Vaccine-Preventable Diseases

Matthew Washam, MD, MPH
Assistant Professor
Department of Pediatrics
Section of Infectious Diseases
Nationwide Children's Hospital

Disclosure Statement

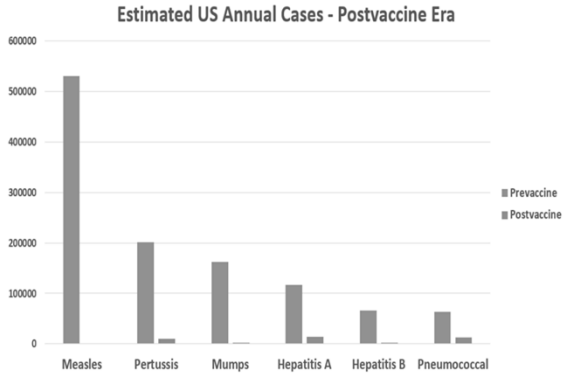
- I have no conflicts of interest to disclose relevant to today's presentation

Vaccine-Preventable Diseases

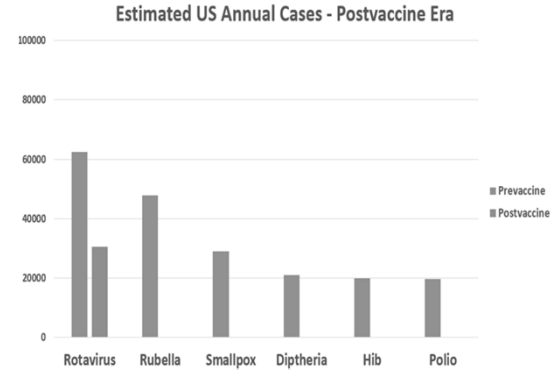
- Anthrax
- Cholera
- Diphtheria
- Hepatitis A
- Hepatitis B
- *H. influenzae* type B
- HPV
- Seasonal influenza
- Japanese encephalitis
- Meningococcus
- Mumps
- Pertussis
- Pneumococcus
- Polio
- Rabies
- Rotavirus
- Rubella
- Shingles
- Smallpox
- Tetanus
- Typhoid fever
- Varicella
- Yellow fever

Life Before Vaccines

- Diphtheria and smallpox outbreaks
- Summer infantile paralysis epidemics
- Near universal infection with measles and pertussis during childhood
- Congential rubella syndrome
- Invasive *Haemophilus influenzae* type B disease
- The list goes on…

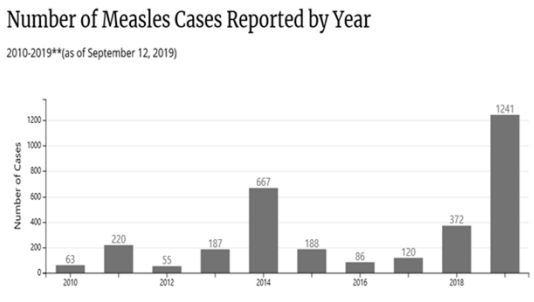


Source: *JAMA*. 2007;298(18):2155-2163
CDC



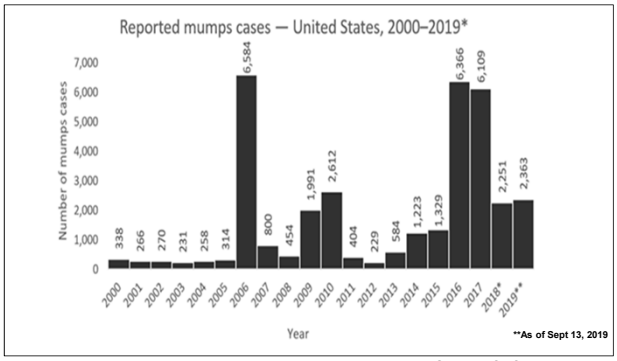
Source: *JAMA*. 2007;298(18):2155-2163
CDC

