IMMUNITY

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Objective

- At the end of the class you shoud know
  - Architecture of immune system
  - Immunity
  - Antigens
  - Antibodies
  - Immune response development
  - Other immune mechanims

Defense Mechanism

Nonspecific defense mechanisms		Specific defense mechanisms (immune system)
First line of defense	Second line of defense	Third line of defense
• Skin • Mucous membranes • Secretions of skin and mucous membranes	• Phagocytic white blood cells • Antimicrobial proteins • The inflammatory response	• Lymphocytes • Antibodies

Introduction

- Definition
- Types
- Antigens
- Antibodies
- Immune system

Immune response

Immunomodulation
- Immunoenhancement
- Immunosuppression

Immunotolerance.

Autoimmunity

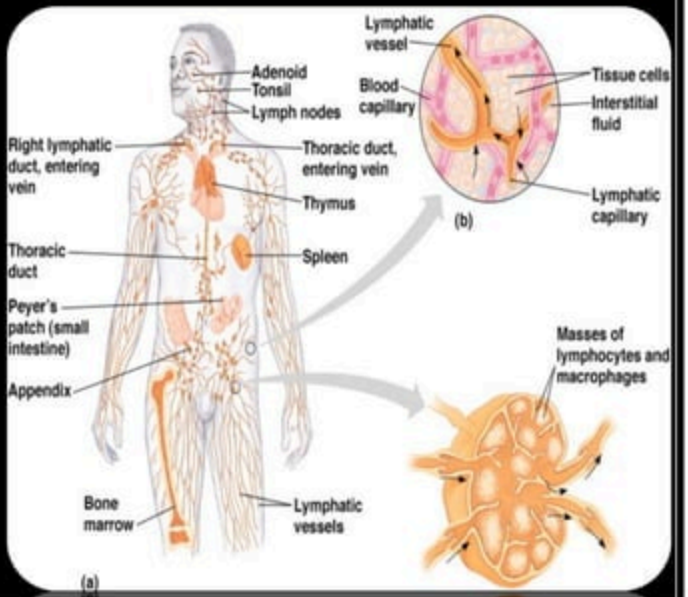
Hypersensitivity

Architecture of immune system

- Mononuclear Phagocytic system
- Lymphoid components

Mononuclear Phagocytic system

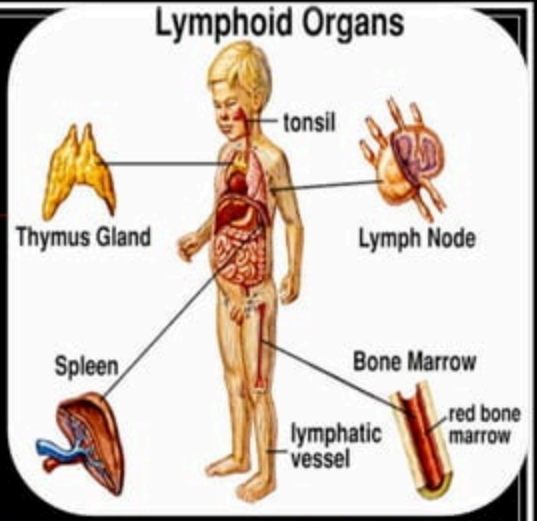
- Formation
- Constituent cells
- Functions

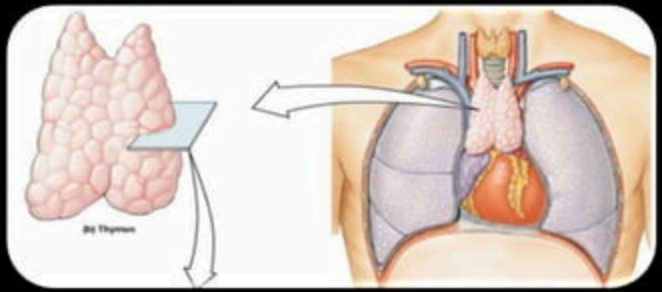


Lymphoid Components

Primary lymphoid tissue

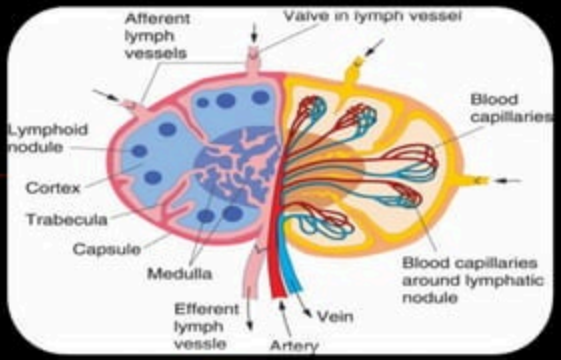
- Thymus
  - Role
  - Effects of thymectomy.
- Bursa equivalent

