

Vaccine-Preventable Diseases

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

Disclosure Statement

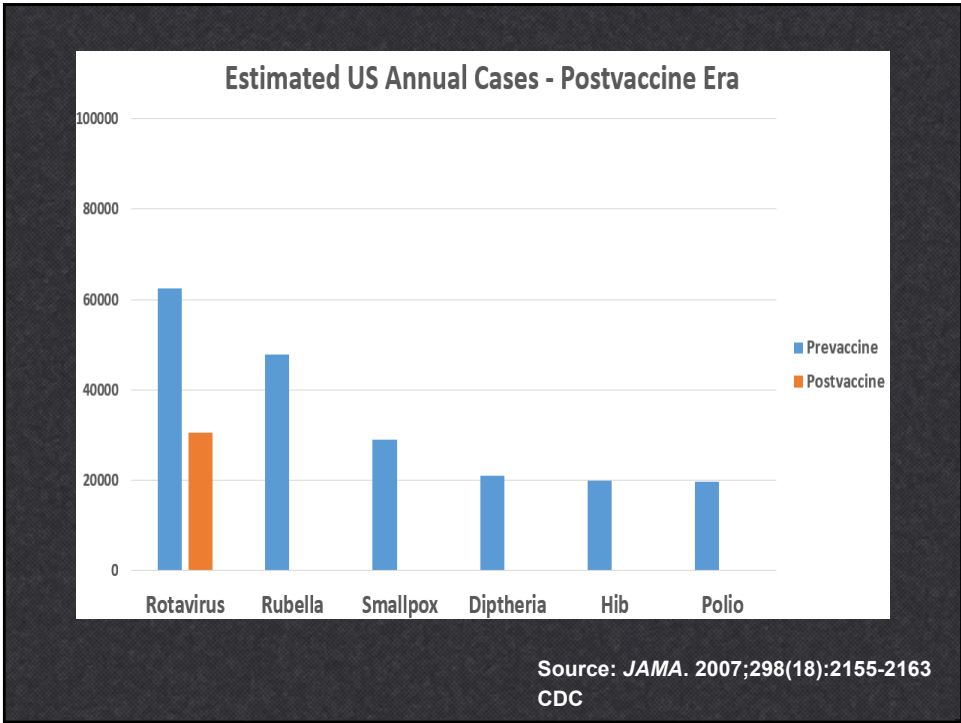
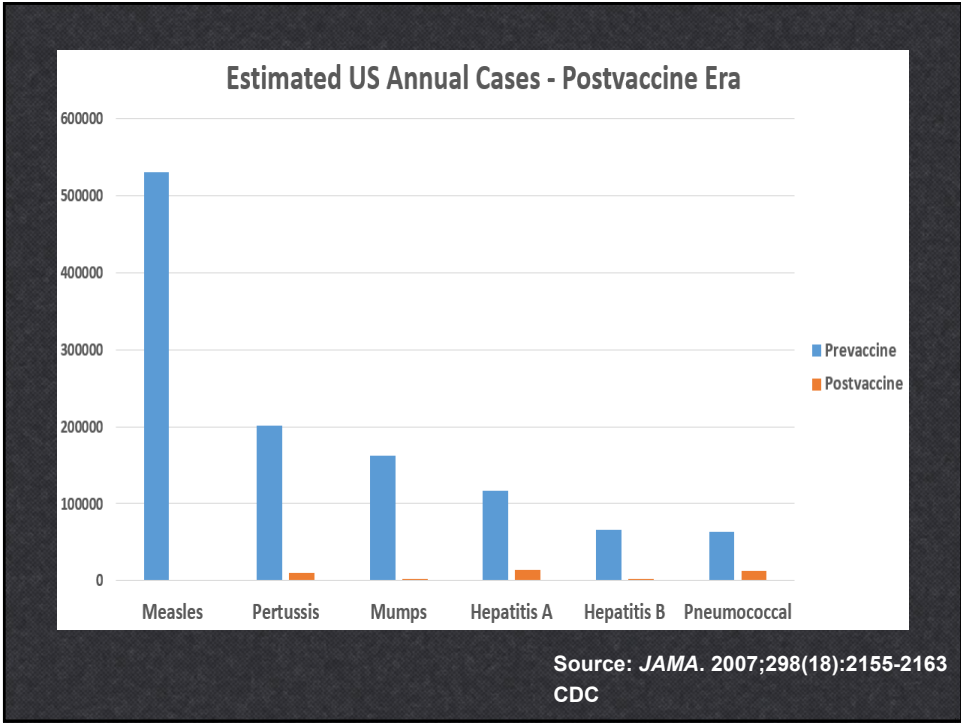
- I have no conflicts of interest to disclose relevant to today's presentation