Re-emergence of Vaccine Preventable Diseases



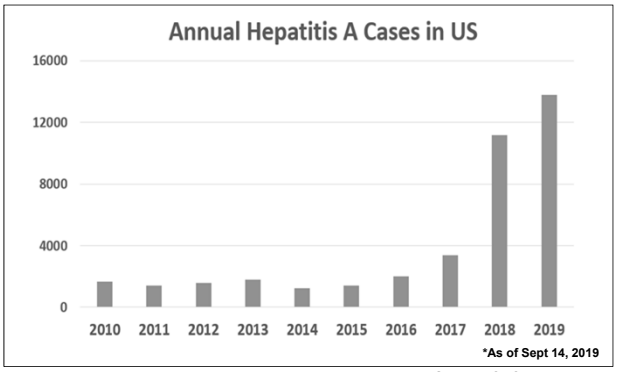
Source: CDC

Re-emergence of Vaccine Preventable Diseases



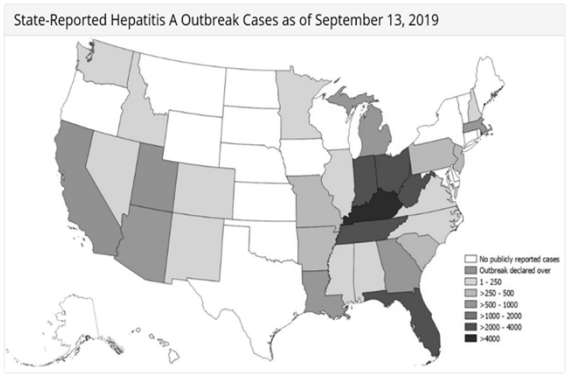
Source: CDC

Re-emergence of Vaccine Preventable Diseases



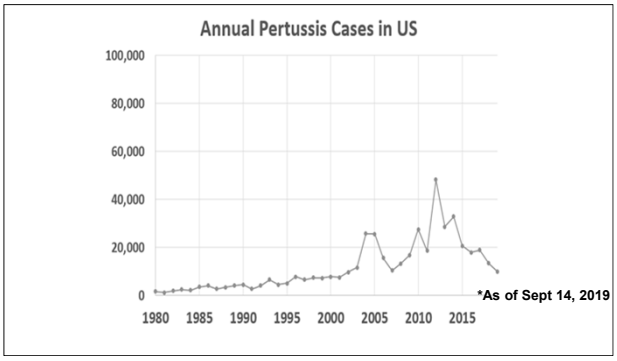
*As of Sept 14, 2019

Source: CDC



Source: CDC

Re-emergence of Vaccine Preventable Diseases



*As of Sept 14, 2019

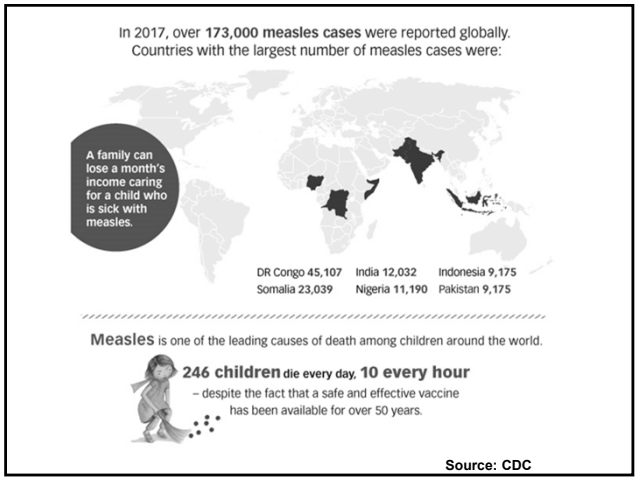
Source: CDC

Re-emergence of Vaccine Preventable Diseases

- **Contributing Factors:**
  - **Decreased vaccination rates**
  - **Endemic transmission**
  - **Increased international travel**
  - **Waning vaccine-mediated immunity**

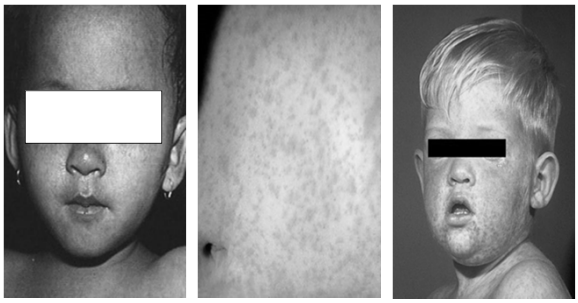
Outline

- **Notable VPDs in the clinic setting:**
  - **Measles**
  - **Mumps**
  - **Hepatitis A**
  - **Influenza – addressed in separate webcast**
- **Common vaccine questions from patients**

