ANTIBODY

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DEFINITION

- Antibodies are Protein molecules/ Globulins that react specifically with the specific Ag, that produced them
- Make up 20% of plasma proteins (Gamma globulins)
- Produced by plasma cells (B cells)
- 5 classes of antibodies;
  - IG G (IgG1, IgG2, IgG3, IgG4)
  - IG A (IgA1, IgA2)
  - IG M
  - IG D & IG E

PROPERTIES OF IMMUNOGLOBULINS

PROPERTIES		IgG	IgA	IgM	IgD	IgE
% OF Igs	75	15	09	0.2	0.004	
Serum con mg/dl		1000	200	120	03	0.05
Sediment coeffi		7s	11s	19s	7s	8s
Mol Wt (x1000)		150	170	900	180	190
Structure		Mono	Dimer	Penta	Mono	Mono
H- Chain	ɾ	α	μ	δ	€	
Complement fixation	+	-	+	-	-	
Transplacental passage		+	-	-	-	-
Allergy mediation		-	-	-	-	+
Secretions present		+milk	+mucus+m		-	-
Opsonization	+	-	-	-	-	
Ag receptar on B cell	-	-	+	-	-	
J chains in polymer	-	-	+	+	-	-

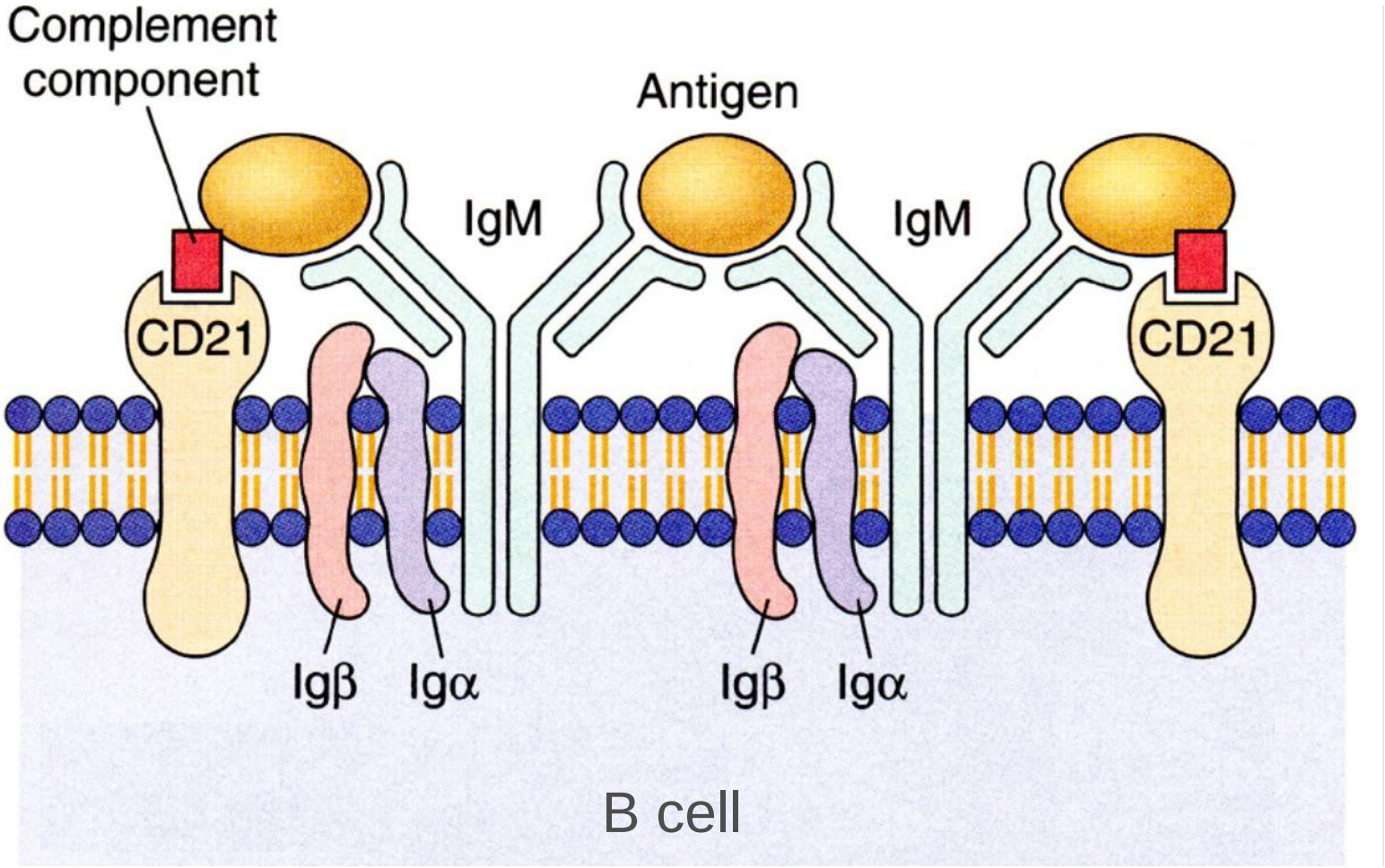
SECRETORY- Ig

- **Epithelial cells in intestine, tear ducts, salivary gland, lactating mammary gland do secrete antibody**
- **Secreted "IgA" forms a very important defence against infection in Resp; Tract & GIT**
- **"IgG also IgM" secreted into the external secretions.**

HUMORAL IMMUNITY & B LYMPHOCYTES

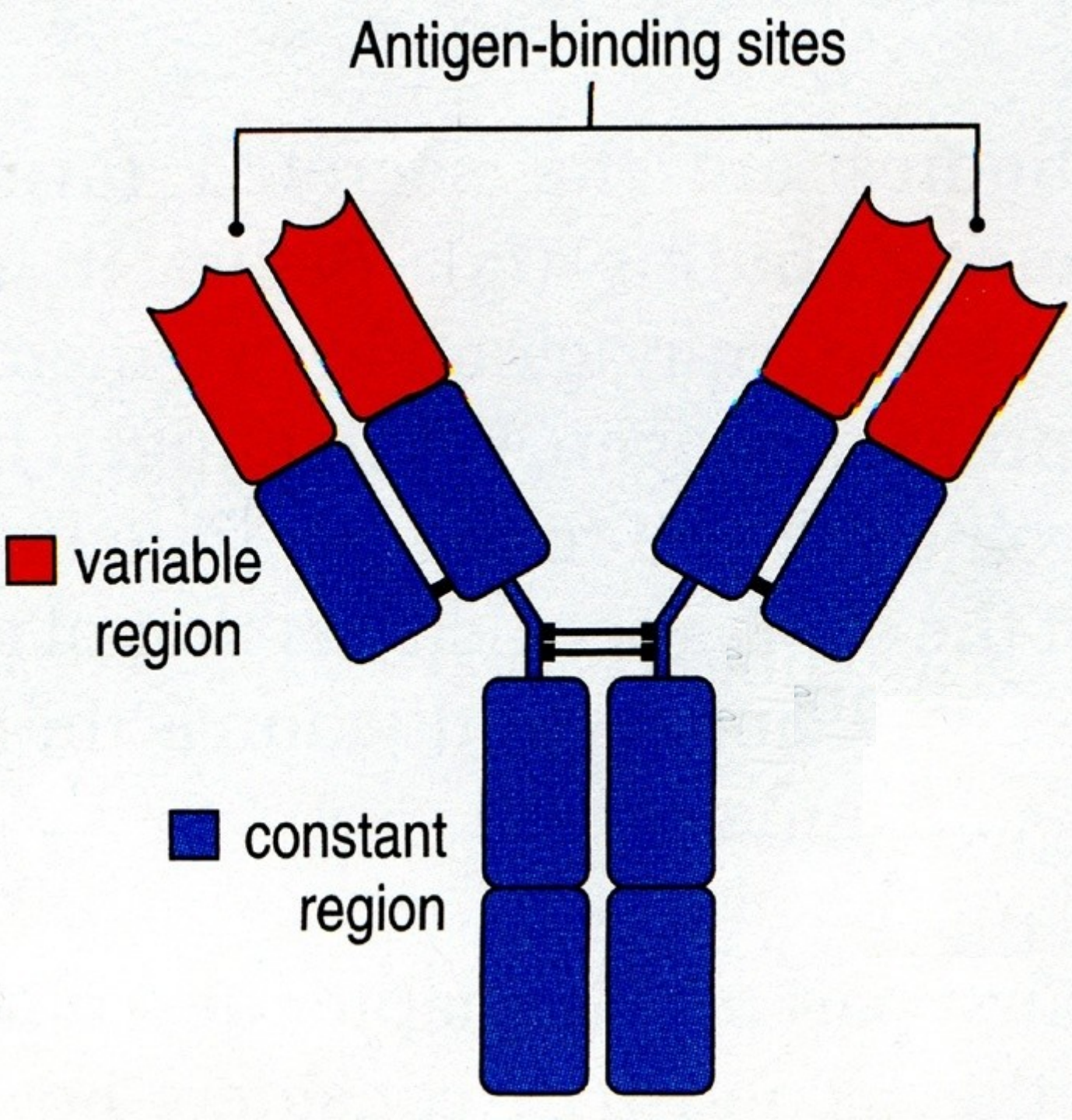
- B Lymphocytes Live in blood, bone marrow, lymphoid tissues (spleen/ LN)
- Activation of Lymphocyte by exposure to antigens (CD4+ T cell)
- B cells differentiate into plasma cells (that make antibodies)
- The antibodies kill the pathogens

