and either Trumenba (three-dose series) or MenBex (two-dose series). | Boost every five years with Menactra or Menveo. |

Adapted from the Immunization Action Coalition (www.immunize.org)

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<th>Booster dose(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>People with functional or anatomic asplenia, including sickle cell disease</strong></td>
<td>Give Menveo at ages 2, 4, 6, and 12 months or MenBex at ages 2, 4, 6, and 12 to 15 months.</td>
<td>Give Menactra or Menveo booster after three years followed by boosters every five years thereafter.</td>
</tr>
</tbody>
</table>
| **2 through 18 months** | Give Menveo at ages 2, 4, 6, and 12 months or MenBex at ages 2, 4, 6, and 12 to 15 months. | \(\text{Give Menveo at ages 2, 4, 6, and 12 months or MenBex at ages 2, 4, 6, and 12 to 15 months.} \)
| **7 through 23 months who have not initiated a series of Menveo or MenBex** | Give two doses of Menactra or Menveo, two months apart and either Trumenba (three-dose series) or MenBex (two-dose series). | Boost every five years with Menactra or Menveo. |
| **2 through 9 years** | Give two doses of Menactra or Menveo, two months apart. | Boost every five years with Menactra or Menveo. |
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<tr>
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<th>Primary dose(s)</th>
<th>Booster dose(s)</th>
</tr>
</thead>
</table>
| **Travelers to or residents of countries where meningococcal disease is endemic or epidemic** | Give Menveo at ages 2, 4, 6, and 12 to 15 months. | \(\text{Give Menveo at ages 2, 4, 6, and 12 to 15 months.} \)
| **2 through 18 months** | Give Menveo at ages 2, 4, 6, and 12 to 15 months. | \(\text{Give Menveo at ages 2, 4, 6, and 12 to 15 months.} \)
| **7 through 23 months who have not initiated a series of Menveo or MenBex** | Give two doses, separated by three months, of Menveo (if age 7 to 23 months) or Menactra (if age 9 to 23 months). | If risk continues, give initial booster after three years followed by boosters every five years. |
| **2 through 55 years** | Give two doses of Menactra or Menveo, two months apart and either Trumenba (three-dose series) or MenBex (two-dose series). | Boost every five years with Menactra or Menveo. |
| **56 years and older** | Give two doses of Menactra or Menveo two months apart and either Trumenba (three-dose series) or MenBex (two-dose series). | Boost every five years with Menactra or Menveo. |

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