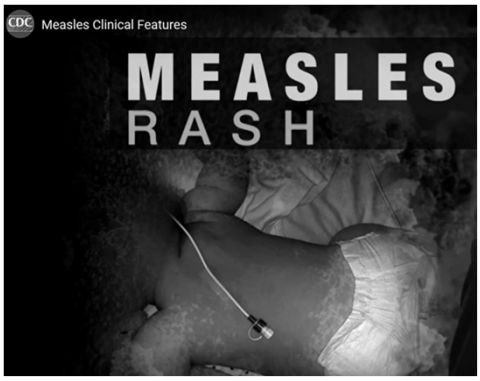


Measles Clinical Features

- **Incubation Period: 8-12 days (range: 7-21 days)**
- **Symptoms arise as two distinct phases:**
  - **Prodrome**
    - **2-4 days prior to rash onset**
    - **Fever & "the 3 C's"**
    - **Koplik spots**
  - **Rash**
    - **Cephalocaudal progression**
    - **Confluence**
    - **Fading with desquamation**
- **Infectious 4 days prior to 4 days after rash onset**



Source: CDC



Measles Complications

- **Acute Otitis Media**
- **Diarrhea**
- **Febrile Seizures**
- **Pneumonia**
- **Encephalitis**
- **Post-infectious encephalomyelitis**
- **Subacute sclerosing panencephalitis**

Source: CDC

Measles Diagnosis

- RT-PCR
  - Nasopharyngeal or throat swab specimen
  - Highest sensitivity during first 3 days of rash
- Serology
  - IgM
    - Acute specimens may have false negative results
    - False positives may occur with other viral infections
  - IgG
    - Usually positive by 1-2 weeks after rash onset

Measles Treatment and Prophylaxis

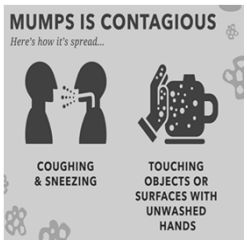
- Treatment
  - Supportive
  - Vitamin A for hospitalized children
- Post-Exposure Prophylaxis
  - MMR Vaccine within 72 hours
  - Immunoglobulin within 6 days
    - Intramuscular immune globulin
      - Infants
    - Intravenous immune globulin
      - Immunocompromised children and adults
      - Pregnant women without evidence of immunity

Measles Prevention

- Prevention
  - 2 dose MMR series in childhood
  - Other indications:
    - Students at post-high school educational institutions
    - Adults born during or after 1957
    - Prior to international travel
    - Healthcare personnel

Mumps

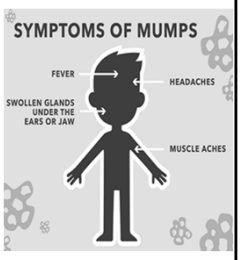
- Highly contagious - Spread via respiratory droplets
- Endemic transmission ongoing in US



Source: CDC

Mumps Clinical Features

- Incubation period 16-18 days (range: 12-25 days)
- Non-specific prodromal symptoms
- Tender unilateral or bilateral parotitis
  - Symptoms peak in 1-3 days
  - Resolve over 1 week
- Clinical presentation may vary
  - Asymptomatic
  - Non-specific respiratory symptoms
- Infectious 2 days before to 5 days after parotitis onset



Source: CDC

Ear Protrusion & Obscuring of the angle of the jaw common

Source: CDC

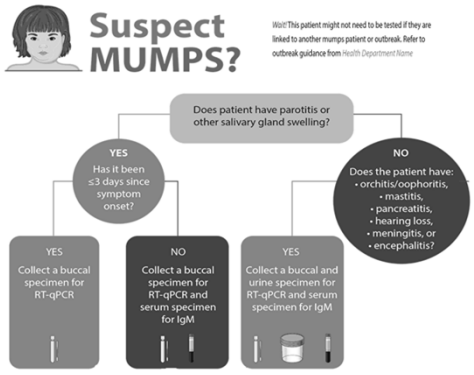
Mumps Complications

- Occur less commonly in vaccinated patients
- Complications are more common in adults
- Orchitis
- Oophoritis
- Mastitis

Source: CDC

Mumps Complications

Source: CDC



Modified from CDC Mumps Job-Aid Template

Mumps Testing Considerations

- Previously vaccinated patients:
  - Obtain PCR specimens within 1-3 days after onset
  - May have transient or undetectable IgM
  - IgG during acute phase usually very high

Mumps Treatment and Prophylaxis

- Treatment
  - Supportive
- Post-exposure prophylaxis
  - None

Mumps Prevention

- Prevention
  - 2 dose MMR series in childhood
  - Other indications:
    - Students at post-high school educational institutions
    - Adults born during or after 1957
    - Prior to international travel
    - Healthcare personnel
  - 3rd dose for high risk groups during outbreak

Source: CDC

Hepatitis A

- Transmission routes:
  - Fecal-oral
  - Contaminated food or water
- Risk factors:
  - Contact with infected person
  - International travel
  - Men who have sex with men
  - Users of injection and non-injection drugs
  - Persons with clotting factor disorders
  - Working with NHP

