Hypersensitivity

Hypersensitivity is an undesirable reaction produced by normal immune system. It includes allergy and autoimmunity.

Allergy is a pathological reaction of the immune system to external antigens - allergens , which exist normally in the environment (pollens, molds, animals, foods, insect stings, etc.). Allergens are substances usually protein in nature. Simple low molecular weight substances are only partial antigens (hapten), become a complete antigen in the body after binding with internal protein. The time lag before developing an allergic reaction is called the refractory period. Response time is the time at which the reaction develops after contact with an allergen. Allergic reaction may be localised (asthma) or systemic (anaphylactic shock).

Autoimmunity is a pathological reaction in which the immune system directly or indirectly targets and damages own cells. The effect may range from discomfort, organ damaging to fatality.

Etiology

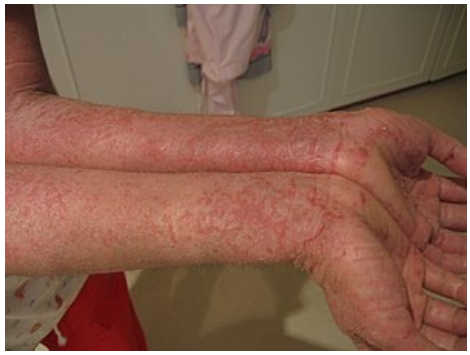
There is a strong genetic basis in developing hypersensitivity. Other causes may include infection.

Hypersensitivity type 1

This type of reaction is also indiscriminately called immediate hypersensitivity or allergy or atopy, even though the term atopy is usually used for describing genetic propensity to develop this hypersensitive reaction, in which person with this propensity is called atopic. An atopic patient may not undergo allergic reaction if not exposed to a particular allergen.

Mechanism

1. In the first exposure to an allergen, IgE is produced, presumably under the stimulation of T-Helper type 2.
2. These IgE is bound to the Fc receptor on mast cell. The mast cell is 'sensitized' against the allergen.
3. Subsequent exposure to allergen results in degranulation of the mast cell, releasing its mediators, namely cytokines, vasoactive amines and eicosanoids - prostaglandin and leukotrines)
4. These mediators cause vasodilation, increased vasopermeability, tissue damage and smooth muscle contraction. This is called early phase reaction.
5. Other mediators, especially cytokines recruit other inflammatory cells to the site of reaction. This is called late phase reaction.



Atopic eczema.

Clinical example

Asthma and anaphylaxis

Hypersensitivity type 2

This type of hypersensitivity is also called antibody mediated hypersensitivity.

Mechanism

There are a few ways in which antibody can cause hypersensitivity reaction, including:

- IgM and IgG against self-antigens (autoantibodies) of the extracellular matrix or cell surface triggers the classical pathway of complement activation.
- Autoantibodies against self antigens function as opsonin for phagocytes.
- Autoantibodies act as ligands for receptors (in Grave's disease)

Autoantibodies are formed as a result of failure of tolerance (central and peripheral tolerance). In some cases, antibodies are formed after infection, such as in post-streptococcal endocarditis, in which antibodies used against streptococcus becomes cross reactive also against endocardium (rheumatic fever).

Clinical example

- Autoimmune hemolytic anemia
- Goodpasture's Syndrome
- Grave's disease, myasthenia gravis.

Hypersensitivity type 3

This is also called immune-complex mediated hypersensitivty.

Mechanism

In some people, in relation to post-streptococcal endocarditis, the antibodies that is formed against streptococcus forms immune-complex that is deposited in vascular membrane, especially the glomerulus. This may also activate the complement system or become target of phagocytes, causing damage to the vessel wall and ultimately the organ itself (the kidney).

Clinical example

Systemic lupus erythematosus, post-streptococcal vasculitis, post-streptococcal glomerulonephritis

Hypersensitivity type 4

This is also called the T-cell mediated hypersensitivity. It is further divided to:

1. Delayed type hypersenstivity (mediated by CD4+ and CD8+T cells)
2. T-cell mediated cytotoxicity (mediated by CD8+ T cells) - in this reaction, T-cytotoxic cell specific for autoantigen on host cells may directly kill these cells.

Delayed type hypersensitivity

APC or tissue antigen (autoantigen) activate/sensitize CD4+ and CD8+ T cells, causing them to secrete cytokines. This cytokines recruits and activates phagocytes, as well as inducing local inflammation. Ultimately, tissue injury occurs.

Clinical examples: Contact dermatitis, rheumatoid arthritis, mantoux test.

Links

Related articles

- Oral Tolerance

External links

Sources

References

Bibliography

Further reading