

# Communicable Disease and Immunizations

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## Communicable diseases

- ▶ **Communicable diseases** spread from one person to another or from an animal to a person.
- ▶ The spread often happens via airborne viruses or bacteria, but also through blood or other bodily fluid.
- ▶ The terms infectious and contagious are also used to describe communicable disease which are prevented by immunization.

## Public Health Roles

- ▶ The two public health interventions that have had the greatest impact on the world's health are **clean water** and **vaccines**.
- ▶ **Immunization is the most cost-effective public health intervention**, vaccines prevent illness or death for millions of individuals every year.
- ▶ Almost **two million children still die** each year from diseases for which are available at low cost .
- ▶ Over 90 000 fall victim to paralytic polio, which could also have been prevented by immunization

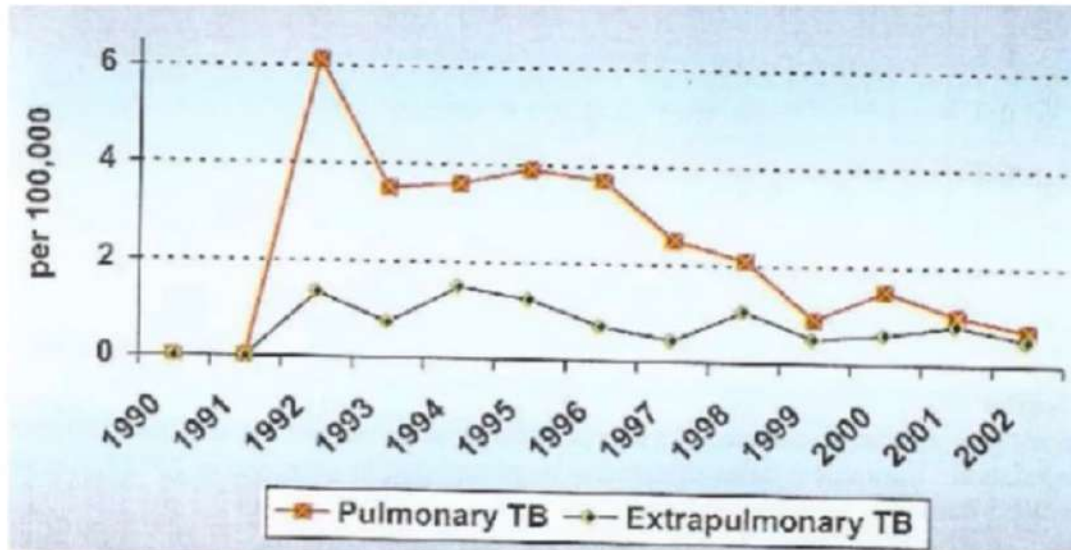
## The benefits of immunization

- ▶ It is better to keep people from falling ill than to treat them once they are ill.
- ▶ **Suffering, disability, and death are avoided.**
- ▶ Immunization change the relative age distribution of cases with a shift to older ages.
- ▶ Immunization **averted** about two million deaths in 2002.
- ▶ Strain on **health-care systems is eased.**
- ▶ **Money is frequently saved** that can be used for other health services.
- ▶ Immunization is a proven tool for controlling and even eradicating disease.

## Immunization programs

- ▶ An immunization programs implemented jointly by the government health service and the UN Relief Works Agency (UNRWA) has controlled or eradicated vaccine-preventable diseases in addition to other health services.

# Immunization Effects



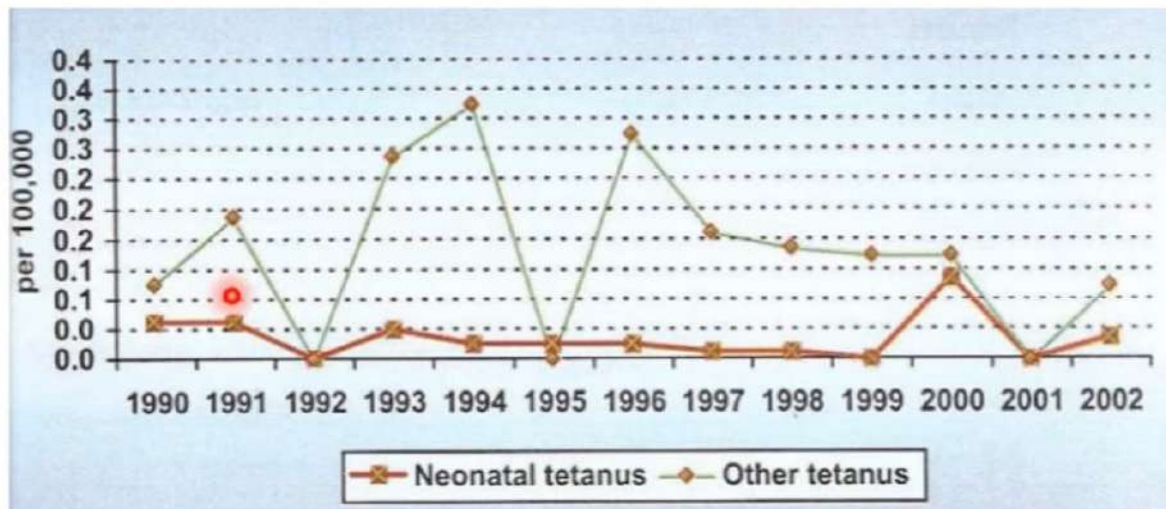
**Annual reported incidence rate of tuberculosis in Palestine , 1990–2002 ( per 100.000**