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

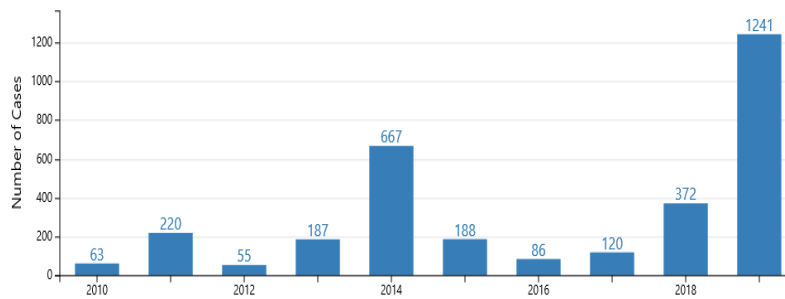
- Diphtheria and smallpox outbreaks
- Summer infantile paralysis epidemics
- Near universal infection with measles and pertussis during childhood
- Congenital rubella syndrome
- Invasive *Haemophilus influenzae* type B disease
- The list goes on...



Re-emergence of Vaccine Preventable Diseases

Number of Measles Cases Reported by Year

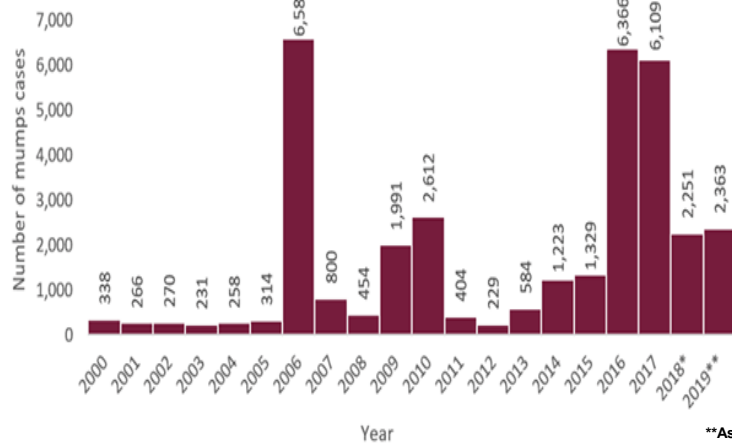
2010-2019**(as of September 12, 2019)



