



المناعة 1

IMMUNOGLOBULINS

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Third Stage

جامعة ساوة الاهلية

كلية التقنيات الصحية والطبية

قسم تقنيات المختبرات الطبية

المرحلة الثالثة

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الجانب النظري

Theoretical

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Immunoglobulins

Antibody (Ab), also known as an immunoglobulin (Ig), **Y** shaped protein produced mainly by **plasma cells** that is used by the immune system to **identify** and **neutralize** pathogens such as bacteria and viruses.

The Immunoglobulins are produced by plasma cells in response to **exposure to as antigen**.

They react specifically with that antigen in vivo or in vitro and are hence a part of the **adaptive** immune response-specifically, **humoral immunity**.

The antibodies belong to a class of protein called “**globulins**” due to their “globular structure”.

Antibodies present in the **γ -globulin fraction of serum** [when serum is subjected to electrophoresis (separation of proteins according to their charges in an electrical field), proteins which migrate faster to the anode (+ve) is called α -globulin, and β -globulin, while those migrate but slower, towards the anode is called γ -globulin].

Antibodies can be found in **blood plasma** and in **many body fluids** (e.g., tears, saliva, colostrum).

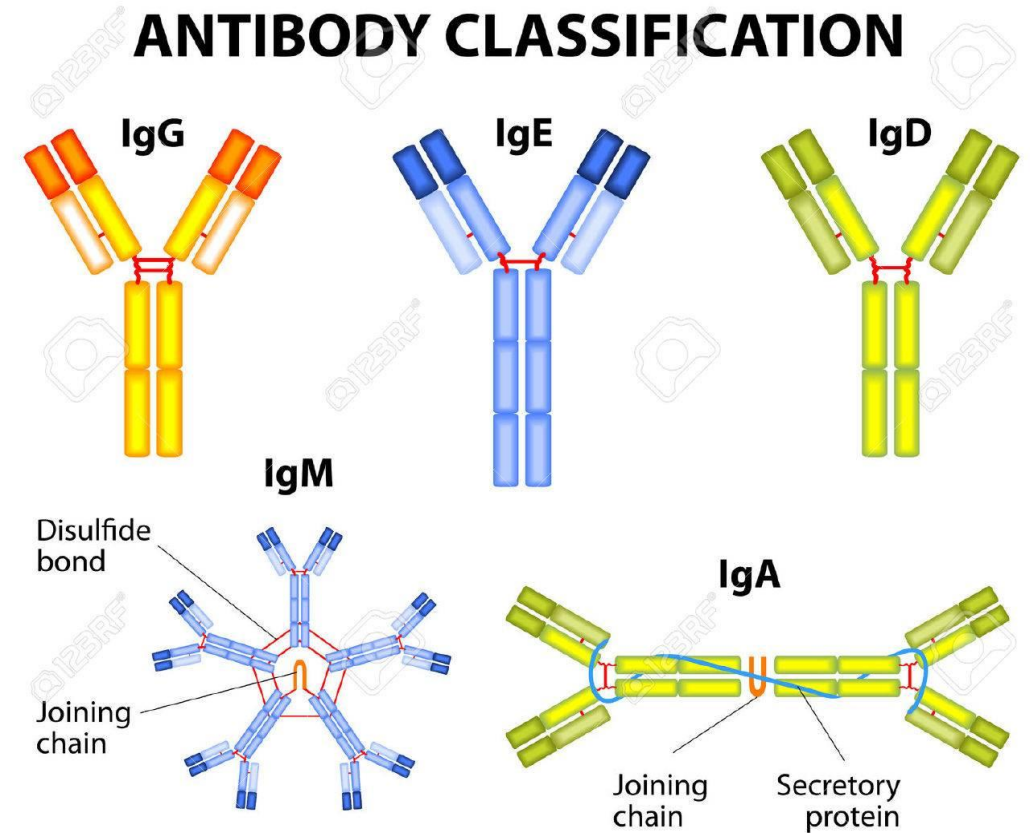
IMMUNOGLOBULINS STRUCTURE

- Antibodies are Y-shaped protein.
- All antibodies share a common structure of **four polypeptide chains**, consisting of **two identical light (L) chains** and **two identical heavy (H) chains**, the arms of the tip join with the tail by hinge region.
- **Each light chain** is bound to its partner **heavy chain** by a **disulfide bond** between corresponding cysteine residues, as well as by non covalent interactions between the VH and VL domains and the CH1 and CL domains. These bonds enable the formation of a closely associated heterodimer (H-L).