B CELL RECEPTORS



STRUCTURE OF ANTIBODIES

- Y-shaped glycoprotein
  - 2 Light chains (k/l), mol wt 25,000,
  - 2 Heavy chains (r, u, a, e, d), mol wt 60,000
- Constant region forms the Fc fragmentfor;
  - Complement fixation
  - Binds to APC's
  - Defines class, (IgG Class: IgA,IgE)
- Variable regions forms the Fab (Ab binding site)
  - Binds to antigen
- Hypervariable region- the Ag binding site


Antigen-binding sites
variable region
constant region

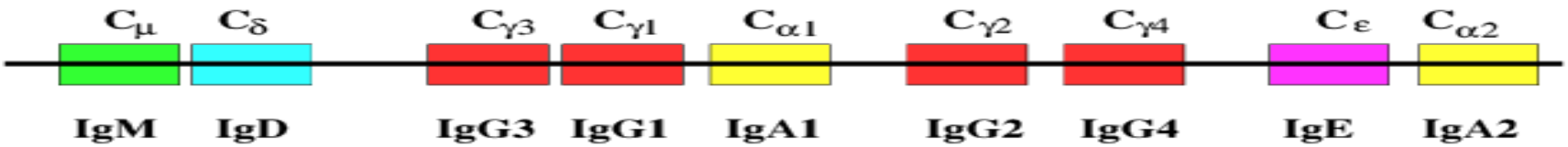
FUNCTIONS OF ANTIBODIES

1. Bind to – and “Neutralizes” – antigens
2. Coats “opsonizes” microbes, making them palatable to macrophages and neutrophils
3. Activate complement.

ANTIBODY DIVERSITY

- 10^6–10^9 (10,00,00,000) different antibody mol, so 10^9 distinct B cell clones in a single individual.
- Ig genes rearrange during B cell development (VDJC).
- DNA from mature B cells rearrange with excision of some DNA.

The arrangement of Ig heavy chain constant regions in man



antibody (sub)class produced

MONO/ POLYCLONAL Abs/ CHYMERIC Abs

- **Antibodies in animals are *Heterogenous & polyclonal*- formed by different plasma cells/ B cells**
- **Antibodies formed by a single clone of plasma cells in cancers (myeloma) are *homogenous & monoclonal*.**
- **In the lab the "hybridomas" make unlimited monoclonal antibodies**
- **Chymeric McAb; Fc portion is Human & Fab portion is from Mouse**

USES OF McAb

1. **Transplant related immuno-suppression; IL2 Ab for GVHD therapy**
2. **Autimmune disease; TNFa Ab for RA/ Crohn's disease**
3. **Prevention of infections; Resp; Syncitial Virus Ab, Prevents Pneumonia**
4. **Treatment of cancer; CD20 Ab (Rituximab), for Lymphoma/ Ca breast (Herceptin)**
5. **Blood group sera (Anti A/AntiB)**

ISOTYPE, ALLOTYPE/ IDIOTYPE

- ISOTYPE; Differnce in Fc- IgG/ IgM
- ALLOTYPE; Same Ab (IgG), but variant IgG1,2,3,4
- IDIOTYPE; Specific AA at Ag binding site of a single clone