Source: CDC

Re-emergence of Vaccine Preventable Diseases

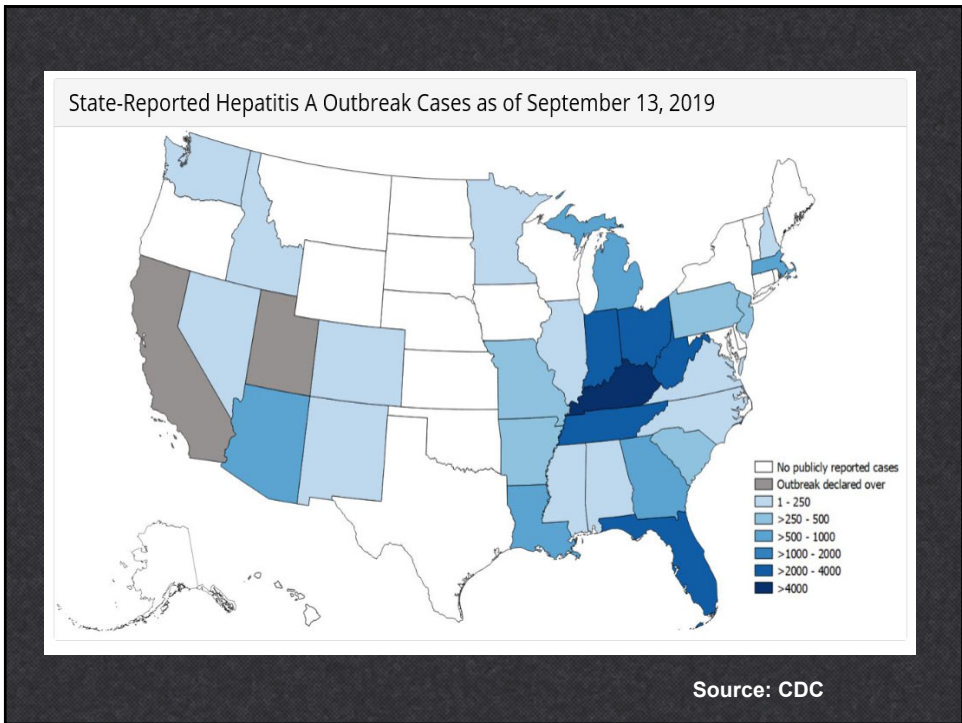
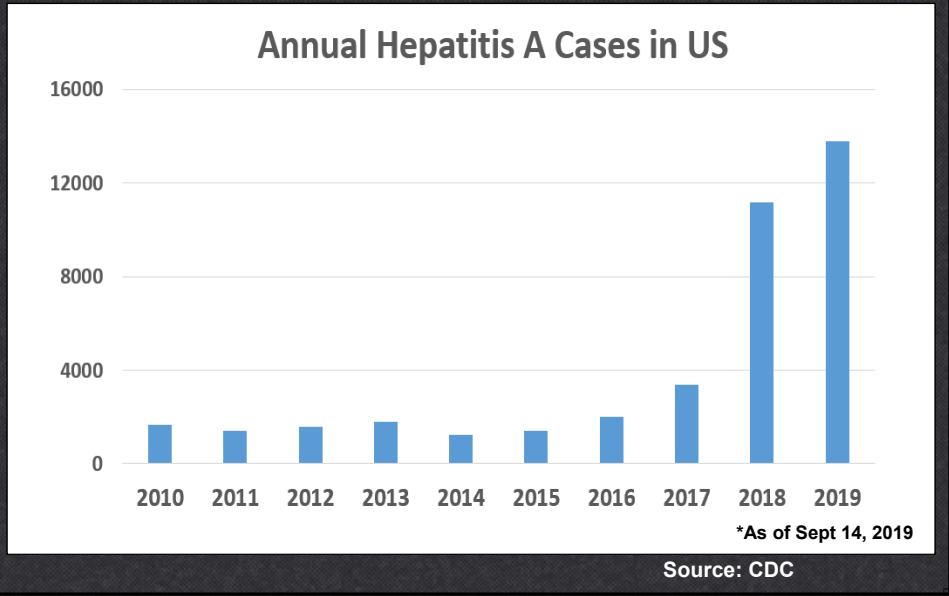
Reported mumps cases — United States, 2000–2019*



