Hypersensitivity reactions

Definition:

Hypersensitivities (also known as hypersensitivity reactions) are exaggerated or inappropriate immune responses to substances that are normally harmless, such as dust, food, or pollen.

From an immunological point of view, these are diseases caused by effectors of the adaptive immune system: allergic diseases and autoimmune diseases

It is necessary to distinguish between allergic hypersensitivity, which results from the involvement of antibodies and T lymphocytes, and non-allergic hypersensitivity, which involves effectors of innate immunity such as non-specific receptors (PRRs).

Classification of hypersensitivities:

Type I Hypersensitivity (Immediate)

1. Definition:

It refers to a set of clinical manifestations induced by an abnormal, excessive, and inappropriate response to a "non-toxic" substance called an allergen. It appears immediately after exposure to the allergen and is specific (involving specific IgE). Allergy occurs in certain genetically predisposed individuals (presence of an atopic background).

- Target organs and tissues: Nasal mucosa, bronchi, and skin.
- Immune players: IgE + mast cells / basophils

- Type II Hypersensitivity (HSII): Cytotoxic

Also known as "cytotoxic hypersensitivity," it can affect a variety of organs and tissues, causing significant damage and impairment of their functions. The reaction time ranges from a few minutes to a few hours.

- This type of hypersensitivity is characterized by the involvement of two other classes of immunoglobulins: **IgG and IgM**, the **complement system**, **phagocytes**, and **NK cells**.

- The antigen is **membrane-bound or intracellular**.
- **Blood cells** (erythrocytes, leukocytes, and platelets) can be targets of reactions in this type of hypersensitivity.

Type III Hypersensitivity (HSIII): Semi-delayed

Hypersensitivity mediated by the deposition of immune complexes (ICs) in the vascular bed, within tissues, or in organs → Immune complex hypersensitivity.

Under normal conditions, these immune complexes are not pathogenic, but when they persist in circulation or in tissues, they can trigger an abnormal (harmful) inflammatory reaction.

- Immune players: IgG or IgM + soluble antigens

Type IV Hypersensitivity (HSIV): Delayed

6- Characteristics

Delayed hypersensitivity (HSR) differs from other types of hypersensitivity in two main features:

➢ The injection of the antigen into a sensitized individual leads to the appearance of a local reaction that manifests between the 24th and 48th to 72nd hour. This HSR is always localized in a tissue.

➢ The passive transfer from a sensitized animal to a naive animal occurs only through T cells (LT) and not through serum. It is a cell-mediated hypersensitivity.

HSR is involved in:

Autoimmune diseases (contact dermatitis, type 1 diabetes, thyroiditis)

Responses to certain infections or foreign bodies: granuloma

Control of certain infectious diseases: tuberculous granuloma

Acute and subacute organ transplant rejection