SNS COLLEGE OF ALLIED HEALTH SCIENCES

SNS Kalvi Nagar, Coimbatore - 35

Affiliated to Dr MGR Medical University, Chennai

DEPARTMENT: ALLIED HEALTH SCIENCES

COURSE NAME: Pathology

Topic: Hypersensitivity Reaction

Introduction

- **Hypersensitivity** (Immunological reaction) refers to undesirable immune reactions produced by the normal immune system.

- **Hypersensitivity reactions**: When an immune response result in exaggerated OR inappropriate reactions harmful to the host the term hypersensitivity OR allergy used.

- **Hypersensitivity reactions**: four types; based on the mechanisms involved and time taken for the reaction, a particular clinical condition (disease) may involve more than one type of reaction.

Types

Classification of Hypersensitivity

- Type I
- Type II
- Type III
- Type IV

Type I, II and III Type - Antibody Mediated

Type IV- Cell Mediated

Classification of Immunoglobulin reaction

- Type I: reaction mediated by IgE antibodies.
- Type II: cytotoxic reaction mediated by IgG or IgM antibodies.
- Type III: reaction mediated by immune complexes.
- Type IV: delayed reaction mediated by cellular response.

Type	Mediator	Reaction
I	IgE (Rarely IgG4)	Immediate
II	IgG, IgM (Cell-Ag)	Cytotoxic
III	Ag-Ab complexes	Immune complex
IV	T cells	Cell-mediated or delayed