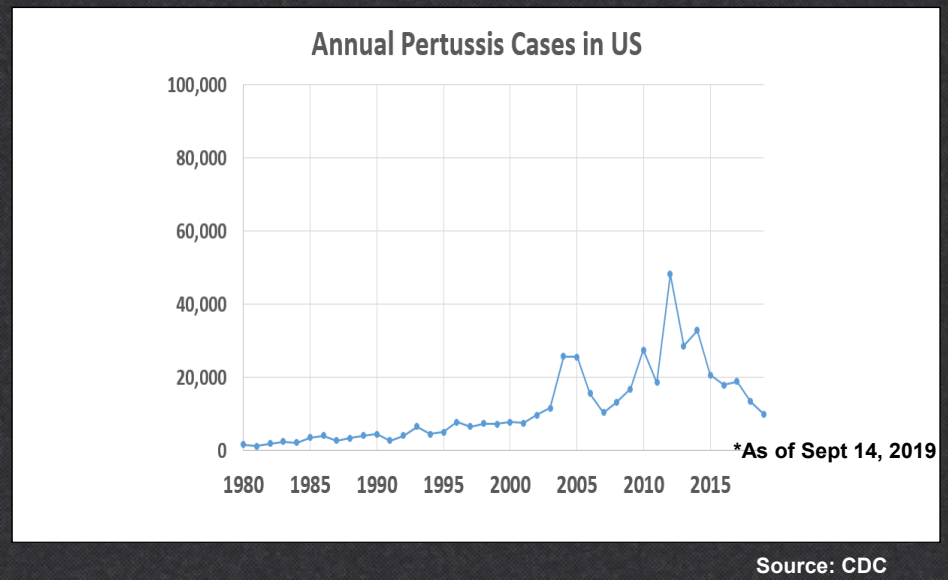
**As of Sept 13, 2019

Source: CDC

Re-emergence of Vaccine Preventable Diseases



Re-emergence of Vaccine Preventable Diseases



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

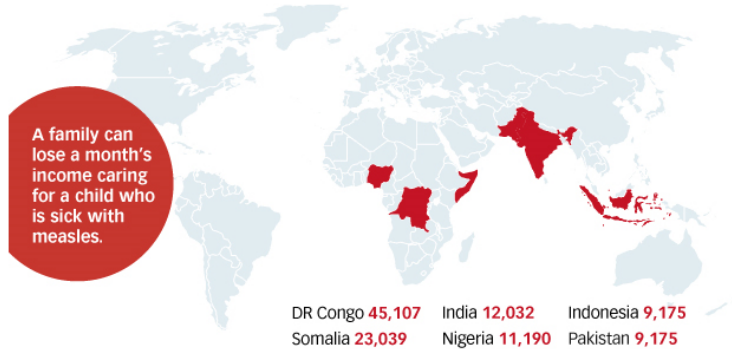


is **highly contagious** and spreads through the air when an infected person **coughs or sneezes**.



It is so contagious that if one person has it, **9 out of 10 people** of all ages around him or her will also become infected if they are not protected.

In 2017, over **173,000 measles cases** were reported globally.
Countries with the largest number of measles cases were:



A family can lose a month's income caring for a child who is sick with measles.

Measles is one of the leading causes of death among children around the world.



246 children die every day, 10 every hour

– despite the fact that a safe and effective vaccine has been available for over 50 years.

Source: CDC

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

MEASLES PRODROME

Koplik spots



Source: CDC

MEASLES RASH



Measles Complications

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

Measles Can Be Serious



About 1 out of 5 people who get measles will be hospitalized.



1 out of every 1,000 people with measles will develop brain swelling due to infection (encephalitis), which may lead to brain damage.



1 to 3 out of 1,000 people with measles will die, even with the best care.

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

You have the power to protect your child.



Provide your children with safe and long-lasting protection against measles by making sure they get the measles-mumps-rubella (MMR) vaccine according to CDC's recommended immunization schedule.

WWW.CDC.GOV/MEASLES

Mumps

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

MUMPS IS CONTAGIOUS

Here's how it's spread...



