





# Part 1: Vaccine-Preventable Diseases and Childhood Vaccines

Most medicines are given to cure an illness or to relieve its symptoms. Vaccines are different. They are given to *prevent* illness.

## Vaccine-Preventable Diseases

Fourteen diseases can be prevented by routine childhood vaccines:

### Diphtheria

- Caused by bacteria.
- Causes sore throat, fever, and chills.
- If not properly diagnosed and treated, it can produce a toxin that can cause heart failure or paralysis.
- About 1 person in 10 infected with diphtheria dies.
- Through the 1920s, about 150,000 people got diphtheria each year, and about 15,000 died.

### Hepatitis A

- Caused by hepatitis A virus.
- Found mostly in bowel movements and spread by personal contact or through contaminated food or water.
- Causes liver disease – muscle and stomach pain, diarrhea or vomiting, loss of appetite, fatigue, yellow skin or eyes (jaundice).
- Children younger than about 6 years old might not have any symptoms.
- About 100 people die each year from liver failure caused by hepatitis A.

## **Hepatitis B**

- Caused by hepatitis B virus.
- Spread through contact with blood or other body fluids.
- Causes liver disease – muscle and stomach pain, diarrhea or vomiting, loss of appetite, fatigue, yellow skin or eyes (jaundice).
- Some people recover and others become “chronically infected,” which can lead to cirrhosis of the liver or liver cancer.
- Chronically infected people can infect others through, for example, unprotected sex or sharing needles.
- Babies of chronically infected mothers are usually infected at birth.
- About 3,000 to 5,000 people die each year.

## ***Haemophilus influenzae* type b (Hib)**

- Caused by bacteria.
- If Hib bacteria enter the bloodstream they can cause meningitis, pneumonia, arthritis, and other problems.
- Before vaccine, Hib was the leading cause of bacterial meningitis in children younger than 5 (about 1 out of every 200 children in that age group).
- One child in 4 suffered permanent brain damage, and 1 in 20 died.

## **Influenza (flu)**

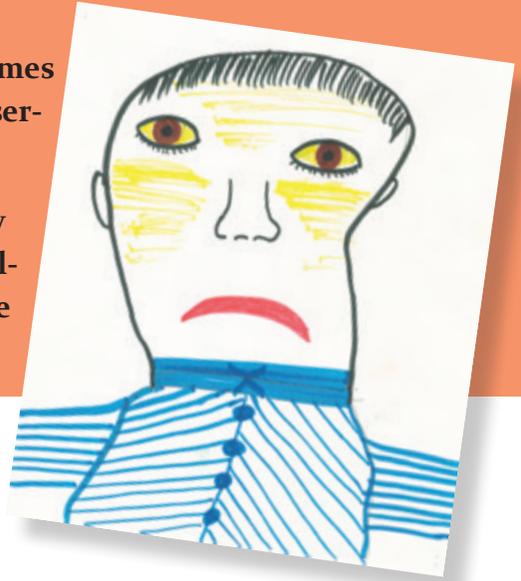
- Caused by influenza virus.
- Occurs mostly during the winter.
- Causes fever, sore throat, cough, headache, chills, muscle aches.
- Can lead to sinus infections, pneumonia, and inflammation of the heart.

- Hospitalization rates are high among children, especially babies under 1 year old.
- Flu causes more deaths each year than any other vaccine-preventable disease – mostly among the elderly, but it can also kill children.

## Measles Trivia:

The word “measles” probably comes from a Latin word meaning “miserable.”

In 1970, astronaut Ken Mattingly could not participate in the Apollo XIII moon mission because he had been exposed to measles.



## Measles

- Caused by measles virus.
- Extremely contagious.
- Causes a rash all over the body, runny nose, fever, and cough.
- About 1 child in 10 also gets an ear infection, up to 1 in 20 gets pneumonia, 1 in 1,000 gets encephalitis.
- Before vaccine, almost all children got measles – about 48,000 were hospitalized each year, 7,000 had seizures, about 1,000 suffered permanent brain damage, and about 450 died.
- Measles still kills about a half million people a year around the world.
- About 1 person in 1,000 who gets measles will die.