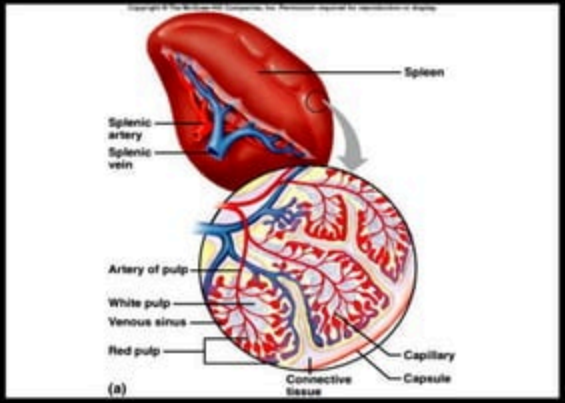




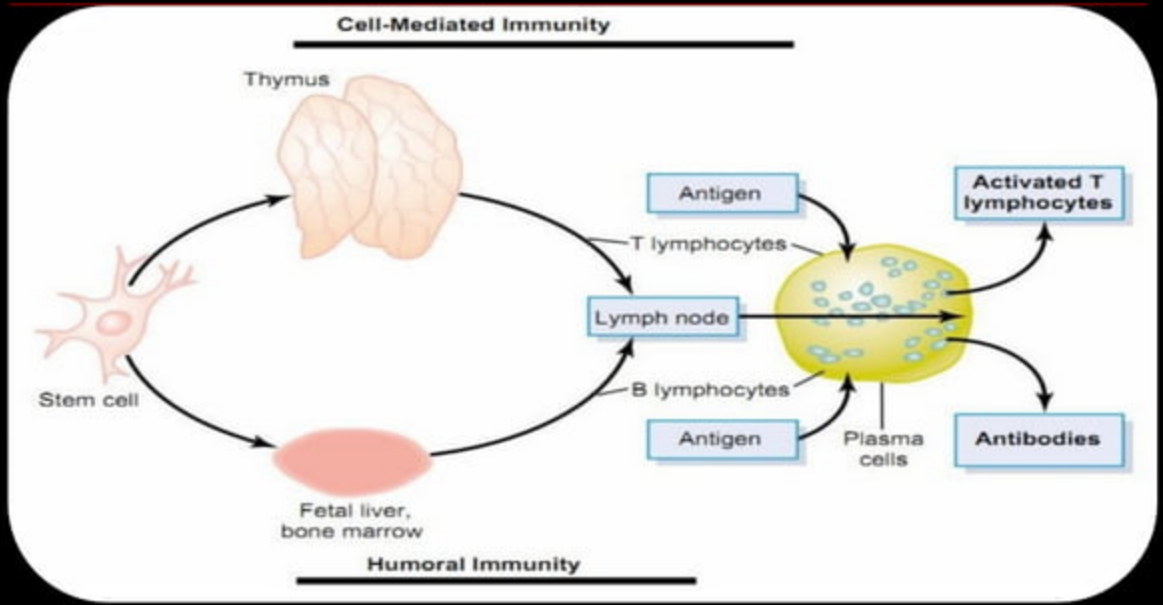
Peripheral lymphoid organs

- lymph nodes
  - structure
  - function
- spleen
  - structure
  - Function
- MALT (Mucosa Associated Lymphoid Tissue)





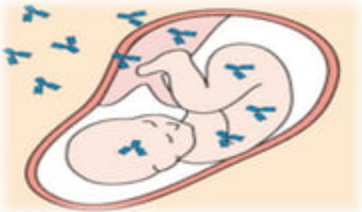
Review


Cell-Mediated Immunity
Thymus
Antigen
Activated T lymphocytes
T lymphocytes
Lymph node
Stem cell
B lymphocytes
Antigen
Plasma cells
Antibodies
Fetal liver, bone marrow
Humoral Immunity

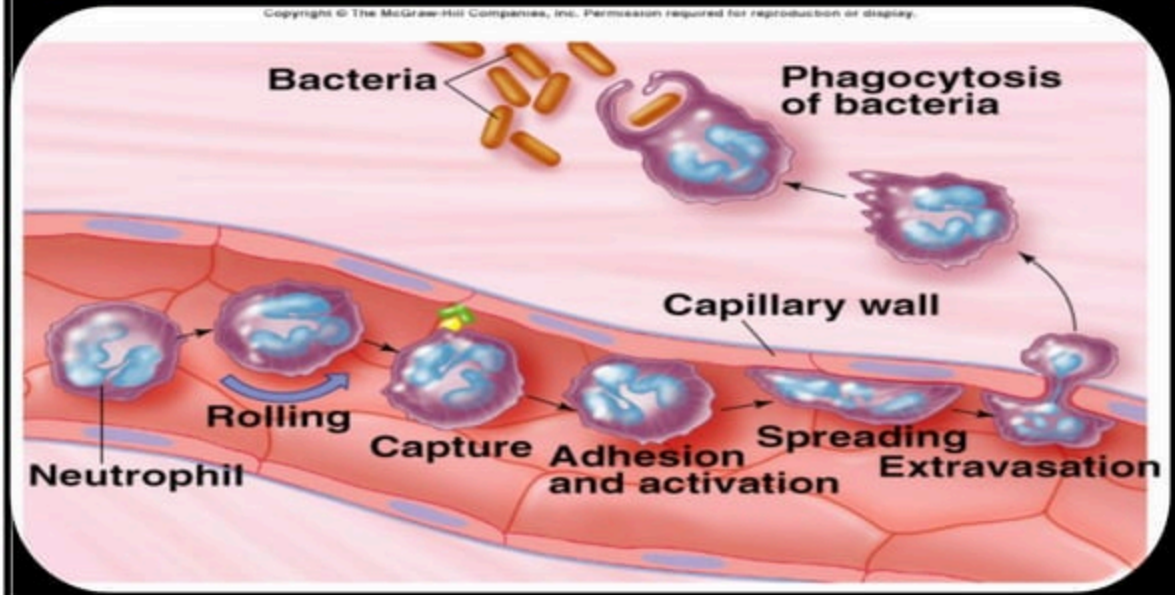
IMMUNITY

SPECIFIC RESISTANCE (IMMUNITY)
Responds to threats on an individualized basis

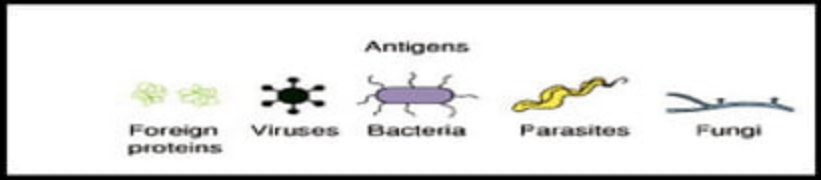
- **INNATE IMMUNITY**
  Genetically determined—no prior exposure or antibody production involved
- **ACQUIRED IMMUNITY**
  Produced by prior exposure or antibody production
  - **ACTIVE IMMUNITY**
    Produced by antibodies that develop in response to antigens **(Immune response)**
    - **Naturally acquired active immunity**
      Develops after exposure to antigens in environment
    - **Induced active immunity**
      Develops after administration of antigen to prevent disease
  - **PASSIVE IMMUNITY**
    Produced by transfer of antibodies from another person
    - **Natural passive immunity**
      Conferred by transfer of maternal antibodies across placenta or in breast milk
    - **Induced passive immunity**
      Conferred by administration of antibodies to combat infection