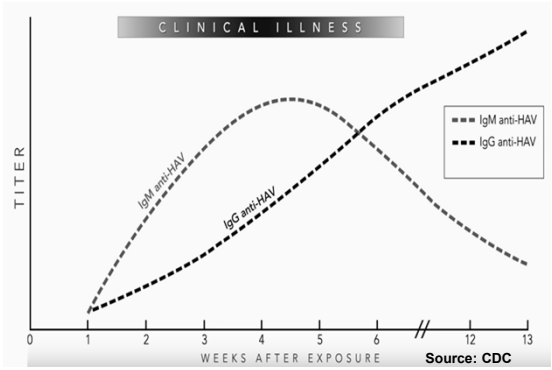
Hepatitis A Clinical Features

- Incubation period: 28 days (range: 15-50 days)
- Most children < 6 years asymptomatic
- Older children and adults:
  - Fever
  - Fatigue
  - Abdominal pain
  - Nausea and vomiting
  - Diarrhea
  - Jaundice

Hepatitis A Clinical Features

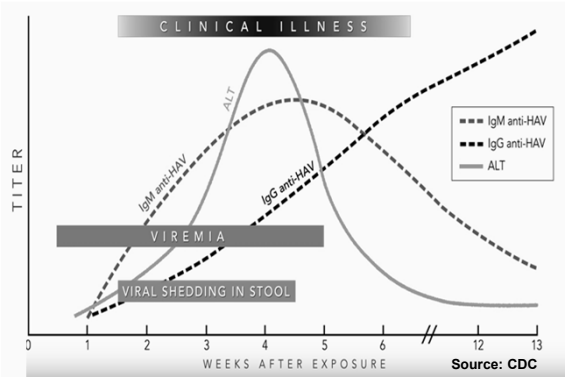
- Symptoms resolve in < 2 months
- Prolonged or relapsing disease may occur
- Does not cause chronic infection
- Infectious from 2 weeks before to 1 week after jaundice onset

Hepatitis A Diagnosis



Source: CDC

Hepatitis A Diagnosis



Source: CDC

Hepatitis A Treatment and Prophylaxis

- Treatment
  - Supportive
- Post-Exposure Prophylaxis – within 14 days of exposure
  - Hepatitis A vaccine
    - Healthy persons aged ≥ 12 months
  - Immune globulin & hepatitis A vaccine
    - Immunocompromised persons aged ≥ 12 months
    - Chronic liver disease
    - Healthy persons aged > 40
  - Immune globulin alone
    - Infants < 12 months

Hepatitis A Prevention

Hepatitis A vaccination is recommended for:

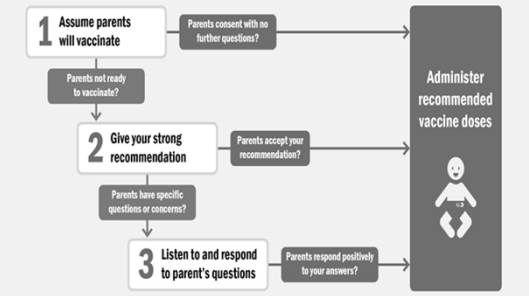
- All children at age 1 year
- Travelers to countries where hepatitis A is common
- Family and caregivers of adoptees from countries where hepatitis A is common
- Men who have sexual encounters with other men
- People who use or inject drugs
- People with chronic or long-term liver disease, including hepatitis B or hepatitis C
- People with clotting factor disorders
- People with direct contact with others who have hepatitis A
- People experiencing homelessness

Source: CDC

Hepatitis A Prevention

- Other patient populations to vaccinate:
  - Persons at increased risk of complications
    - Congenital or acquired immunodeficiency
    - HIV infection
    - Hemodialysis
    - Transplant recipients
    - Iatrogenic immune suppression
  - Occupational risks
    - Nonhuman primates
    - Working with HAV in research laboratory

Parent and Patient Vaccine Questions



Source: CDC

Common Questions and Concerns

- Too many vaccines
  - Contrast vaccine antigens with every day exposures
- Vaccines make me sick
  - Educate on immune response
- Vaccines contain aluminum or other metals
  - No known safety risks with amount in vaccines
  - Ingested in food and water daily
- Delayed vaccine schedule
  - No data that delayed schedule is more safe
  - Any time delay places at risk

Common Questions and Concerns

- Delay for mild illness
  - Mild febrile illnesses are not contraindications
- VPDs don't exist anymore
  - Educate on international and US outbreaks
  - "One plane ride away"

Source: CDC

Summary

- One of greatest public health achievements
- VPDs still exist in US and internationally
- Maintain high level of clinical suspicion
- Encourage families and patients to vaccinate