

# Immunology

## Important Questions

### Question # 1

Q: Define the following terms:

- Antigen
- Hapten
- Antibody
- Vaccination
- Allograft
- Transplantation
- Tolerance

Q1

- **Antibody:**

A secreted immunoglobulin from plasma cell which consists of heavy and light chains.

- **Vaccination:**

Deliberate induction of protective immunity to a pathogen.

Q2

- **Allograft:**

Transplant from one individual to another with a different genetic makeup, within the same species, eg., kidney transplant from one person to any other (except an identical twin). It is usually rejected unless the recipient is given immunosuppressive drugs.



Q1

- **Transplantation:**

The process of taking cells, tissues, or organs called a graft (transplant), from one part or individual and placing them into another.

- **Tolerance:**

A state of specific immunological unresponsiveness. An immune response to a certain antigen or an epitope does not occur, although the immune system is otherwise functioning normally.

Q2

- **Innate immunity:**

Non-specific defense mechanisms that come into play immediately or within hours of an antigen's appearance in the body.

- **Adaptive immunity:**

Immunity that an organism develops during lifetime. It develops after exposure to the antigens.

Q1) Define innate & adaptive immunity<sup>44</sup>  
(tabulate difference)

# Innate and adaptive immunity

## Innate Immunity

- Present at birth
- Non-specific immunity
- Independent of previous exposure to antigen
- No time lag
- No immunologic memory
- Provides first and second lines of defense

## Adaptive Immunity

- Develops during lifetime
- Specific immunity
- Develops after exposure to antigen
- A lag period
- Development of memory
- Provides third line of defense



# Innate and adaptive immunity

## Innate Immunity

- Physical barriers such as skin, gut Villi, lung cilia, etc
- Soluble factors include many protein and non-protein secretions
- Cells include Phagocytes, Natural Killer cells, Eosinophils

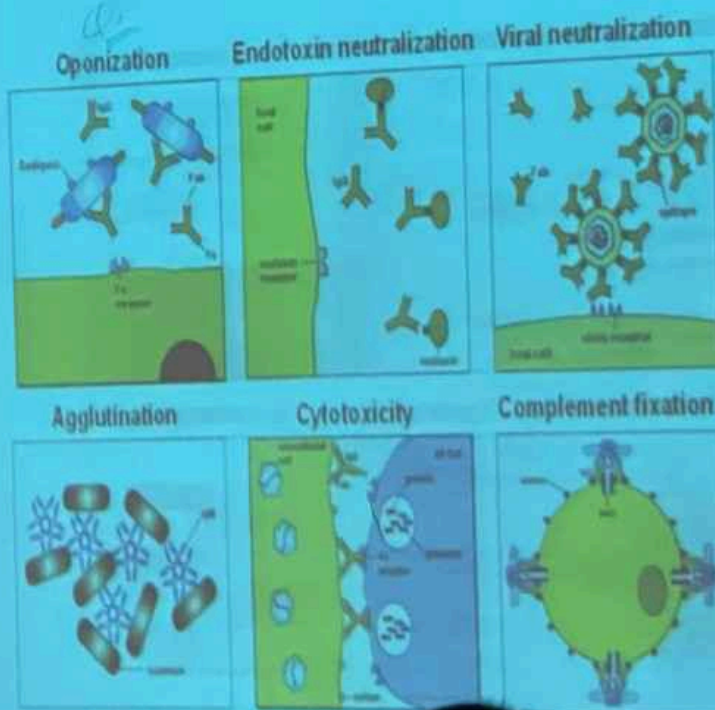
## Adaptive Immunity

- None
- Immunoglobulins (antibodies)
- T and B lymphocytes

## <sup>Qr</sup> Functions of Antibodies:

- i. Opsonization
- ii. Agglutination
- iii. Neutralization
- iv. Complement activation
- v. Inflammation
- vi. Antibody-dependent cell-mediated cytotoxicity (ADCC)