Phagocytosis



Antigen



- Definition
- Hapten
- Immunogenicity
- Antigen specificity
- Species specificity
- Isospecificity

Histocompatability Antigens

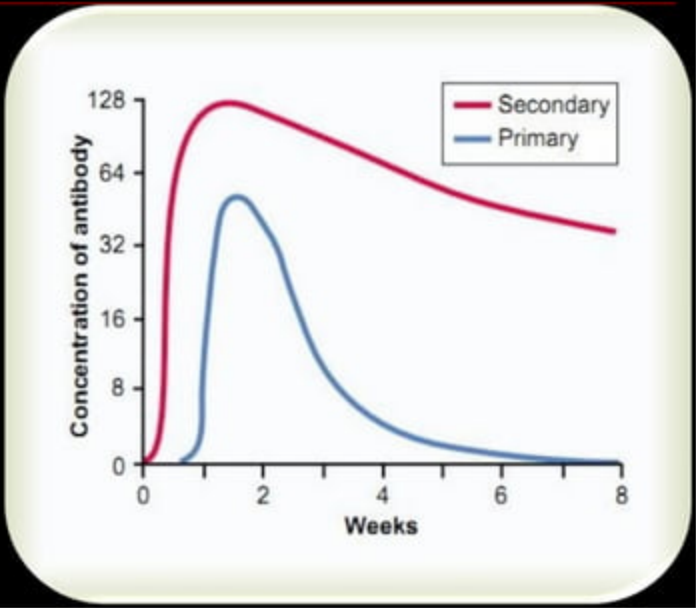
- Major Histocompatability complex (Chromosome 6-short arm) HLA Ag
  - MHC Class I
  - MHC Class II
  - MHC Class III

CELL MEDIATED IMMUNITY

- Role of cellular immunity
  - Intracellular bacteria– M.tuberculosis, M.leprae
  - Viruses
  - fungi
- Allograft rejection & graft versus host reaction
- Delayed hypersensitivity & autoimmune