## **Mumps**

- Caused by mumps virus.
- Used to be a very common childhood disease.
- Usually a relatively mild disease – causes fever, headache, and inflammation of salivary glands.
- Mumps can lead to meningitis (about 1 child in 10), encephalitis or deafness (about 1 in 20,000) or death (about 1 in 10,000).

## **Pertussis (whooping cough)**

- Caused by bacteria.
- Can look like a common cold at first.
- After one or two weeks, it can cause violent coughing spells that can interfere with eating, drinking, or even breathing.
- Can lead to pneumonia, seizures, encephalopathy (brain infection), and death.

## **Pneumococcal Disease**

- Caused by bacteria.
- Most common in winter and early spring.
- After Hib disease began to decline, pneumococcal disease became the most common cause of bacterial meningitis in children under 5.
- Can lead to ear infections, blood infections, and death.
- African Americans, some Native American tribes, children with sickle cell disease or with HIV infection and children without a working spleen are at higher risk.

## Polio

- Caused by polio virus.
- Can cause paralysis, leaving a person unable to walk or even breathe.
- About 1,200 polio victims in the United States were forced to live in 700-pound “iron lungs,” which enabled them to breathe. Several of these people, first confined to an iron lung in the 1950s, still live in them today.
- Polio caused panic in the 1950s before vaccine – about 20,000 people were paralyzed each year.

### Polio Trivia:

In 1948, a retired schoolteacher was a patient in a San Diego polio ward, surrounded by young children also suffering from polio. To help cheer them up she created a simple board game for them to play together. A year later, the toy manufacturer Milton Bradley bought the game from her. Today polio has been nearly eliminated, but *Candy Land* is still being played in millions of homes around the world.



## Rotavirus

- Caused by a virus.
- Causes diarrhea and vomiting in young children – sometimes so severe it can lead to dehydration.
- Before vaccine, rotavirus caused more than 400,000 doctor visits, 200,000 emergency room visits, up to 70,000 hospitalizations, and 20 to 60 deaths each year.

## **Rubella (German measles)**

- Caused by a virus.
- Usually a mild disease, causing swollen glands in the neck, fever, rash on the face and neck, and sometimes arthritis-like symptoms.
- The greatest danger from rubella is to unborn babies. If a pregnant woman gets rubella, her unborn baby has about an 80% chance of “congenital rubella syndrome” (CRS), which can lead to deafness, blindness, mental impairment, or heart or brain damage. Miscarriages are also common.
- In 1964-65, before vaccine, a major rubella epidemic in the United States infected 12.5 million people and led to 20,000 cases of CRS.

## **Tetanus (lockjaw)**

- Caused by bacteria.
- Enters the body through cuts, burns, or other breaks in the skin – not spread from person to person.
- About 3 weeks after exposure, a child could become cranky, get a headache, or have spasms in the jaw muscles.
- Tetanus can then produce a toxin that causes painful muscle cramps in the neck, arms, legs, and stomach – strong enough to break a child’s bones.
- A child might have to spend several weeks in intensive care. One or two out of every 10 die.

## **Varicella (chickenpox)**

- Caused by varicella virus.
- Causes an itchy rash all over the body, fever, and drowsiness.

- Usually mild, but can cause skin infections and encephalitis. For every 100,000 infants younger than 1 year old who get chickenpox, about 4 die.
- If a pregnant women gets chickenpox around the time of delivery, the baby can be infected, and 1 out of 3 will die if not treated quickly.
- Before vaccine, almost every child (about 4 million each year) got chickenpox.

Many of these diseases are spread from person to person through the air by coughing, sneezing, or just breathing. Exceptions are polio, hepatitis A, and rotavirus, which enter the body through the mouth; hepatitis B, which is transmitted through blood or body fluids; and tetanus, which enters the body through breaks in the skin.