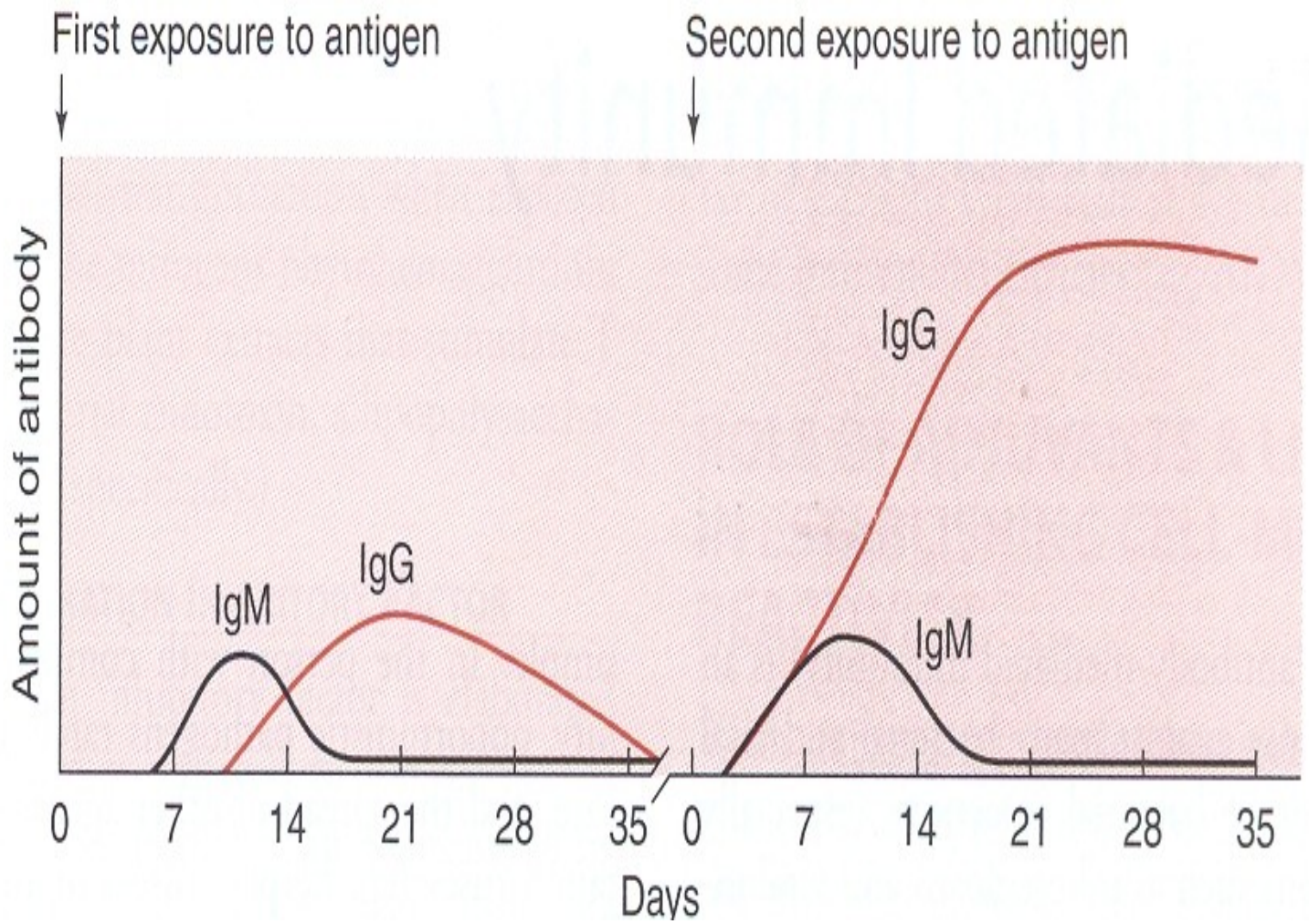
PRIMARY RESPONSE

- When Ag is first time encountered, Abs detectable after long periods (7-10 days)- "PRIMARY RESPONSE"
- Primary response- weaker
- Initially a small clone of B cell/ plasma cells proliferate
- Abs con increases for 02 weeks & then declines
- The first Ab to appear is IgM, followed by IgG.

SECONDARY RESPONSE

- After a second encounter with the ***same*** Ag, months/ years after primary response, a rapid Ab response with a lag period of 3-5 days
- Higher levels of abs produced
- Due to presence of “memory cells”
- The Ig M produced is same as produced in primary response, but larger amounts of Ig G,
- With each subsequent exposure- activation of germinal centre of LN
- Basis of booster doses of vaccine

PRIMARY & SECONDARY RESPONSE



RESPONSE TO MULTIPLE ANTIGENS ADMINISTERED SIMULTANEOUSLY

- When 2/more Ag are administered at the same time, body reacts by forming Abs to all of them (DPT/MMR)
- Functions of Abs- protect against infectious agents;
  - Neutralize toxins/ viruses
  - Opsonize- making microorganisms palatable for phagocytes
    - Fc receptors on phagocytes
    - IgG/IgM Activates complement
  - Abs can be;
    - Induced actively
    - Acquired passively


THANK YOU