

## Hypersensitivity



- **Hypersensitivity (Immunological reaction)** refers to undesirable immune reactions produced by the normal immune system.
- **Hypersensitivity reactions:** When an immune response results in exaggerated OR inappropriate reactions harmful to the host, the term hypersensitivity OR allergy is 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.

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## Classification of Hypersensitivity



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

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Type I, II and III → Antibody Mediated  
Type IV → Cell Mediated

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## Classification of Hypersensitivity



Table 1. Classification Of Immunologic Reactions (Gell And Coombs).

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

Note: This classification is an oversimplification.

Adapted from: Middleton E Jr., et al. Allergy: Principles and Practice. St. Louis: Mosby; 1998.

## Type I (Immediate) Hypersensitivity



- Commonly called allergy
- Mediated by IgE antibodies produced by plasma cells in response to stimulation of Th2 cells by an **antigens**.
- The antigens that stimulate it are called allergens (i.e. House dust, Pollens, Cosmetics, Insects, Clothing and Drug)
- Exposure may be ingested, inhalation, injection or direct contact.
- Type I hypersensitivity reactions can be systemic (e.g., systemic anaphylaxis) or localized to a specific target tissue or organ (e.g., allergic rhinitis, asthma).

## Type II (Cytotoxic) Hypersensitivity



- Cytotoxic
- Type II hypersensitivity involves IgG or IgM antibody-mediated
- IgM or IgG immunoglobulin react with cell-surface antigens to activate the complements system and produce direct damage of the sell surface.
- Transfusion reactions and hemolytic disease of the newborn are examples of type II hypersensitivity.

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## Type III (ICM) Hypersensitivity



### Type III (Immune Complex–Mediated) Hypersensitivity

- Type III hypersensitivity is also known as immune complex hypersensitivity.
- The reaction may take 3 - 10 hours after exposure to the antigen (as in Arhus reaction).
- The reaction may be general (e.g., serum sickness) or may involve individual organs including or other organs.
- Antigens causing immune complex mediated injury are:
  - Exogenous
  - Endogenous

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## Type III (ICM) Hypersensitivity



### Mechanism of Type III Hypersensitivity

- Antigens combines with antibody within circulation and form immune complex
- Wherever in the body they deposited
- They activate compliment system
- Polymorphonuclear cells are attracted to the site
- Result in inflammation and tissue injury

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## Type III (ICM) Hypersensitivity



### Hypersensitivity Type III Reactions

#### Local Reactions

##### ❖ Arthus Reaction:

- ✓ It is named for Dr. Arthus.
- ✓ Inflammation caused by the deposition of immune complexes at a localized site.
- ✓ Clinical Manifestation is :  
Hypersensitivity Pneumonitis

#### Systemic Reactions

##### ❖ Serum Sickness:

- ✓ Systemic inflammatory response to deposited immune complexes at many areas of body.
- ✓ Few days to 2 weeks after injection of foreign serum or drug it results in :  
Fever, Urticaria, Artheralgia,  
Eosinophila, Spleenomegally, and  
Lymph adenopathy

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## Type IV (Cell Mediated) Hypersensitivity

### Mechanism of Type IV Hypersensitivity

- **Activated T Lymphocytes**
  - Release of cytokines and macrophage activation
  - T-cell mediated cytotoxicity

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## Type IV (Cell Mediated) Hypersensitivity

### Type IV (Delayed or Cell-Mediated) Hypersensitivity

- Delayed hypersensitivity is a function of **T Lymphocytes, not antibody.**
- It starts hours (or Days) after contact with the antigen and often lasts for days.
- It can be transferred by immunologically committed (Sensitized) T cells, not by serum.
- Principal pattern of immunologic response to variety of intra cellular microbiologic agents
  - i.e.: Mycobacterium Tuberculosis
  - Viruses
  - Fungi
  - Parasites

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