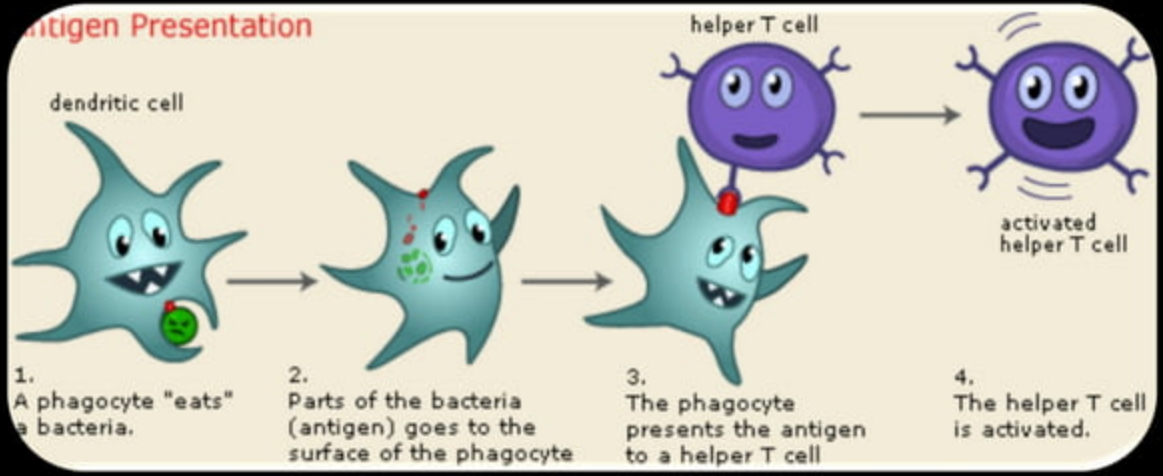
Types of immune response

- Primary
- Secondary

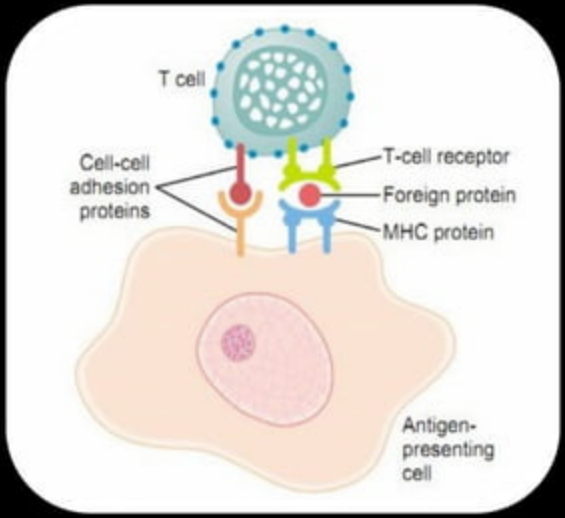


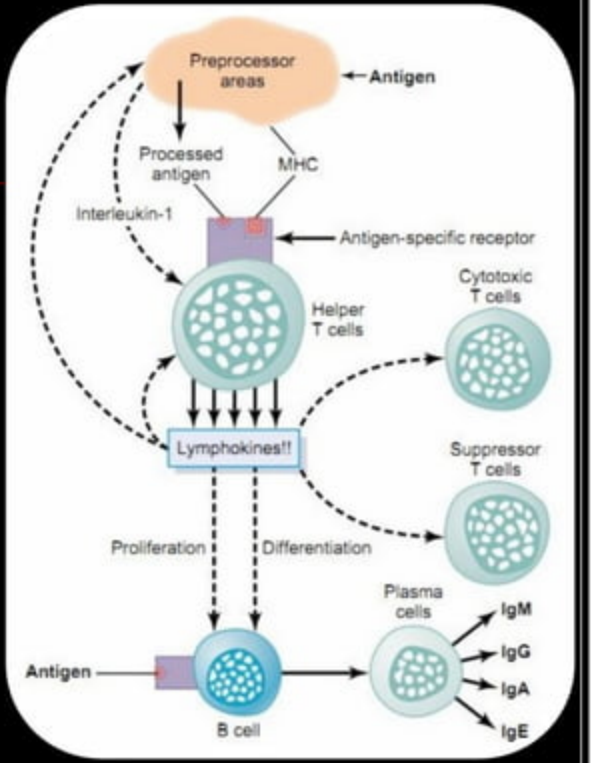
Stages

- Antigen processing and presentation



Recognition of antigen by lymphocytes



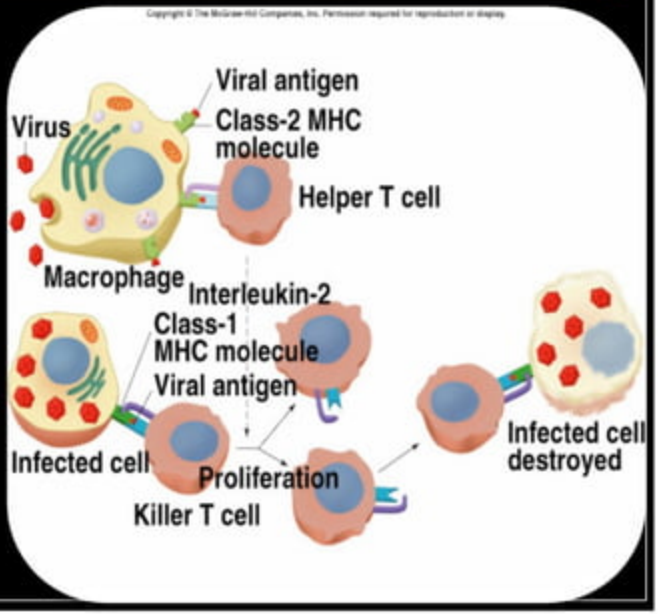


T-lymphocytes differentiation (activation)

