

# Immunity and Immunological Products

Presented by-Suman Bampal  
Lecturer pharmacy  
Govt polytechnic,  
pithuwala Dehradun

# Introduction


- Immunology is the science which deals with immunity or resistance to body infection .
- The lack of ability to resist infection is called susceptibility
- Preparations use to produce immunity are called immunological preparations

# Factors affecting immunity

1. **Phagocytosis** : ingestion of microorganisms by certain cells (Phagocytes ) of the body whereby they are rendered harmless .


It is caused by - W.B.C (leucocytes), Cells of R.E.S

2. **Antibody production** : these are highly specific in nature and attack microorganism or toxins .

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- Antibodies are proteins mainly globulins produced in lymph nodes by the cells of R.E.S
  - Nature of antibodies depends upon the manner in which microorganism produce their harmful effect
  - **Bacteria producing exotoxins** - antitoxins
  - **Bacteria producing endotoxins** – these antibodies are named according to their mode of action

# Antigen-Antibody Reaction

Antigen	antibody	nature of reaction
Exotoxin	Antitoxin	Neutrization
Bacterial cells	Agglutinin	Agglutination
Endotoxin	precipitin	precipitation of toxin
Bacterial cells	Bacteriolysin * Opsonins	Lysis of cells . Makes pathogens more susceptible to phagocytosis

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- Bacteria + Specific Bacteriolysin – no lysis
  - Bacteria + Complement – no lysis
  - Bacteria + Specific Bacteriolysin + Complement – lysis of the bacteria.

# immunity

## 1. Natural immunity

(God gifted)

a .Species

b . Race

c. individual

d. Age

## 2. Acquired immunity

(acquired due to antibodies production)

**active**

(slowly produced but long lasting)

**Naturally acquired**

(after infection)

**Artificially acquired**

(due to admin. of vaccines or antigens)

**passive**

(quickly prod.  
but short lived)

**Naturally acquired**

( from mother through placenta)

**Artificially acquired**

(by admin. of serum)

# 1. Natural Immunity

- **Species** – e.g. Tuberculosis is very fatal to guinea pig but not fatal to man.
- **Races** – e.g. Negroes have high resistance to yellow fever .
- **Individuals**
- **Age**




## 2.Acquired Immunity

- **Active Immunity** – due to stimulation of the individuals antibody producing cells .
- **Passive immunity** – by readymade antibodies .

# Active immunity

1. **Naturally acquired active immunity** : e.g. Diphtheria , smallpox and poliomyelitis (high degree of immunity)
2. Influenza , pneumonia and gonorrhea ( short degree of immunity)


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- Artificially acquired active immunity – by vaccines which are antigens either microorganism / products .
  - These are two types –
  - A) Toxoids ( bacterial exotoxins ) – e.g. Tetanus toxoid , staphylococcus toxoid .
  - B) Suspensions of microorganism.

# Passive immunity

- **Naturally Acquired** – mother to foetus ( chickenpox , measles . Upto 6 months).
- **Artificially produced** – e.g. Human normal immunoglobulin injection , measles antibodies .
- These readymade antibodies called antisera , sera or immune sera .
- **Official products of sera –**
- **A) antitoxins to exotoxins** , e.g. Diphtheria antitoxin
- **B) For endotoxin** , eg. Laptospira antisera .
- **C) antiviral antibodies** , e.g. Rabies antiserum .

# Related terms used in immunity

- **Pathogens** : these are the infection causing microorganisms.
- **Antigens** : these are the substances which stimulate the body to produce antibodies.
- **Antibodies** : these are the substance formed in the body in response to stimulation by antigens.
- **Toxins** : these are the poisonous substance produced by pathogenic microorganisms lead to infection or disease.

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- **Exotoxins** : toxins diffuse freely through the bacterial cell wall into the blood or the medium .
  - **Endotoxins** : retained within the bacteria .& released only when the cells die and start disintegrating.
  - **Antitoxin** : substance containing antibodies produced by the blood which specifically neutralized the toxins produced by particular microorganisms.

- **Sera or immune sera** : A clear fluid separate from blood when it clots known as serum. Serum contains antitoxic antibodies known as antitoxic serum.
- **Toxoids** : The toxins whose toxicity has been removed by gentle heat or by chemical treatment but their antigenic properties are retained .
- **Vaccines** : Administered in the body to produce resistance against infectious diseases. They are mainly used as prophylactic treatment. May contain living , attenuated or killed bacteria , viruses or rickettsia.

# Forms of vaccines

- **Simple Vaccines:** only one species of microorganism. E.g., plague vaccine , from – *Pasteurella pestis*.
- **Mixed Vaccines:** two / more species of microorganism. E.g. , typhoid - paratyphoid A and B vaccine , one from *Salmonella typhi* and two from *Salmonella paratyphi*.

on the basis of strains in preparation

- **Univalent Vaccine:** only one strain of species , e.g., yellow fever vaccine
- **Polyvalent Vaccines :** two or more strain of same species , e.g., cholera vaccine from two main strain of *Vibrio cholerae* , Inaba and Ogawa.
- poliomyelitis , from types I , II and III of poliomyelitis virus.



# Immunological preparations

- For the prevention of disease e.g. vaccines.
- For the treatment of disease e.g. antiserum.
- For diagnostic purposes e.g. bacterial toxins.

# Classification of immunological preparation

- Preparation for active immunity
- **A) bacterial vaccines.**
- living bacteria e.g., B.C.G vaccine
- Dead bacteria e.g., cholera , pertussis , plague and typhoid vaccine.
- **B) Viral and rickettsial vaccines**
- Killed rickettsial-e.g., typhus vaccine
- Living virus- e.g., measals , smallpox , polio and yellow fever .

- **C) Toxoids-** e.g., diphtheria , tetanus and staphylococcus.
- **Preparation for passive immunity-** antitoxin and antiserum . E.g., Diphtheria antitoxin , Gas gangrene antitoxin, Rabies antiserum etc.
- **Preparations for diagnosis containing bacterial toxins-**
- to identify immunity or susceptibility.
- To determine the degree of protection after immunization .
- To determine the presence of particular disease .
- **Official preparations**
- **1.** Schick test toxin , schick control and Tuberculin test.

# Schick test toxin

- Exotoxin from *Corynebacterium diphtheriae* with normal saline and borax boric acid buffer and diluted upto 0.2 ml
- Schick test control- it is schick test toxin of same batch but heated between 70-85 °C for five minutes .



## Storage of immunological products



Thank you