# Immunization Effects



Annual reported incidence rate of measles in Palestine , 1990–2002 ( per 100.000 )

# Immunization Effects



Annual reported incidence rate of tetanus in Palestine , 1990–2002 ( per 100.000 )



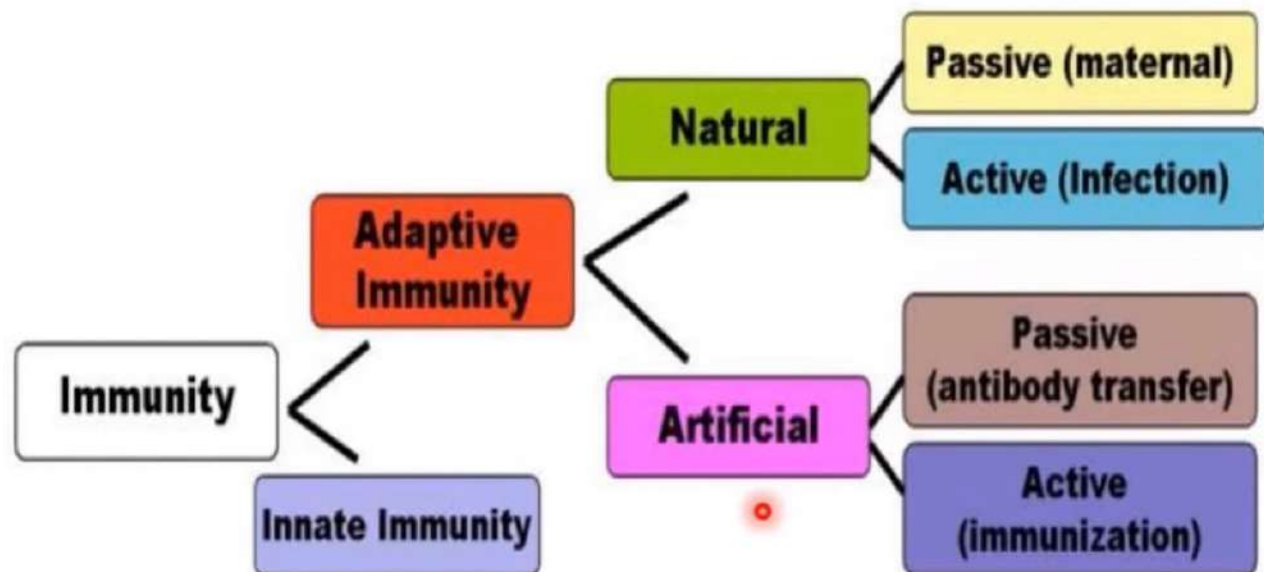
## The cost-effectiveness of immunization

- Immunization is considered among the most cost-effective of health investments.
- In the United States, cost-benefit analysis indicate that every dollar invested in a vaccine dose saves US\$ 2 to US\$ 27 in health expenses.

## Definition of Immunization

- It is a process to increase host resistance to specific microorganism or a disease agent to prevent them from causing disease or provides protection from most of infectious diseases and that is indicated by the presence of antibody to that organism.

# Classification of immunity



# Classification of immunity

**1. Non-specific:**

**2. Specific:**

**A- active immunity (Natural active/ Artificial active)**


**B- Passive immunity (Natural passive /Artificial passive)**



# Classification of immunity

## 1. **Non-specific:**

Inherited, natural resistance (Skin, mucous membrane, phagocytosis )



# Classification of immunity

2. Specific:

## 2. Specific:

**A- active immunity** : is produced by human body. It is stimulation of the immune system to produce antibodies, it is divided as :

**Natural active:** is formed or received without intervention made by health staff such as the immunity acquired after having infectious disease as antibodies produced.