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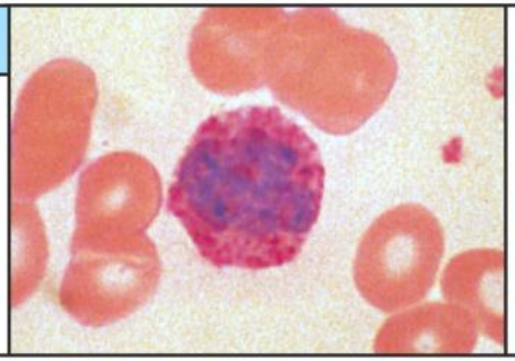
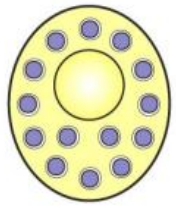
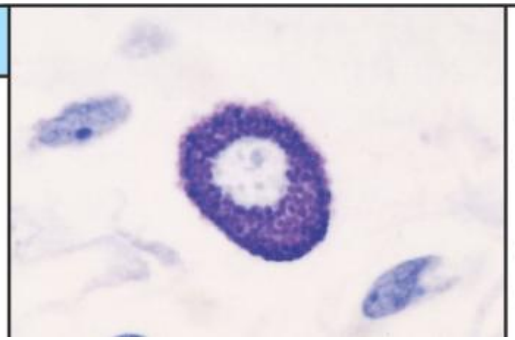
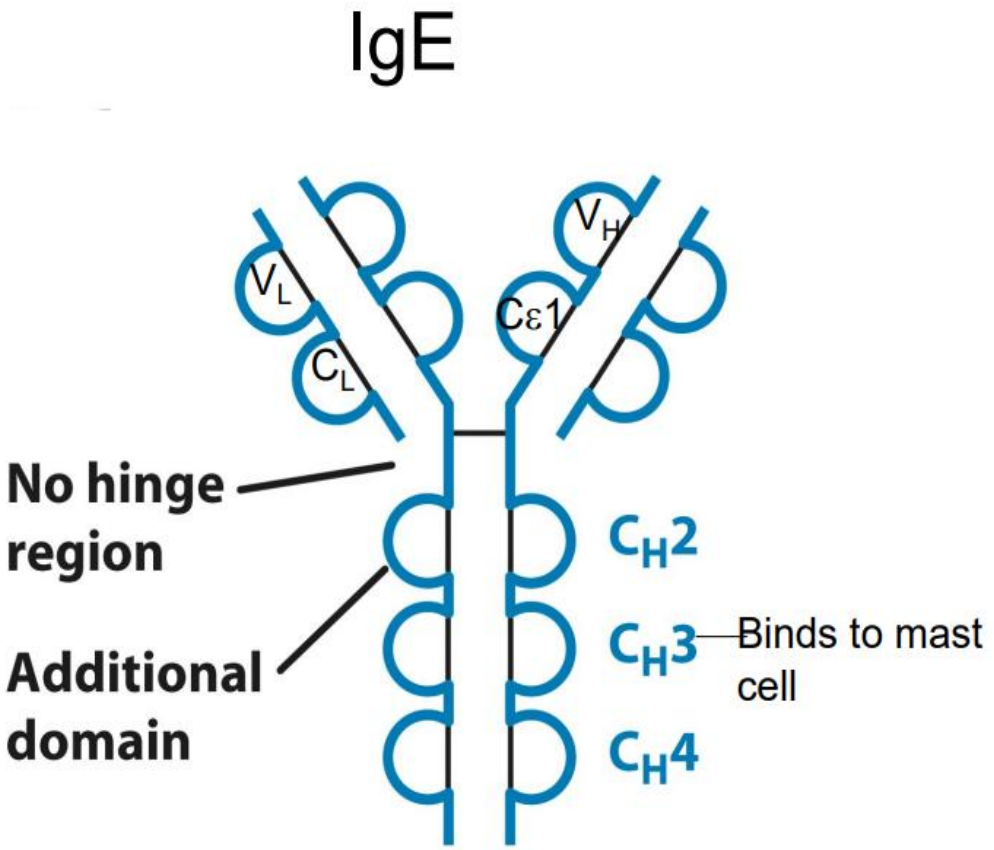
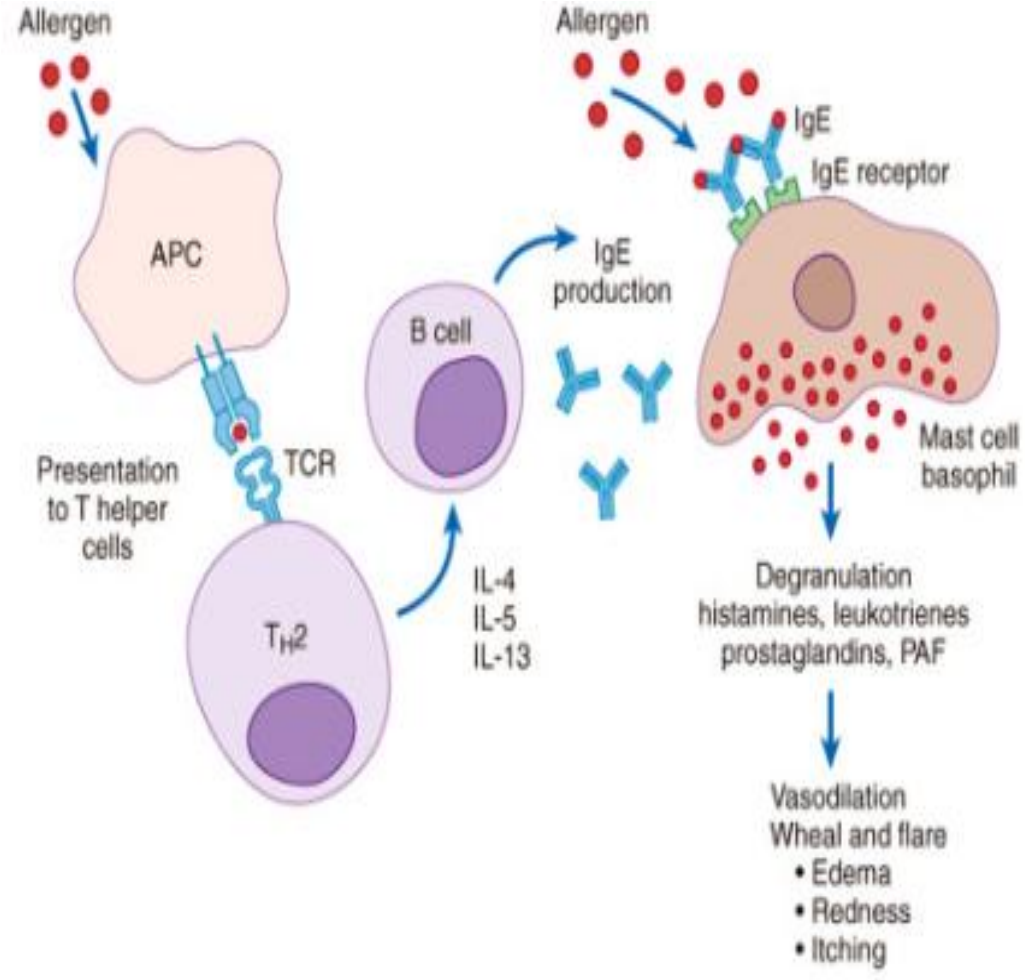
Cell - Type I		Activated function
Basophil 		Produce effector molecules Capable of ingesting foreign Particles Association with parasite infection
Mast cell 		Release of granules containing histamine and other active agents



