Vaccination and Serotherapy

General Introduction

Immunity can be acquired in two main ways:

Active immunity: through stimulation of the immune system (e.g., vaccination).

Passive immunity: through the transfer of ready-made antibodies (e.g., serotherapy).

Both aim to protect the body from infections, but they differ in their mechanisms, duration, and uses.

I. Vaccination

1. Definition

Vaccination is a method of active prevention that involves introducing an antigen (attenuated, inactivated, or modified) into the body to stimulate the production of antibodies without causing the disease.

2. Objective

Prevent the onset of infectious diseases.

Induce immune memory.

Protect the individual and contribute to herd immunity.

3. Types of Vaccines

Type of Vaccine	Description	Examples
Live attenuated vaccines	Weakened live pathogens	BCG (tuberculosis), MMR (measles, mumps, rubella)
Inactivated vaccines	Killed microorganisms	Hepatitis A, flu
Subunit vaccines	Only parts of the pathogen (proteins, sugars)	Acellular pertussis
mRNA/DNA vaccines	Contain genetic material that codes for an antigen	Pfizer-BioNTech (COVID-19)
Vector-based vaccines	Use a virus as a carrier for a gene	AstraZeneca (COVID-19)

4- Immune Response

- **Primary response:** antibody production after the first dose.
- **Secondary response** (memory): faster and more effective upon re-exposure.

5. Advantages and Limitations

✓ Advantages:

- Long-term protection
- Reduces child mortality
- Herd immunity

✗ Limitations:

- Risk of side effects
- Requires booster shots
- Varying effectiveness between individuals

II. Serotherapy

1. Definition

Serotherapy is a passive treatment method involving the injection of preformed antibodies to quickly neutralize an infectious agent or toxin.

2. Objective

- Provide immediate but temporary protection.
- Used in emergency situations after exposure to an infection or toxin.

3. Sources of Antibodies

- Human serum (recovered patients, plasma).
- Animal serum (horse, rabbit… but may cause allergic reactions).

4. Examples of Use

Snakebite: antivenom serum

Tetanus: anti-tetanus immunoglobulins

Rabies: anti-rabies immunoglobulins (alongside vaccine)

Hepatitis B: post-exposure immunoglobulins

5. Advantages and Limitations

✓ Advantages:

Fast-acting

Useful for immunocompromised individuals

✗ Limitations:

No immune memory

Short duration of protection

Risk of allergic reaction (especially with animal sera)

Comparison: Vaccination vs Serotherapy

Criteria	**Vaccination**	**Serotherapy**
Type of immunity	Active	Passive
Onset of action	Slow (days to weeks)	Immediate
Duration	Long-term	Short-term
Immune memory	Yes	No
Purpose	Prevention	Emergency treatment