ANTIBODY : Structure and Function

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SYNOPSIS –

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2. History
3. Structure of Antibody
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   - sites of immunoglobulin
4. Immunoglobulin Domains
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5. Different classes and function of Ab
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1. Introduction -

- Antibody is a large protein, constitiutes γ-globulin produced by plasma cells.
- It is used by the immune system to identify and nutralize pathogens such as bacteria and viruses.
- Antibodies are also called Immunogloublins.
- The antibody recognizes a unique molecule of the harmful agent called ANTIGEN,via the variable region.

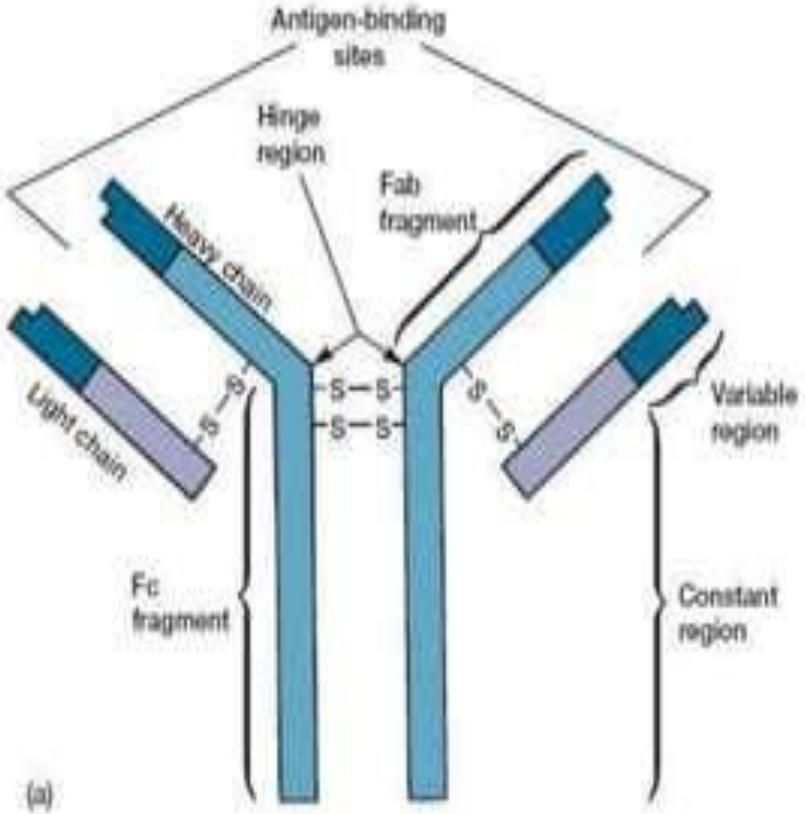
2. History

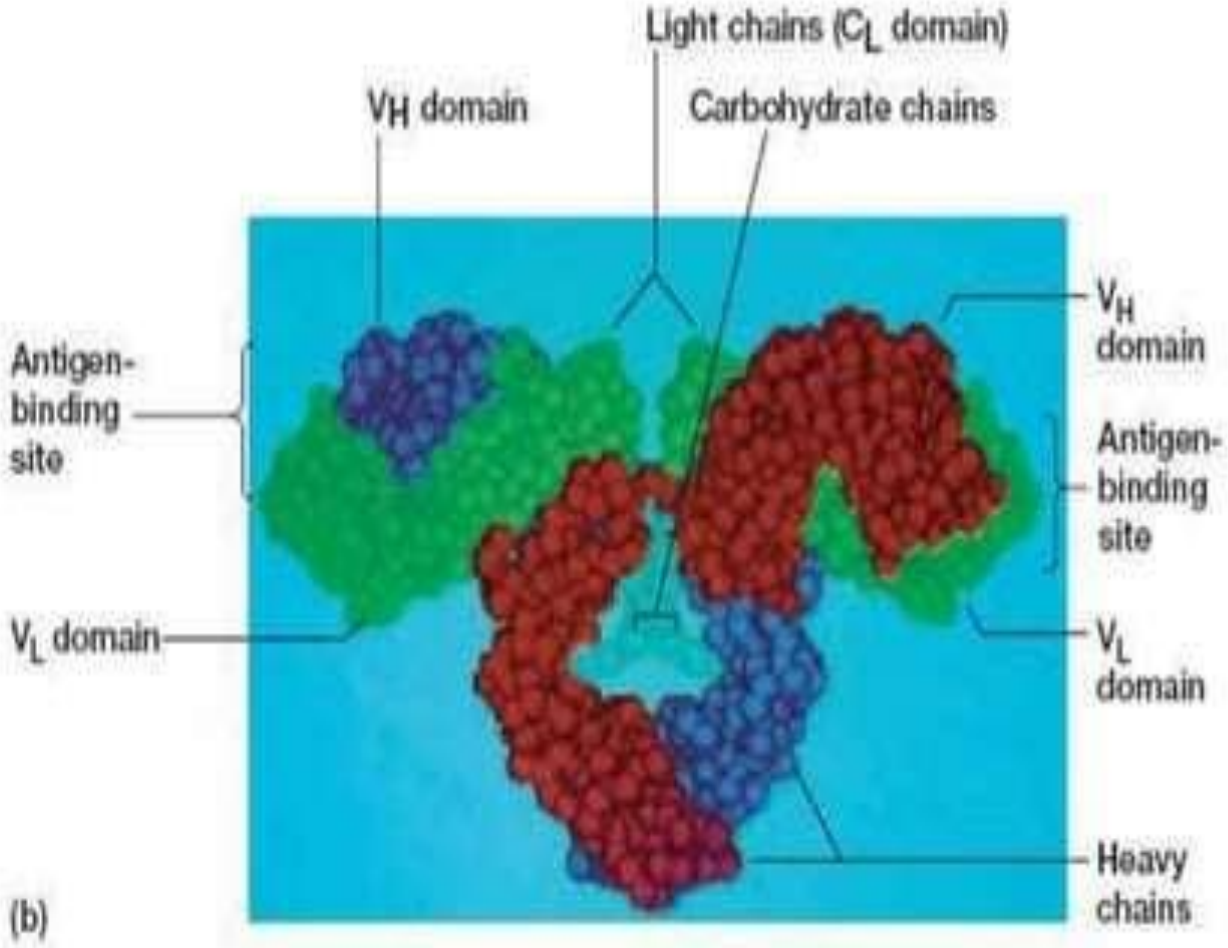
- By 1959 Gerald Edelman and Rodney Porter independently published the molecular structure of antibodies for which they were later jointly awarded the Nobel Prize in 1972.
- The first atomic resolution structure of an antibody fragment was published in 1973.

3. STRUCTURE

- All antibodies share a basic structure
- Antibodies are heavy globular plasma proteins[or] glycoproteins.
- The attached glycans are critically important to the structure and function of the antibody.