Type I (Immediate) Hypersensitivity

- Type I hypersensitivity is also known as an **immediate reaction**
- **immunoglobulin** involves immunoglobulin E (IgE) mediated release of antibodies against the soluble antigen.
- **Substance released** This results in mast cell degranulation and release of histamine and other inflammatory mediators.
- Eg- allergic bronchial asthma



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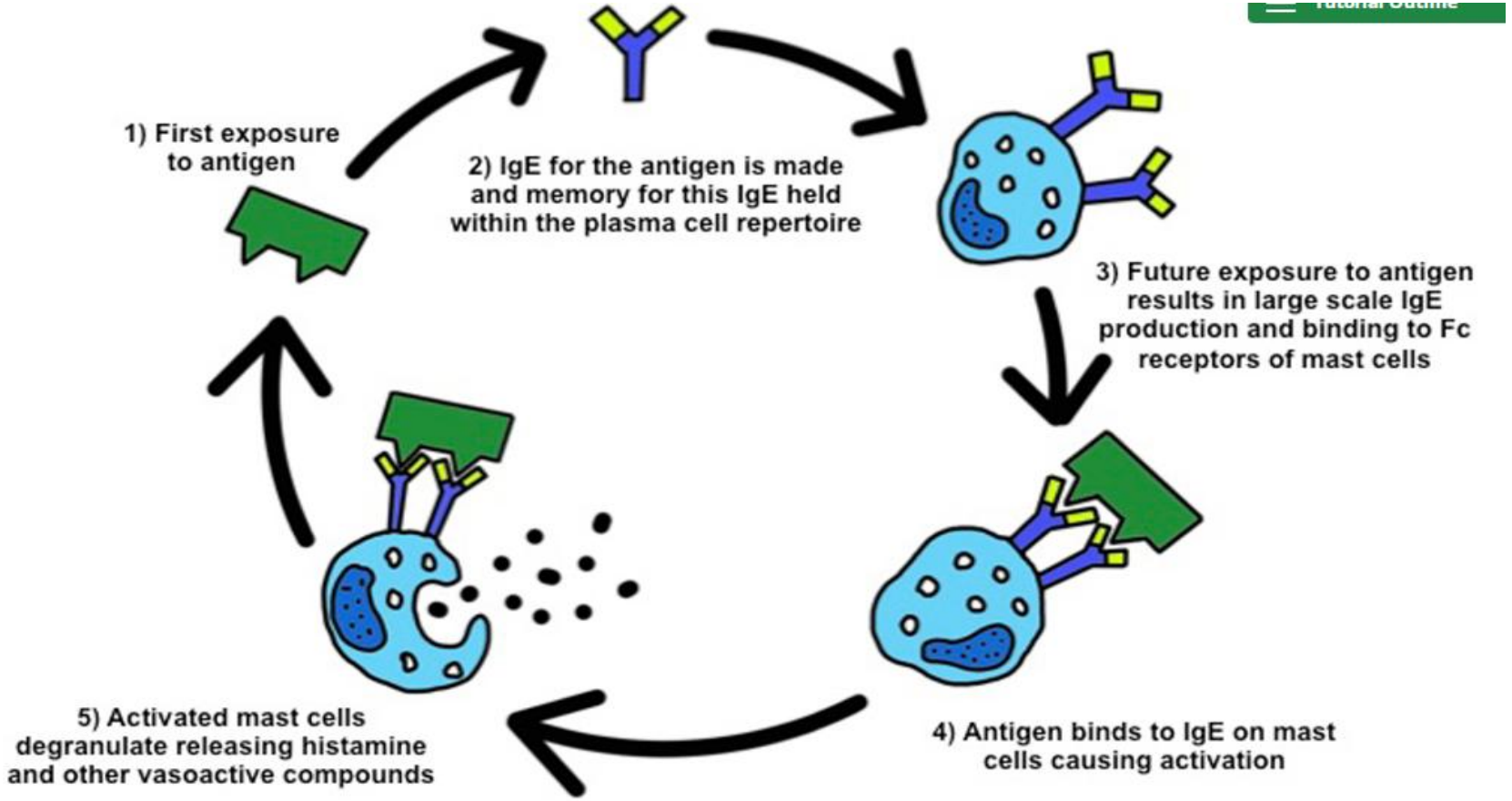
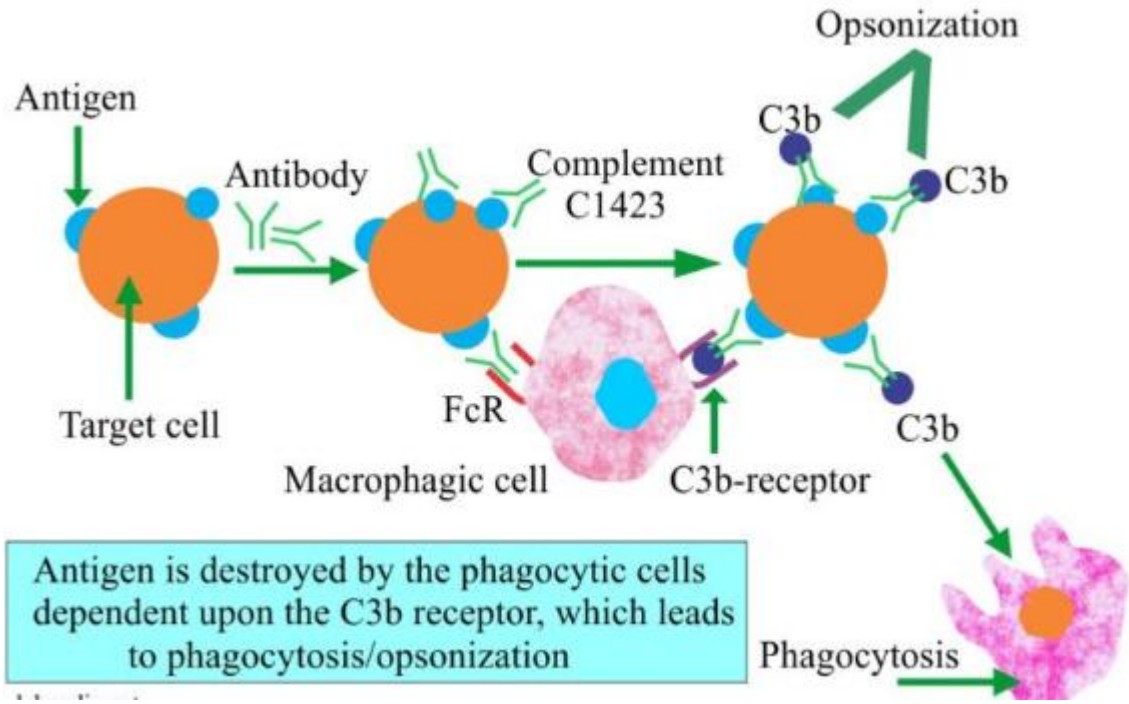

1) First exposure to antigen
2) IgE for the antigen is made and memory for this IgE held within the plasma cell repertoire
3) Future exposure to antigen results in large scale IgE production and binding to Fc receptors of mast cells
4) Antigen binds to IgE on mast cells causing activation
5) Activated mast cells degranulate releasing histamine and other vasoactive compounds

Type II Cytotoxic Hypersensitivity

- Type II hypersensitivity reaction refers to an **antibody-mediated immune reaction**
- **Antigen:** It is present or is a part of the cell membrane
- **Antibody:** This is mainly due to IgG and occasionally IgM. Rarely IgA can give this reaction.
- **The effector cells** are macrophages, neutrophils, eosinophils, and NK (natural killer) cells.
- Eg –graves disease