COUGHING & SNEEZING



TOUCHING OBJECTS OR SURFACES WITH UNWASHED HANDS

MUMPS IN THE UNITED STATES

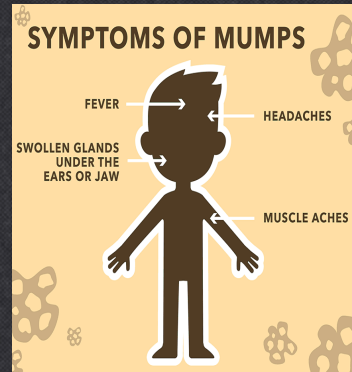
From year to year, mumps cases in the U.S. range from roughly a couple hundred to a couple thousand.



Source: CDC

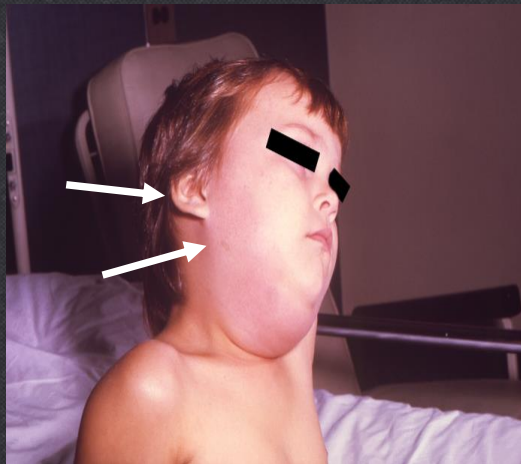
Mumps Clinical Features

- 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

MUMPS
More than just swollen glands

MUMPS CAN BE DANGEROUS
Before there was a vaccine, mumps was one of the most common causes of:

- **DEAFNESS** and
- **MENINGITIS** (infection of the brain and spinal cord covering) in childhood.

Mumps can also lead to

- **ENCEPHALITIS** (swelling of the brain) in some children.

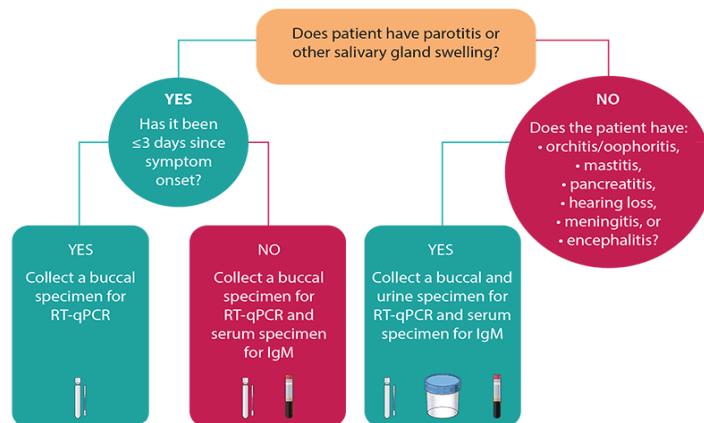


Source: CDC



Suspect MUMPS?

Wait! This patient might not need to be tested if they are linked to another mumps patient or outbreak. Refer to outbreak guidance from *Health Department Name*