CD8 types

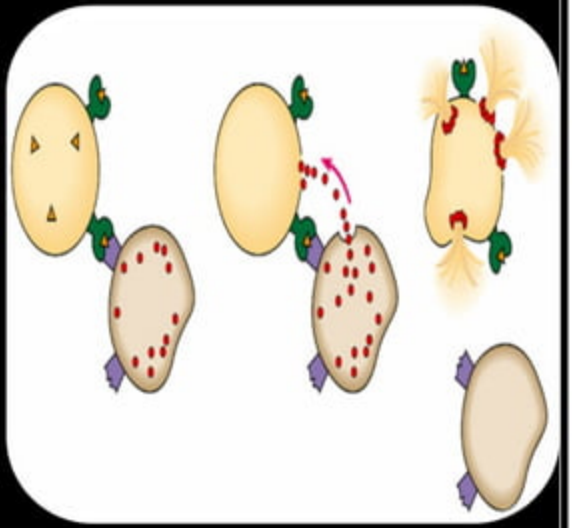
CD4 types

TT co-operation
Memory cells

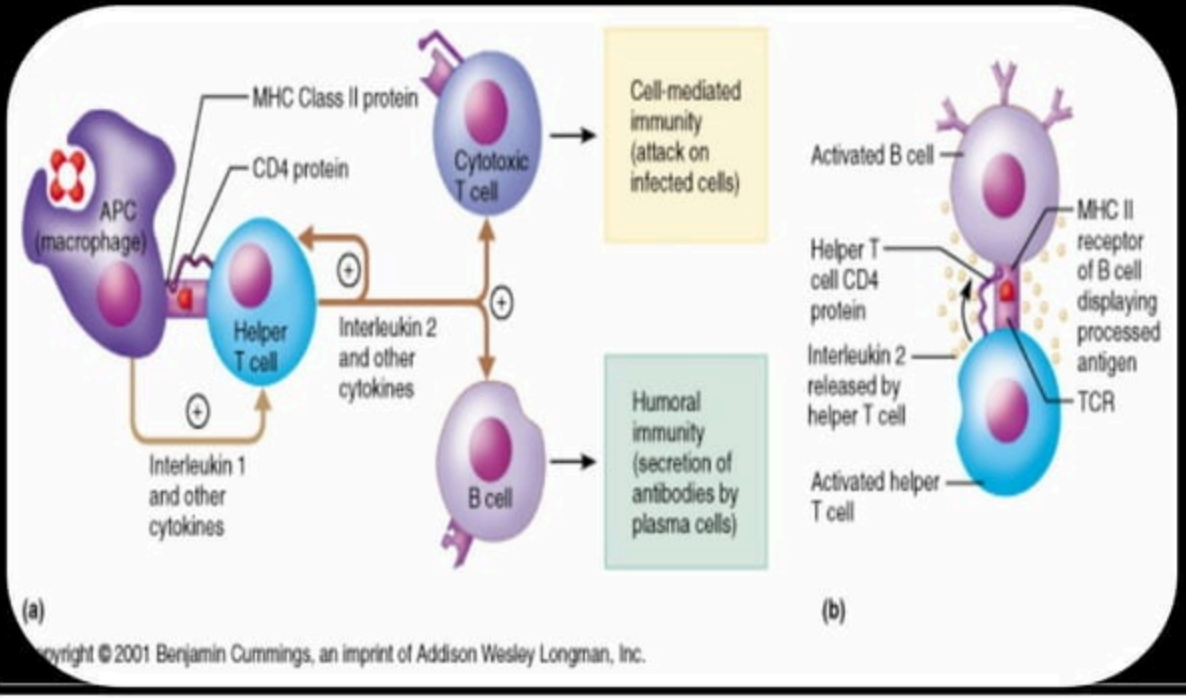


Attack phase

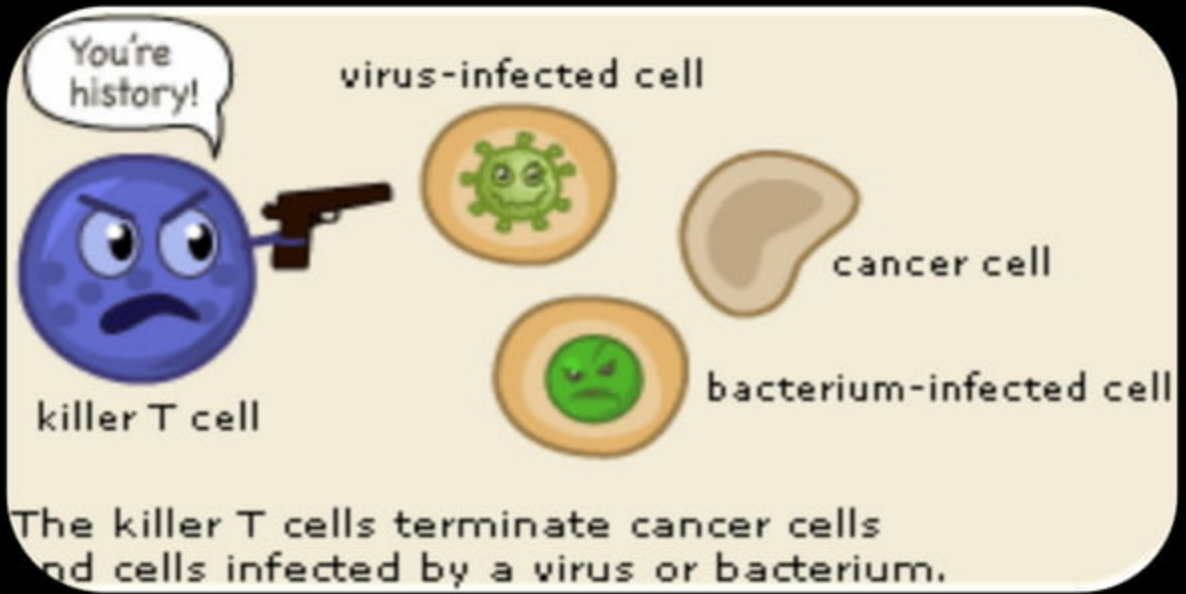
- Role of cytotoxic T-cell
  - Lysis through cytotoxic substances
  - Induction of Apoptois
  - Perforin mediated killing



Helper T Cell



Memory cells

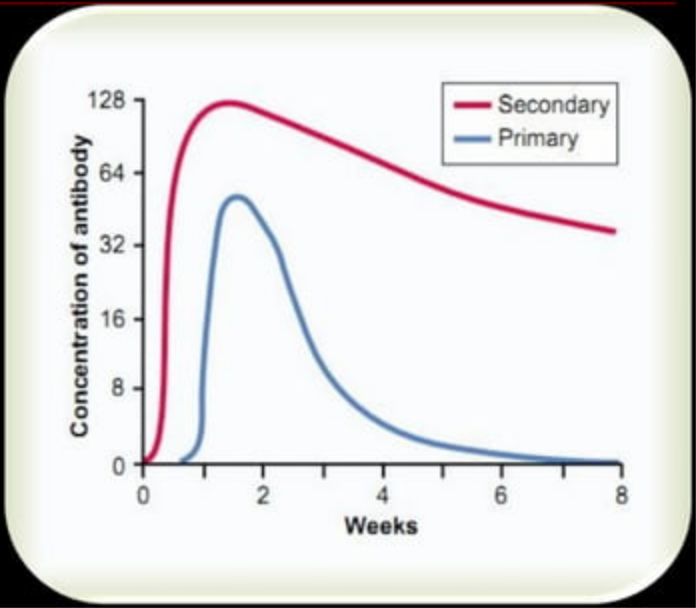


Humoral mediated immunity

- Role of humoral immunity
  - Extracellular bacterial pathogens.
  - Immediate hypersensitivity
  - Autoimmune diseases.

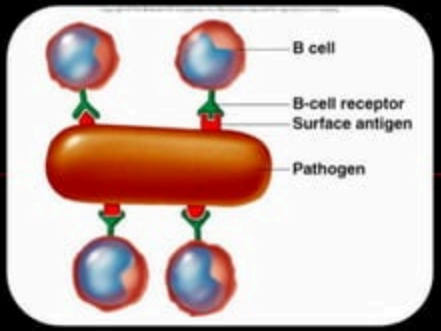
Types of immune response

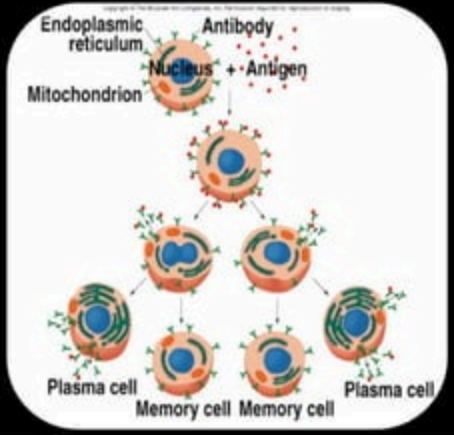
- Primary
- Secondary



Stages

- Antigen processing and presentation
- Recognition of antigens by lymphocytes
- Lymphocyte activation
  - Activation of T-lymphocytes.
  - Activation of B-lymphocytes.
    - Role of plasma cells
    - Role of memory cells