All of these diseases were much more common before vaccines.

Disease	Annual Reported Cases 20th Century (Pre-Vaccine)	Reported Cases 2013
Diphtheria	21,053	0
Measles	530,217	187
Tetanus	580	26
Mumps	162,344	584
Rubella	47,745	9

However, after declining for years, some of them – notably measles and pertussis – are again causing outbreaks in the United States, partly because some parents are not getting their children vaccinated.

# Childhood Vaccines

Ten vaccines, which children receive between birth and 6 years of age can prevent these 14 diseases.

1. Hepatitis A (HepA) vaccine
2. Hepatitis B (HepB) vaccine
3. Hib (*Haemophilus influenzae* type b) vaccine
4. Influenza (flu) vaccine
5. PCV13 (pneumococcal disease) vaccine
6. Polio vaccine
7. Rotavirus (RV) vaccine
8. Varicella (chickenpox) vaccine
9. DTaP (Diphtheria, Tetanus, and Pertussis) vaccine
10. MMR (Measles, Mumps, and Rubella) vaccine

These vaccines are given by injection (shot), except for rotavirus, which is a liquid that is swallowed, and one type of flu vaccine, which is sprayed into the nose.



# The Vaccine Schedule

All of these childhood vaccines are given in a series of 2 or more doses, at specific ages.

Age	Vaccine
 <i>at birth</i>	HepB
 <i>2 months</i>	HepB (1-2 mos) + DTaP + PCV <sub>13</sub> + Hib + Polio + RV
 <i>4 months</i>	DTaP + PCV <sub>13</sub> + Hib + Polio + RV
 <i>6 months</i>	HepB (6-18 mos) + DTaP + PCV <sub>13</sub> + Hib + Polio (6-18 mos) + RV
 <i>12 months</i>	MMR (12-15 mos) + PCV <sub>13</sub> (12-15 mos) + Hib (12-15 mos) + Varicella (12-15 mos) + HepA (12-23 mos)
 <i>15 months</i>	DTaP (15-18 mos)

For more detailed versions of this schedule, visit CDC's website at <http://www.cdc.gov/vaccines/schedules/index.html>.

For some of these vaccines, a booster dose is also recommended at 4-6 years of age.

A dose of flu vaccine is recommended every winter for children 6 months old or older.

Several “combination” vaccines are available for children. These are vaccines that contain more than one vaccine in a single shot, which means fewer shots at one visit:

Vaccine Name	Contains
Pediarix®	DTaP, Polio, and HepB
Pentacel®	DTaP, Polio, and Hib
Kinrix®	DTaP and Polio
Quadracel®	DTaP and Polio
ProQuad®	MMR and Varicella

## Other Vaccines

There are other vaccines that might be recommended for older children or adolescents, or for young children in certain circumstances.

**Rabies vaccine** might be recommended for a child who was bitten by an animal, or is traveling to a country where rabies is common.

Children traveling abroad may need other vaccines, too. These could include **Japanese encephalitis, typhoid, meningococcal, or yellow fever** vaccines.

**Meningococcal vaccine** is also recommended for adolescents between 11 and 18 years of age, and for younger children with certain medical conditions, to protect them from infections that could cause bacterial meningitis. **Tdap** is a tetanus, diphtheria, pertussis vaccine that is similar to DTaP, but is formulated for adolescents and adults. It is recommended at the 11-12 year doctor’s visit. **Human papillomavirus (HPV)** vaccine is also recommended at the 11-12 year visit. HPV is a virus that causes cervical cancer and other types of cancer.

Your healthcare provider can tell you more about these vaccines.

## Vaccine Trivia:

The world's first vaccine, Dr. Edward Jenner's smallpox vaccine, was actually made from cowpox virus. Jenner called the process "vaccination" from *vacca*, a Latin word for cow.