**Artificial active:** includes most of vaccines given to public and specifically for children to improve their immune status including tetanus toxoid.

## Classification of immunity

### 2. Specific:

**B- Passive immunity** : is formed outside the person's body and it is temporary immunity lasts for many years or for life time . It is transfer of antibodies produced by one human or animal and given to another, and it provides protection against some infections but this protection is temporary.

**Natural passive** : as trans placental transmission of antibodies from mother to her baby and milk during lactation.

**Artificial passive** : as giving anti-tetanus serum and immunoglobulin or other types of serums.

## Definition of vaccine

It is a suspension of live or killed microorganism given to induce immunity to specified disease.



# Children vaccination Programme in Gaza

Time	Vaccine	Site
Birth -3 months	BCG	Lt upper arm
2nd month	OPV DPT Hep.B Hib.	Oral drops Lt. outer mid. Thigh IM Rt. outer mid .thigh IM Outer mid.thigh IM
4th month	OPV DPT Hep.B	Oral drops Lt. outer mid. Thigh IM Rt. outer mid .thigh IM
6TH month	OPV DPT Hep.B	Oral drops Lt. outer mid. Thigh IM Rt. outer mid .thigh IM
9th month	Measles Hib.	Rt upper arm subcut. Outer mid.thigh IM
12-24 month	OPV (Booster dose) DPT (Booster dose)	Oral drops Lt. outer mid. Thigh IM

## جدول التطعيم المقترح في فلسطين للعام 2012

<b>BCG + HB0</b>	<b>At Birth</b>
<b>IPV1</b>	<b>1 month</b>
<b>PCV1 + Penta1 + TOPV1 + IPV2</b>	<b>2 month</b>
<b>PCV2 + Penta2 + TOPV2</b>	<b>4 month</b>
<b>PCV3 + Penta3 + TOPV3</b>	<b>6 month</b>
<b>MMR1</b>	<b>12 month</b>
<b>MMR2+DTP4+TOPV4</b>	<b>18 month</b>
<b>DT + TOPV</b>	<b>6 years</b>
<b>Rubella</b>	<b>12 years</b>
<b>dT</b>	<b>15 years</b>

**New  
vaccination  
Programme  
in Gaza**

*Penta Vaccine = (HB1+DTP1+Hib1)*

# Types of vaccines

## 1. Live attenuated :

prepared in labs by repeated culturing, organisms have the ability to produce immunity but does not cause disease

- Viral : measles, mumps, OPV, rubella, yellow fever
- Bacterial: BCG, oral typhoid.

## Types of vaccines

**2. Inactivated:** Produced by growing the bacteria or viruses in culture media then inactivated or killed heat and chemicals

### Types of inactivated vaccines:

- Whole** (viruses – bacteria ): viral influenza, polio, rabies, hepatitis A, pertusis
- Fractional** : diphtheria, tetanus, influenza
- Polysaccharide** : hemophilus influenza type b, meningococcal, pneumococcal

## Causes of inadequate immunization

1. Limited access
  2. Vaccination cost
  3. Patient disinterest
-

## Important notes, terms, definitions

- **Eradication** : is irreversible termination
- **BCG** : Bacille Calmette Guerin
- **Herd immunity** : group of people are protected against infectious disease
- **Primary responses** : occurs on the first exposure to antigen 3-14 days
- **Secondary exposure** : is the response on second and subsequent exposure to antigen.

## Important notes, terms, definitions

**Children known to have rare congenital immune deficiency syndrome should receive IPV rather than OPV**

- **OPV produces antibodies in the blood ('humoral' or serum immunity)-**  
The oral polio vaccine was developed by Albert Sabin and came into commercial use in 1961.
- **IPV consists of inactivated (killed) poliovirus strains** (It was developed by Jonas Salk and came into use in 1955).