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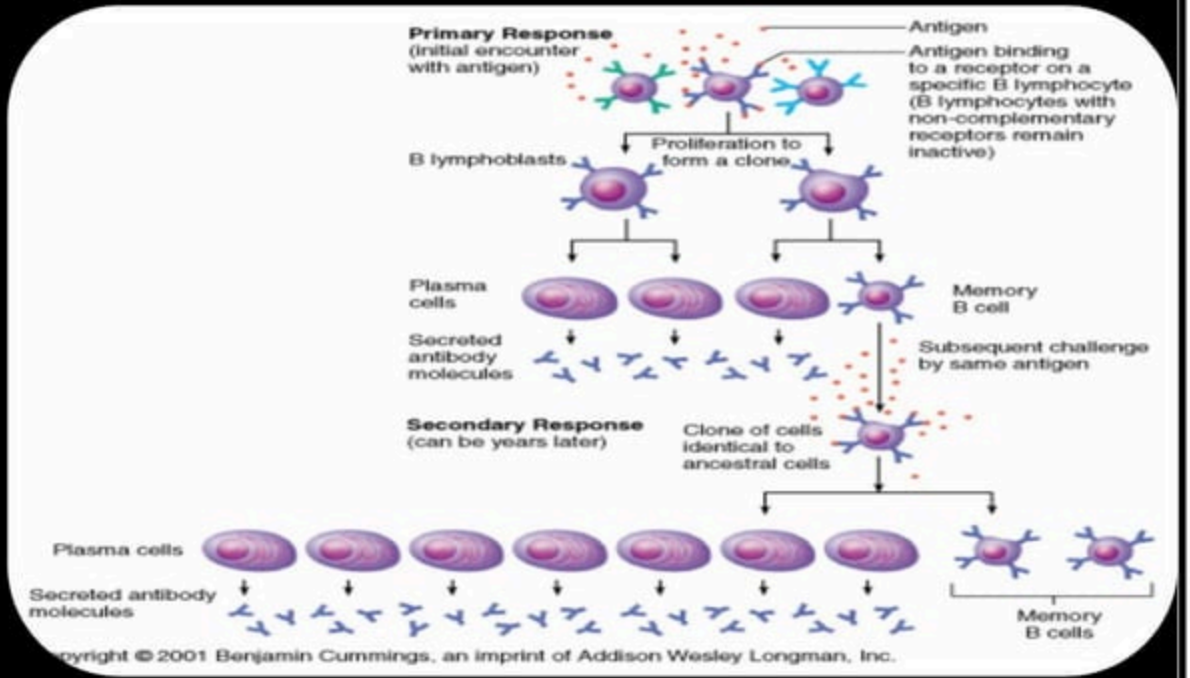
Primary Response
(initial encounter with antigen)
Antigen
Antigen binding to a receptor on a specific B lymphocyte (B lymphocytes with non-complementary receptors remain inactive)
Proliferation to form a clone
B lymphoblasts
Plasma cells
Memory B cell
Secreted antibody molecules
Subsequent challenge by same antigen
Secondary Response
(can be years later)
Clone of cells identical to ancestral cells
Plasma cells
Secreted antibody molecules
Memory B cells
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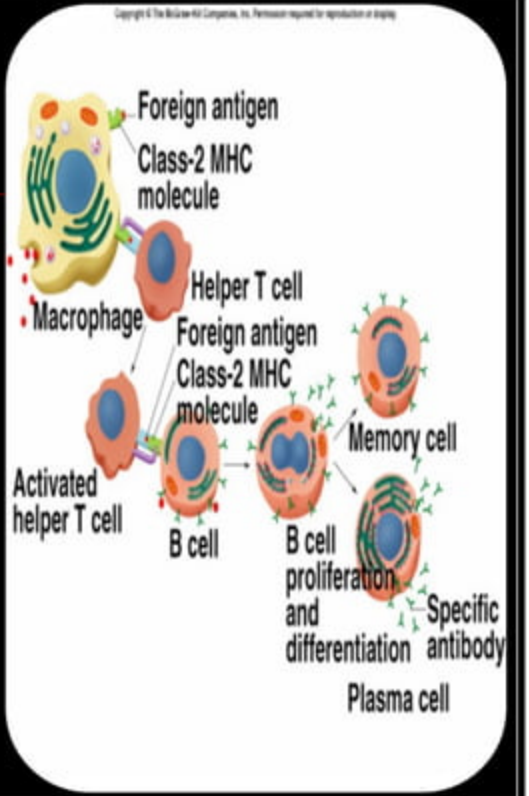
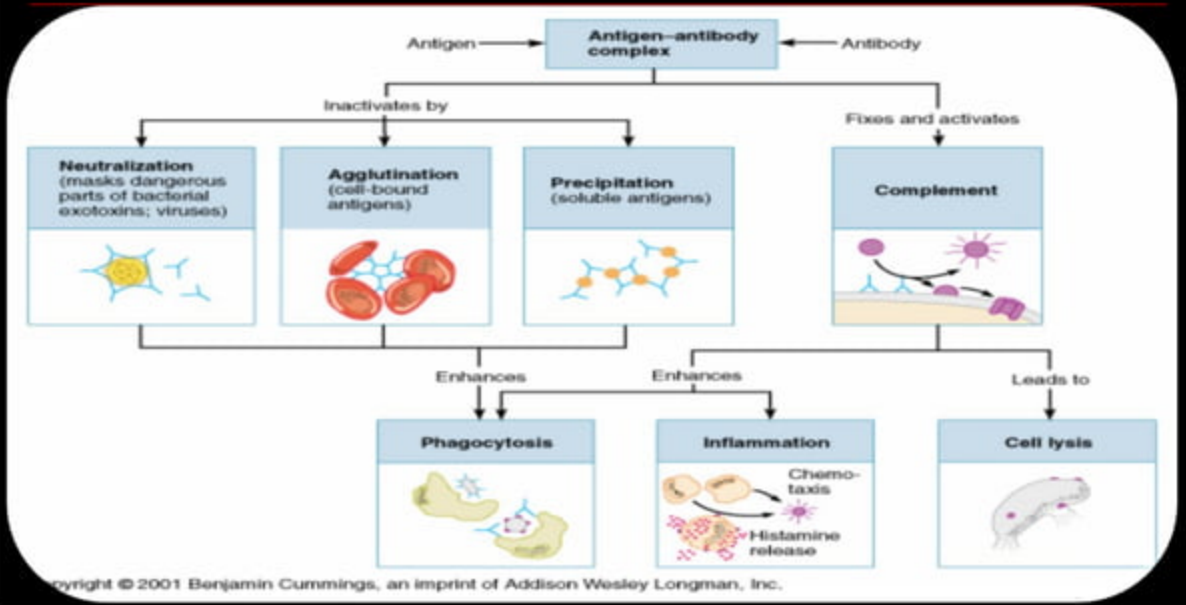
- Production of antibodies
  - Theories of antibody production
  - Clonal selection theory (Burne 1957)
- Inactivation or attack phase
  - Direct attack
  - Complement system