- Each antibody is heterodiamer with a molecularweight of approximately 150KD.

Basic structure of Antibody




Light chains (C_L domain)
V_H domain
Carbohydrate chains
Antigen-binding site
V_L domain
V_H domain
Antigen-binding site
V_L domain
Heavy chains
(b)

H2N
H2N
S–S
C1
VH
NH2
Heavy chain
NH2
Light chain
VL
CL
C2
CHO
CHO
C3
COOH
COOH

(c)

4. IMMUNOGLOBULIN DOMAINS

- Antibody is composed of two identical heavy polypeptide chains and two identical light chains, bonded via interchain disulphide[s-s] Linkages.
- Each chain is composed of structural domains called Immunoglobulin domains.
- These domains contains about 70-110 aminoacids.

HEAVY CHAINS

- Five types of heavy chains are present
- They are;1) alpha (α) 2) gamma (γ) 3) delta (Δ) 4) epsilon 5) mu (μ)

- Each heavy chain has two regions, one constant region and one variable region.

- Alpha and gamma chains contains approximately 450 aminoacids, where as mu and epsilon chains have approximately 550 aminoacids.

LIGHT CHAINS

- Two types of light chains are present
- They are; 1) kappa 2) lambda

- All antibodies have one of the two kinds of light chains.

- A light chain has two successive domains, one constant domain and one variable domain.

- The approximate length of a light chain is 211-217 aminoacids.