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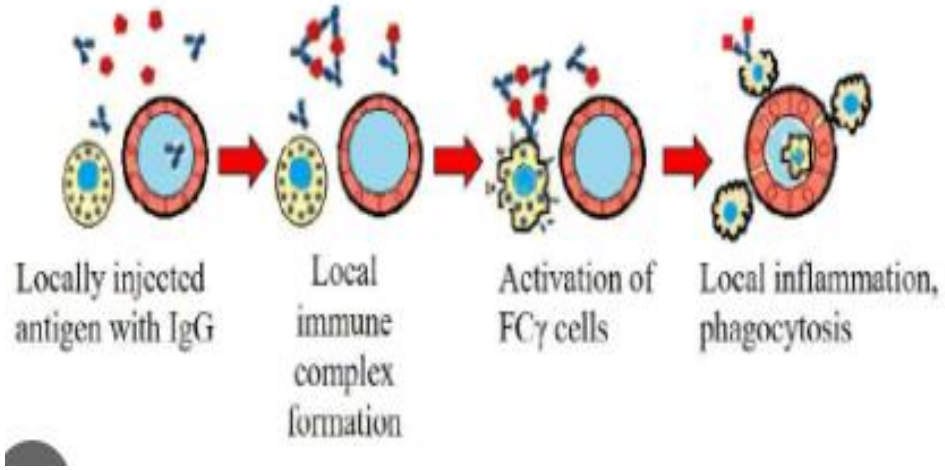
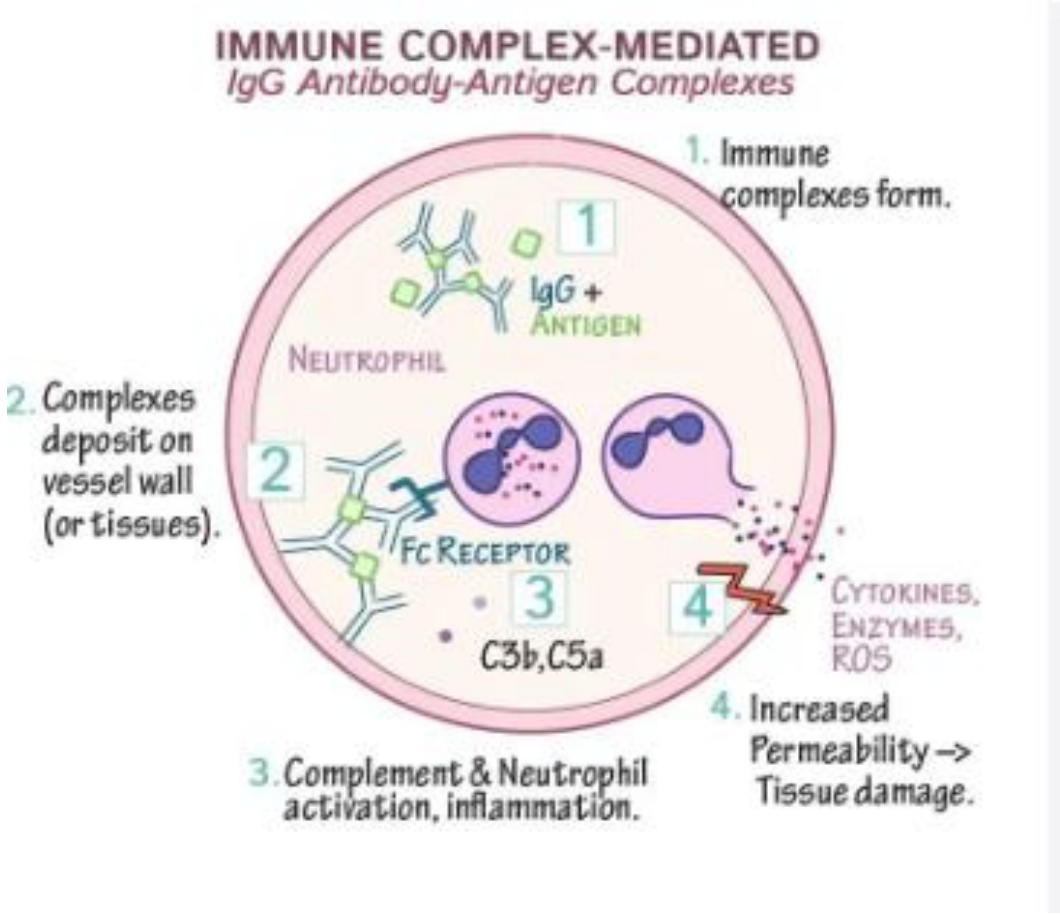
- **Mechanism**
- Complement activation:
  - The antibody attaches to Antigen on the surface of cells and activates the complement system, which leads to lysis.
- Antibody-dependent cellular toxicity (ADCC):
  - Sometimes Antibody is attached to Antigen on the cell surface will bring this complex near to NK cells or other phagocytic cells possessing the Fc-Receptor and leads to antibody dependant cellular cytotoxicity (ADCC).
- Opsonization and phagocytosis:
  - The antibody binds to an antigen and makes it a target for phagocytosis, and this process is called opsonization.