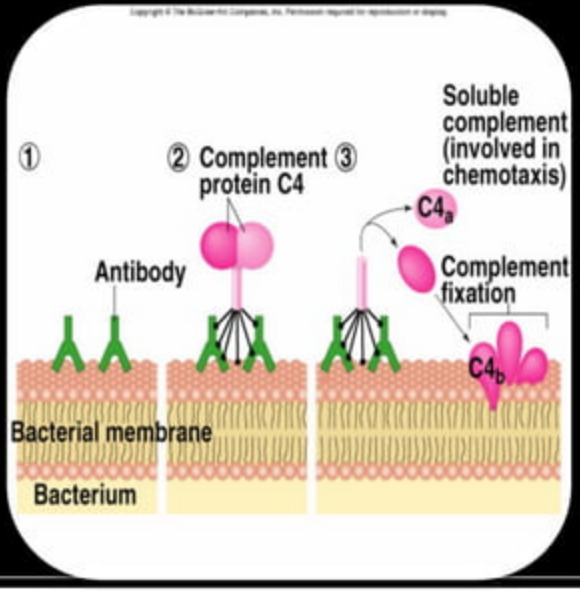


Direct attack

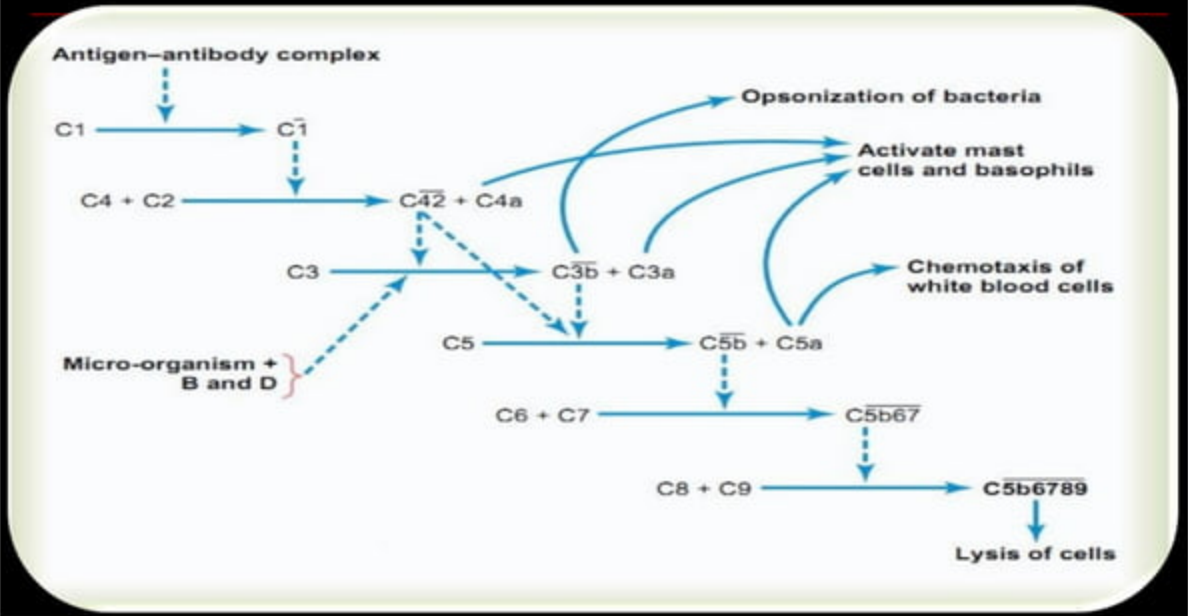


Complement system

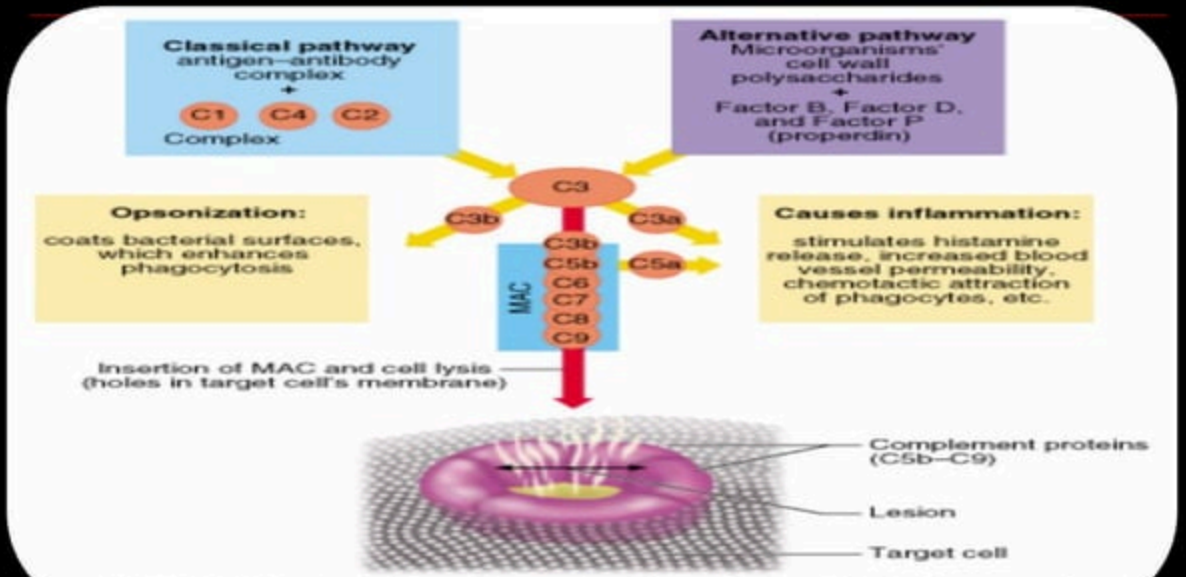
- Classical pathway.
  - L
  - A
  - N
  - A
  - C
  - O
- Alternate pathway.