## Important notes, terms, definitions

**DPT** : **D**iphtheria . **P**ertussis (whooping cough) . **T**etanus

**MMR** : Measles . Mumps . Rubella

**TT** : Tetanus Toxoid

**OPV** : Oral Polio Vaccine

**IPV** : Intramuscular Polio Vaccine

**Hib** : Hemophilus influenza type b ( prevent meningitis)



## Important notes, terms, definitions

- **Hep.B** : Hepatitis B
- Freezing damages the killed vaccines and ( Tetanus Toxoid , DPT, Hep.B )
- Freezing does not damage live attenuated vaccines (BCG, OPV, Measles )
- Heat and sunlight can damage vaccines especially live attenuated ones (Polio, Measles, BCG )
- **Cross immunity** : immunity shifted from a person provides immunity to another agent such as BCG.

## Commonly used vaccines

- **BCG**
- **Polio**
- **DTP**
- **Hepatitis B**
- **MMR**

## Other vaccines

- Hib Vaccine
- Hepatitis A Vaccine
- Varicella (Chickenpox) Vaccine
- Cholera Vaccine
- Influenza Vaccine
- Meningococcus Vaccine
- Pneumococcus Vaccine
- Rabies Vaccine
- Smallpox Vaccine
- Typhoid Vaccine
- Yellow Fever Vaccine

# Vaccines

## **Tuberculosis Vaccine**

Tuberculosis (TB) is caused by a bacterium, *Mycobacterium tuberculosis*. The infection primarily attacks the lungs. Extremely contagious, TB is spread through the simple act of sneezing, talking and coughing.

# Vaccines

## Polio Vaccine

Polio is caused by a virus and is highly contagious.

OPV was made by weakening the three strains of polio virus that caused disease by growing them in monkey kidney cells.

- IPV, unlike OPV, cannot reproduce itself (or replicate) and, therefore, cannot possibly revert back to natural polio.

# Vaccines

## **Diphtheria vaccine**

The diphtheria vaccine is contained in a preparation called "DTP" (the "D" stands for diphtheria).

The dangers associated with diphtheria come from the toxin released by the bacterium, *Corynebacterium diphtheriae*.

# Vaccines

## **Tetanus vaccine**

- The tetanus vaccine is contained in a preparation called DTP (the "T" stands for tetanus).
- Tetanus is another disease caused by a toxin-releasing bacterium, *Clostridium tetani*. Unlike most vaccine-preventable diseases, tetanus is not a disease that you catch from someone else.
- The bacteria live in the soil and usually enter the body following a puncture wound of the skin.

# Vaccines

## **Pertussis vaccine**

- The pertussis vaccine is contained in a preparation called DTP (the "P" stands for pertussis).
- Pertussis (widely known as whooping cough) is one of the most contagious diseases around. Caused by a bacterium (*Bordetella pertussis*), whooping cough makes children cough uncontrollably.



# Vaccines

## **MMR: measles vaccine :**

- The measles vaccine is contained in a combination vaccine called MMR (measles, mumps and rubella, also known as German measles). •
- Measles is a disease that is caused by a virus.

# Vaccines

## **MMR: mumps vaccine :**

- Mumps is a virus, just like measles. The mumps virus usually causes swelling in the salivary or parotid glands, just below the ear, lasting for seven days.
- Before the mumps vaccine, mumps was the most common cause of meningitis (inflammation of the lining of the brain and spinal cord).

# Vaccines

## **MMR: rubella vaccine :**

- Rubella is a viral infection also known as German measles.
- Rubella infection of children causes a mild rash on the face, swelling of glands behind the ear,

# Vaccines

## **Hepatitis A Vaccine :**

- Hepatitis A is a virus that causes hepatitis (inflammation of the liver).
- The hepatitis A vaccine is given to people who are traveling to parts of the world where hepatitis A virus infections are common.

# Vaccines

## Hepatitis B Vaccine :

- The hepatitis B vaccine is given to prevent the severe liver disease that can develop when children or adults are infected with hepatitis B virus.
- Hepatitis B virus infections are known as the "silent epidemic" because many infected people don't experience symptoms until decades later when they develop hepatitis, cirrhosis (severe liver disease), or cancer of the liver (hepatocellular carcinoma).

# Vaccines

## **Hib Vaccine :**

- Haemophilus influenzae type b (Hib) is a bacterium that infects the lining of the brain, causing meningitis.

# Vaccines

## **Meningococcus Vaccine :**

- A new meningococcal vaccine was licensed in early 2005.
- The bacterium, *Neisseria meningitidis*, primarily targets children under 1 year of age. Because meningococcus is contagious, outbreaks can occur in childcare centers and schools.
- Cases also occur in high schools and on college campuses.