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

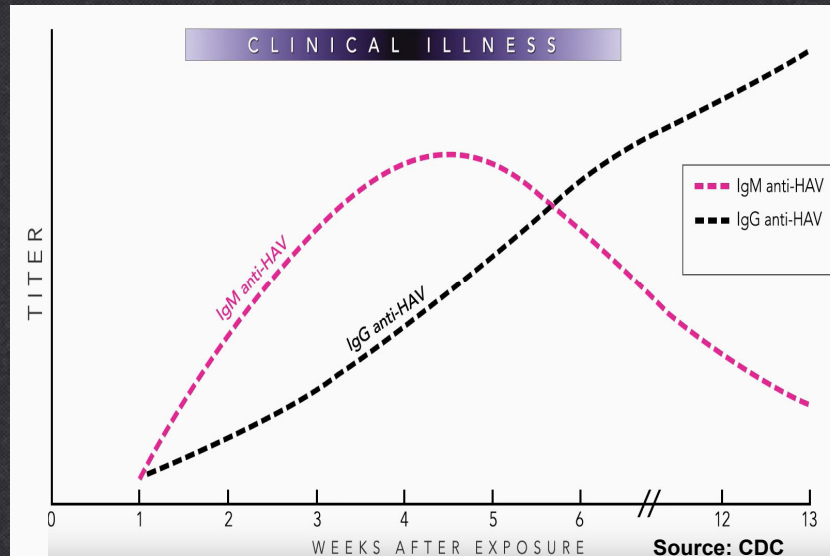
Hepatitis A Clinical Features

- 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

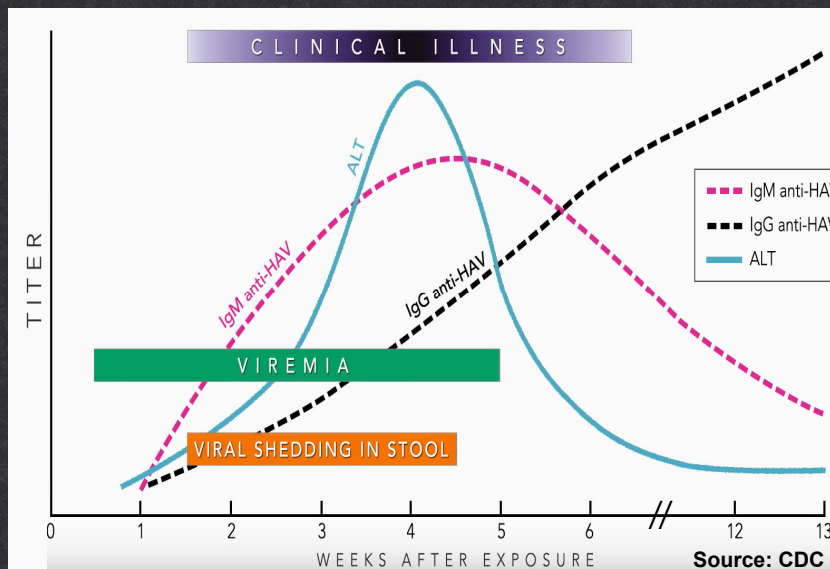
Hepatitis A Clinical Features

- 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



Hepatitis A Diagnosis



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

WASH YOUR HANDS
after using the toilet

1,000,000,000,000
germs can live in
one gram of poop

(That's the weight of a paper clip)



U.S. Department of
Health and Human Services
Center for Disease
Control and Prevention

CSH43017

Hepatitis A vaccination is recommended for:

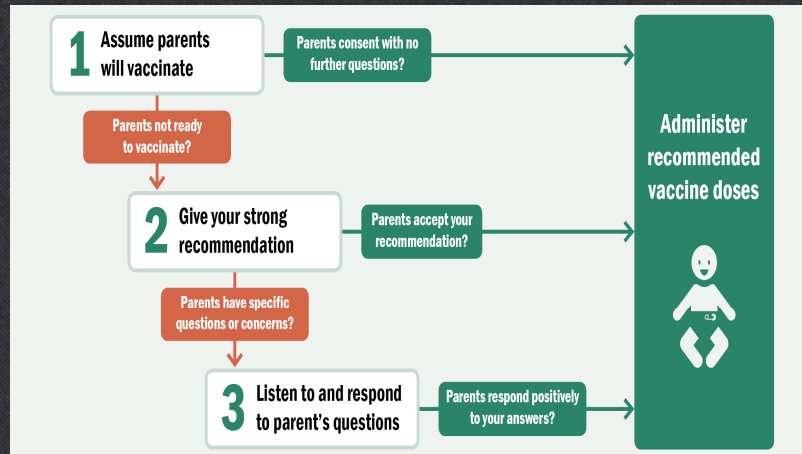
- All children at age 1 year
- Travelers to countries where hepatitis A is common
- Family and caregivers of adoptees from countries where hepatitis A is common
- Men who have sexual encounters with other men
- People who use or inject drugs
- People with chronic or long-term liver disease, including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