- Multiple disulfide bridges link the two heavy chains together about halfway down their length, and the C-terminal parts of the two heavy chains also participate in non covalent bonding interactions between corresponding domains.
- The antibody molecule forms a Y shape with two identical antigen-binding regions at the tips of the Y.
- Each antigen-binding region is made up of amino acids derived from both the heavy- and the light chain amino-terminal domains.
- The heavy and light chains both contribute two domains to each arm of the Y, with the non-antigen-binding domain of each chain serving to extend the antigen-binding arm.
- The base of the Y consists of the C-terminal domains of the antibody heavy chain.

Classification of Ab

Antibodies that contain different heavy chains belong to different **classes**, or **isotypes**, and are named according to their heavy chains (**IgM**, **IgD**, **IgG**, **IgE** and **IgA**).



Classes of Ig:-

1- IgG:- Have molecular weight 150000- 180000 dalton with sedimentation coefficient 7S , it is found in serum and in extravascular fluid like peritoneal and ascites fluid , this Ig is responsible for defensive mechanism against viral , parasitic and microbial infection.

It produce in high quantities, the concentration of IgG in serum is 1600 mg / dl this Ig is produced **during the secondary immune response** and found in different concentration in body fluid. IgG composed of 4 subunits.

2- IgM:- is responsible for the primary immune response, found in blood only (intravascular) with sedimentation coefficient 90S and the molecular weight of it is 900000 dalton so it is called macroglobulin composed of pentamer (5 subunits) of the basic 4 chain subunit held together by disulphide bonds with 7S and molecular weight 180000 dalton , the concentration of this Ig from 180-190 mg / dl.

This Ig produce during primary immune response , it is of limited defensive mechanism (capacity) . The function of IgM remain at least 3-4 day and then breakdown.

IgM is fixed the complement so it is effective agglutinating and cytolytic agent but it do not passing through placenta.

3- IgA:- present in intestinal secretion and bronchial secretion and nasal secretion , tears, saliva and colostrum .

It composed of 2 light chain and 2 heavy chain monomeric form is predominant in human serum , the dimer 11S is the most common form in secretion in all species of animals .

Disulphide bond link 2 monomers of IgA to a J-chain refer as (secretory piece).

IgA provide new born with Abs which will protect him before the synthesis of his own Ig.

There are two types of IgA:-

1- serum IgA

2- secretory IgA

Why the IgA not digest by proteolytic enzymes?

Because presence of J- chain in structure of it, so prevent it lysis or digest while the other protein in colostrums digest by the proteolytic enzyme.

IgA not presence in so much concentration in serum as IgG.

4- IgD:- immunological function is unknown, it is found in serum and in the lymphocyte (on the surface of B- lymphocyte with IgM) and in chronic lymphatic leukemia.

Operate as antigen receptor and control of lymphocytic activation and suppression.

5- IgE:- important in immunopathology , is responsible for immediate type of hypersensitivity reaction . anaphylactic shock , asthma , hay fever , urticaria.

IgE bind to basophil, mast cell and blood platelets this binding triggers the release of several mediators .

$\text{IgE} + \text{Ag} \rightarrow \text{IgE-Ag complex}$.

- Because the Ag cause allergy , so it called Allergin Allergy :- is reversible process , mean it does not cause death of mast cell (degranulation). IgE increase in parasitic infection with eosinophil . IgE act as opsonin which fix the ag by FC fragment on macrophage lead to phagocytosis

Thank
you!