# Vaccines

## **The cholera vaccine :**

- Cholera is a bacterium (*Vibrio cholera*) that attacks the intestines, causing diarrhea in about 5 percent of those infected. Each year about 120,000 cases of cholera are reported to the World Health Organization from 50 countries.
- It is generally not required or recommended for travel anywhere in the world, with perhaps a few local exceptions.



# Vaccines

## **Rabies Vaccine :**

- Rabies is a virus that attacks the brain and nervous system. It is transmitted by a bite from a rabid animal (meaning an animal infected with rabies virus).
- The rabies vaccine is given to prevent the progressive, invariably fatal, disease, rabies. There are only three known cases of people surviving rabies once they developed symptoms of the disease.

# Vaccines

## **Typhoid Vaccine :**

- Typhoid is caused by a bacterium (*Salmonella typhi*) that attacks the intestines, causing fever, stomach pain and rash.
- The typhoid vaccine is not required for international travel. The typhoid vaccine should be used only by people traveling to high-risk areas .
- Typhoid bacteria are ingested in contaminated food or water .

# Vaccines

## **Influenza Vaccine**

- The influenza vaccine is given to those who are at high risk of developing severe influenza.
- The influenza vaccine is unusual in that each year a different vaccine is made. Because strains of influenza virus that circulate in the community can differ from one season to the next, the vaccine must change to best protect against those different strains.

# Vaccines

## **Yellow Fever Vaccine :**

- Yellow fever is a virus that causes hepatitis (inflammation of the liver) and hemorrhaging (severe bleeding problems).
- The yellow fever vaccine is recommended for travel to countries with risk of yellow fever transmission.
- Many of these countries are located in Africa and South America.

## Cold chain

- It is the cycle of transportation of vaccines from the factory to the child including transportation ,airplane ,boats ,central store ,regional store ,district store ,health center ,MCH center ,immunizing staff ,mother and child.

Vaccine Manufacturer

Vaccine



International / National Airports



Transit storage facilities  
(2° to 8°C)

Primary Vaccine Store

Cold room (2° to 8°C) and  
freezer room (-15° to -25°C)

Intermediate Vaccine Store

Cold room (2° to 8°C) and  
freezer room (-15° to -25°C)

Intermediate Vaccine Store

Refrigerators (2° to 8°C) and  
freezer room (-15° to -25°C)

Health Centre

Refrigerators (2° to 8°C) and  
cold boxes

Health Post



Refrigerators (2° to 8°C) and/or  
cold boxes/vaccine carriers

Child and Mother



Vaccine Cold Chain Monitor shipment record

Date	Origin	Destination	Temp. (°C)	Temp. (°C)

1. Vaccine Cold Chain Monitor (VCCM) 2. Vaccine Cold Chain Monitor (VCCM) 3. Vaccine Cold Chain Monitor (VCCM) 4. Vaccine Cold Chain Monitor (VCCM) 5. Vaccine Cold Chain Monitor (VCCM) 6. Vaccine Cold Chain Monitor (VCCM) 7. Vaccine Cold Chain Monitor (VCCM) 8. Vaccine Cold Chain Monitor (VCCM) 9. Vaccine Cold Chain Monitor (VCCM) 10. Vaccine Cold Chain Monitor (VCCM)

# Cold chain

## REMEMBER

- Vaccines are sensitive to heat so they are damaged if they are exposed to heat.
- The more the temp rises ,the more rapid the vaccines loses its potency.
- Vaccine potency can't be regained once it is lost.
- Returning vaccine to the freezer will not restore its potency

## Vaccine monitor and safety measures

- vaccine vial monitor
  - The freezing watch indicator
  - Mini –maxi thermometer
  - Vaccine storage
- 



## What damage the vaccines

- All vaccines lose their potency after a certain time ,even with good care ,expiry date must be noted.
- Heat and sunlight can damage vaccines, especially the live attenuated ones(Polio ,Measles and BCG) .
- Freezing damage the killed vaccines and toxoid (DPT,DT,TT,and Disinfectants or antiseptics can damage vaccines (such as spirits and detergents ) and antibiotics such as streptomycin on BCG.

## The response of any country to outbreaks depend on many factors as

1. Availability of resources
2. Stage of development of surveillance system
3. Current vaccine coverage ,vaccine incidence
4. Program objective

## Contraindication of the vaccination

- Very severely ill children who need to be hospitalized or children who have very high fever should delay vaccine. ●
- Children who have A very severe reaction from DPT injection.
- DON'T give this child any more doses of DPT ,give him DT vaccine.
- BCG is the only vaccine which should not be administered to children with clinically apparent AIDS or immune deficiency.