5. DIFFERENT CLASSES AND FUNCTION OF ANTIBODIES

- There are five classes of antibodies are present
- They are; 1) IgG 2) IgM 3) IgA
  4) IgD 5) IgE
- The antibody classes are named as correspond to their heavy chain types

1)IgG

- They makes up approximately 80% of the serum antibodies
- They has a half-life of 7-23 days
- IgG is a monomer and has 2-epitope binding sites
- This is the only class of antibodies that can cross the placenta and enter the fetal circulation

Functions

i. Immunity to new born
ii. Neutralisation of Toxins
iii. IgG_3 binds to Fc receptor by Phagocytosis

2)IgM

- They makes up approximately 13% of the serum antibodies
- They has a half-life of about 5 days
- Most of the IgM are pentamer and has 10 - epitope binding sites. some are monomer
- It is the first immunoglobulin class produced in a primary response to antigen

functions

i. Activation of classical pathway
ii. Defence against multivalent antigens
iii. Act as Opsonin

3)IgA

- They makes up approximately 6% of the serum antibodies
- They has a half-life of approximately 5 days
- IgA is a dimer and has 4-epitope binding sites
- They found mainly in body secretions such as saliva, mucous, tears, colostrum and milk

Functions

i. It as a Secretory antibody
ii. Effective against virus that causing Influnza
iii. Production to Infant gut

4)IgD

- They makes up approximately 0.2% of the serum antibodies
- IgD is a monomer and has 2-epitope binding sites
- This class antibodies are found on the surface of B-lymphocytes

Function

i. B cell activation.
ii. Act a receptor for antigen binding

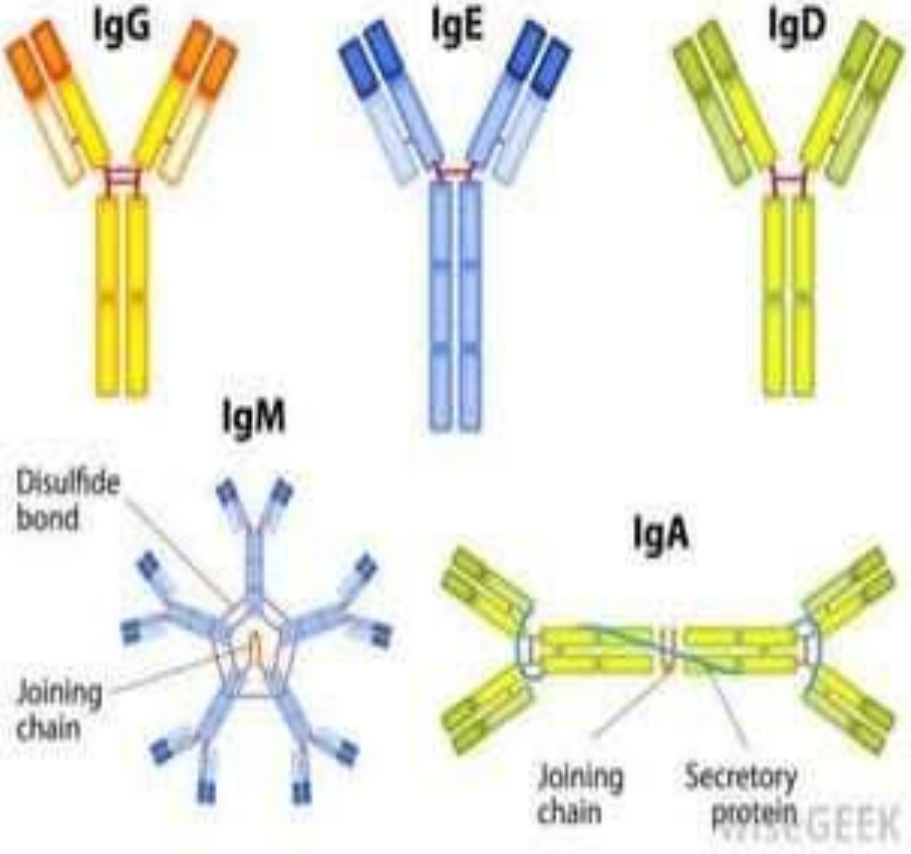
5)IgE

- It was discovered in 1966 by K. Ishizaka.
- It is very low concentration in blood(17-450ng/ml)
- It contain small percentage of Lympocytes

Functions

i. Responsible for Immediate hypersensitivity
ii. Binds to Fc receptor on basophils and mast cells
iii. Release of substance like histamine ,vasoactive mediators

Structures of Antibodies



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THANKYOU