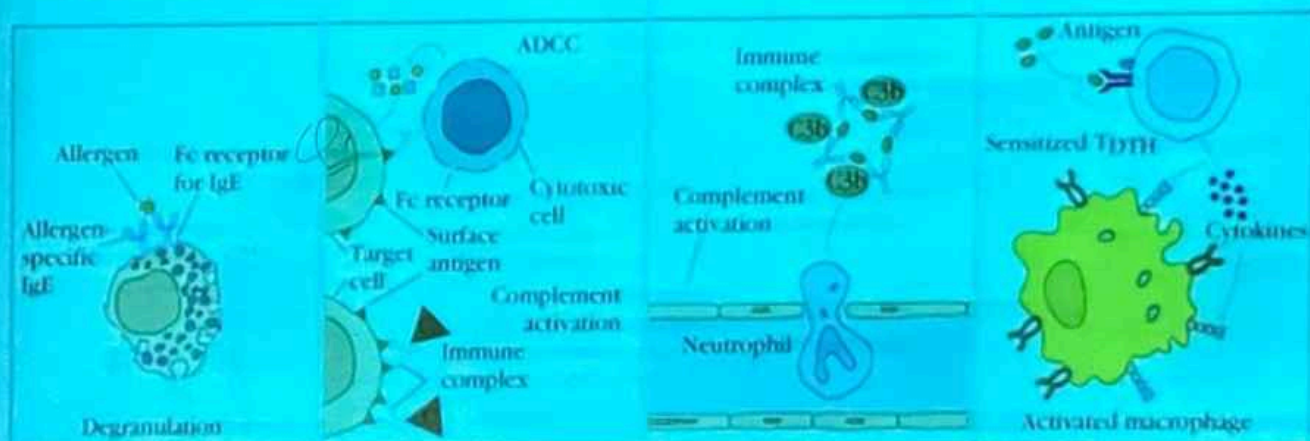
# IMMUNOGLOBULINS IN ACTION



## Question # 5

- Enumerate various types of Hypersensitivity reactions with two examples of each.
- In a tabulated form compare various Hypersensitivity reactions.

# Gel and Coombs classification of hypersensitivities.



Type I

IgE Mediated

Classic Allergy

Type II

IgG/IgM Mediated

Rbc lysis

Type III

IgG Mediated

Immune complex Disease

Type IV

T cell

Delayed Type Hypersensitivity



Type	Immune Mediator	Antigen	Mechanism
Type-I: Immediate/ Allergic/ Anaphylactic	IgE (mainly fixed on mast cells or basophils) <i>Q1</i>	Free and foreign (e.g., Pollens, House dust mites, Mold spores, Animal dander, Penicillins)	Release of mediators from mast cells and basophils
Type-II: Ab-mediated	IgM, IgG Abs against cell surface or tissue Ags	Fixed and intrinsic (e.g., Ag as a part of RBC membrane, or neutrophil or platelet)	-Opsonization and phagocytosis of cells  -Complement activation  -Fc receptor mediated recruitment & activation of leukocytes
Type-III: Immune complex mediated	Immune complexes of circulating Ags & Abs (IgM and IgG)	May be exogenous or endogenous but always free circulating	-Complement activation  -Fc receptor mediated recruitment & activation of leukocytes
Type-IV: T-cell mediated	-CD4 <sup>+</sup> T cells (Delayed Hypersensitivity) -CD8 <sup>+</sup> CTL (T-cell mediated lysis)	Exogenous or endogenous	-Macrophage activation, Cytokine mediated inflammation -Direct target cell lysis, -Cytokine mediated inflammation



Type	Time of Onset	Examples
Type-I: Immediate/ Allergic	Minutes <i>Q1</i>	Anaphylaxis, Hay fever, Urticaria, Asthma, Allergic rhinitis, Allergic conjunctivitis, Food allergies (nuts, shellfish, eggs, etc), Drug allergies esp Penicillin, Bee venom, Eczema (atopic dermatitis), Latex gloves
Type-II: Ab-mediated	Hours to days	ABO transfusion reactions, Rh incompatibility (erythroblastosis fetalis, hemolytic disease of the new born), Hemolytic anemia, Neutropenia, Thrombocytopenia, Grave's disease, Goodpasture's syndrome, Rheumatic fever
Type-III: Immune complex mediated	2 to 3 weeks	Systemic lupus erythematosus (SLE), Rheumatoid arthritis (RA), Post-streptococcal glomerulonephritis, Serum sickness, Arthus reaction, Farmer's lung
Type-IV: T-cell mediated	2 to 3 days	Contact dermatitis, Poison oak/ivy, Tuberculin skin test reaction, Stevens-Johnson syndrome, Erythema multiforme, Acute graft reaction, Graft versus host disease