Type III(Immune complex mediated hypersensitivity)

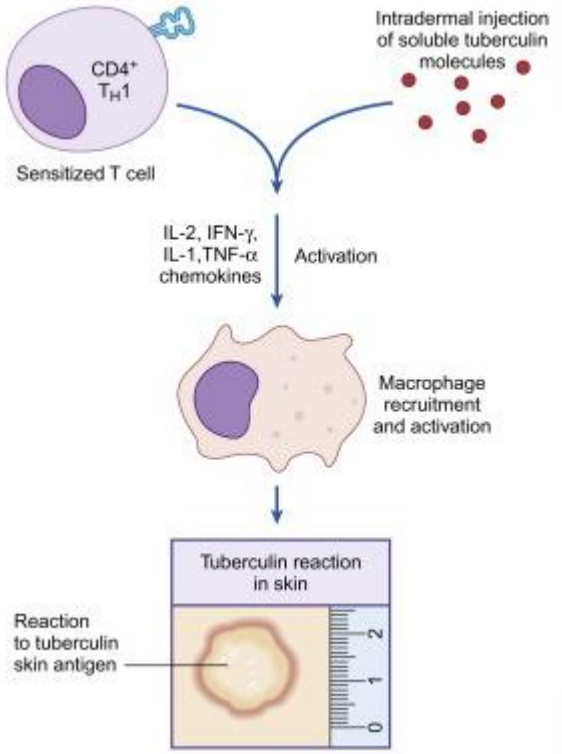
- is a type of immune response in which antigen-antibody complexes accumulate in the tissues and cause inflammation and tissue damage. This type of hypersensitivity is also known as immune-complex-mediated hypersensitivity.
- Eg-Goodpasture syndrome

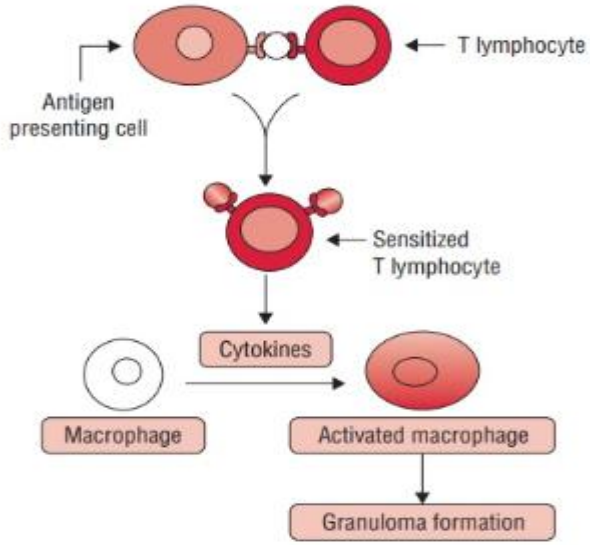




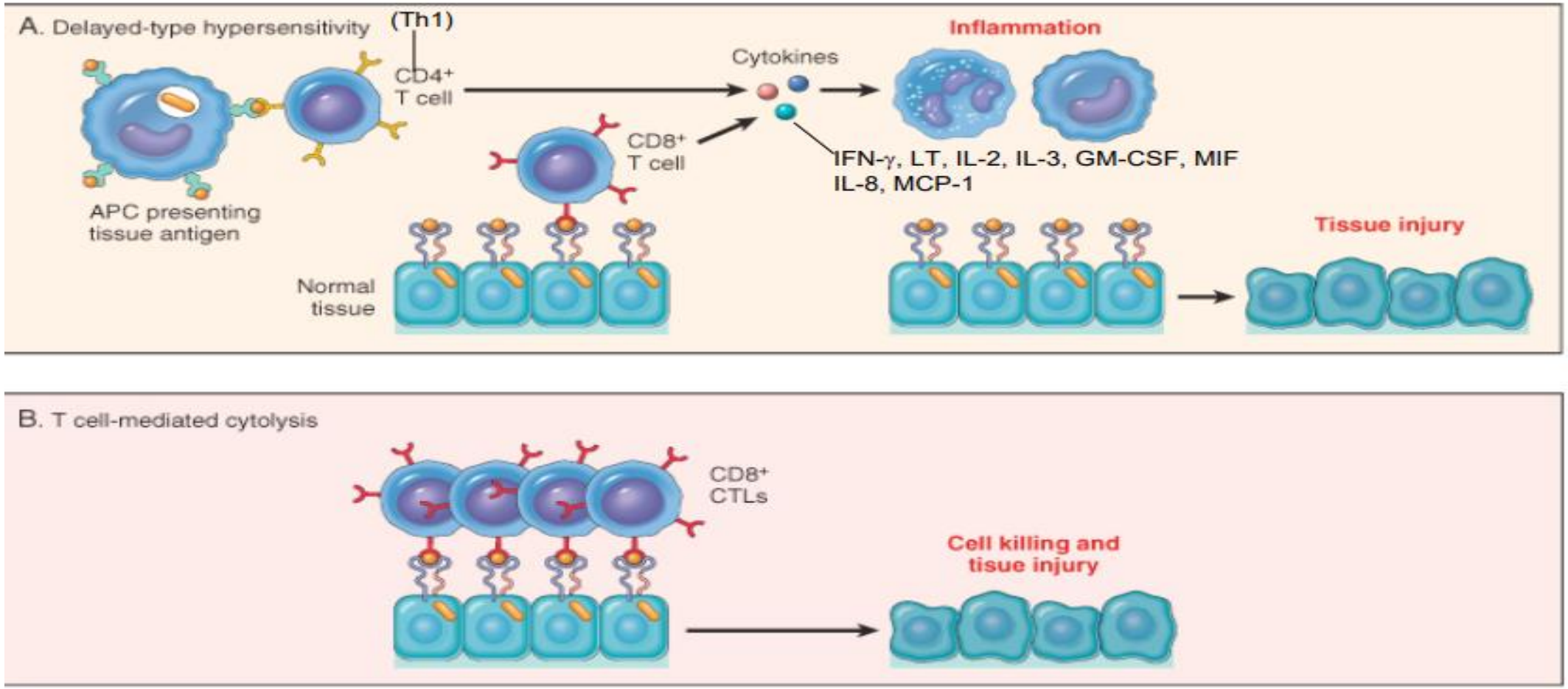
Type IV delayed hypersensitivity

- Type IV hypersensitivity is a type of delayed-type immune response, in which the immune system responds to an antigen several hours or days after exposure. It is also known as cell-mediated hypersensitivity because tissue damage involves T cells.
- **Mechanism of** Delayed-type hypersensitivity (DTH) is defined as the recruitment of T cells into tissues to be activated by antigen-presenting cells to produce cytokines that mediate local inflammation. CD8+ T cells are now known to mediate DTH responses in allergic contact dermatitis, drug eruptions, asthma, and autoimmune diseases.
- Eg-HIV
- Leprosy





Type IV Hypersensitivity



Reference

- The Text Book of Pathology author Nithin chawla
- https://youtu.be/jXTW4F-8jd4?si=QQpY1nmmFSl77ZS2