Complement system

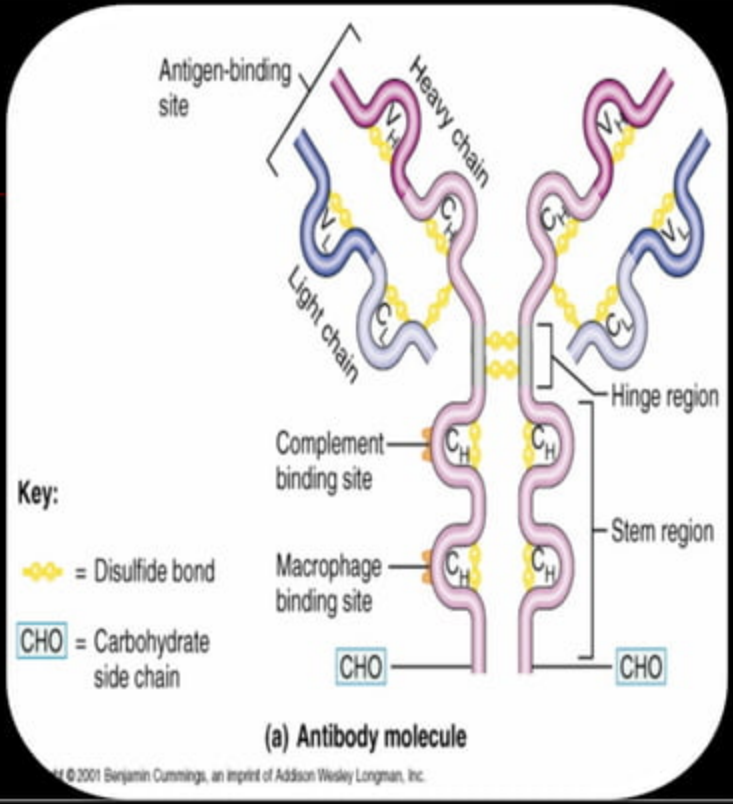


Complement system



Antibodies

- Structure
  - Heavy Chain
  - Light Chain



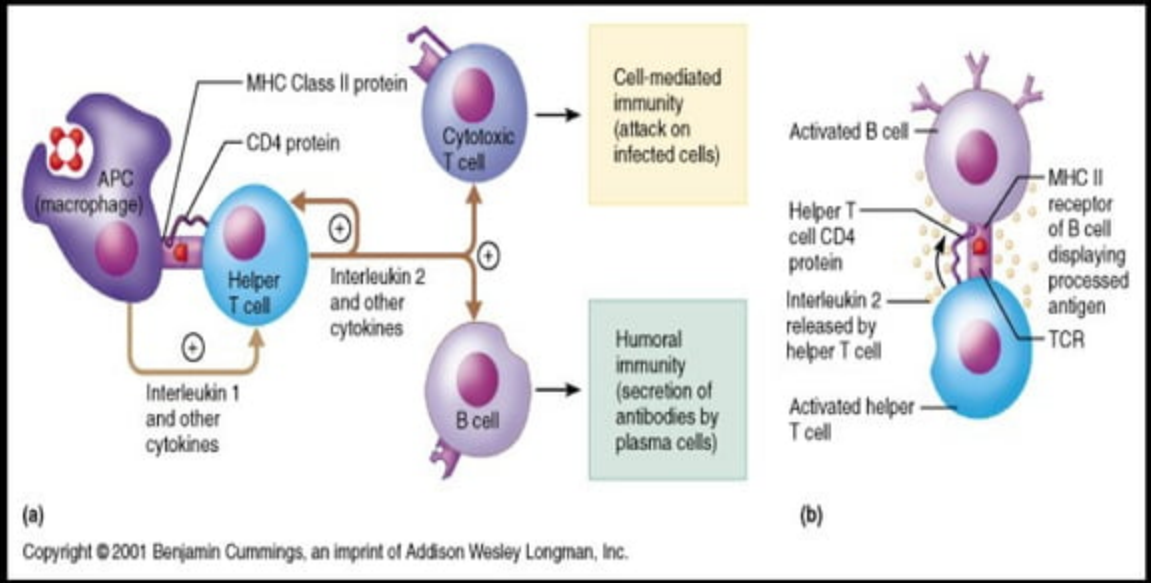
Types

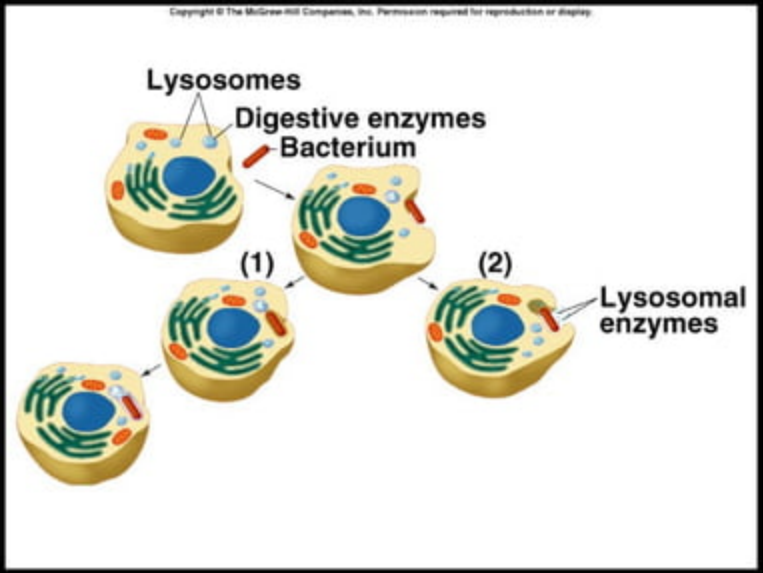
- Immunoglobulins (Ig)
  - Ig G
  - Ig A
  - Ig M
  - Ig D
  - Ig E

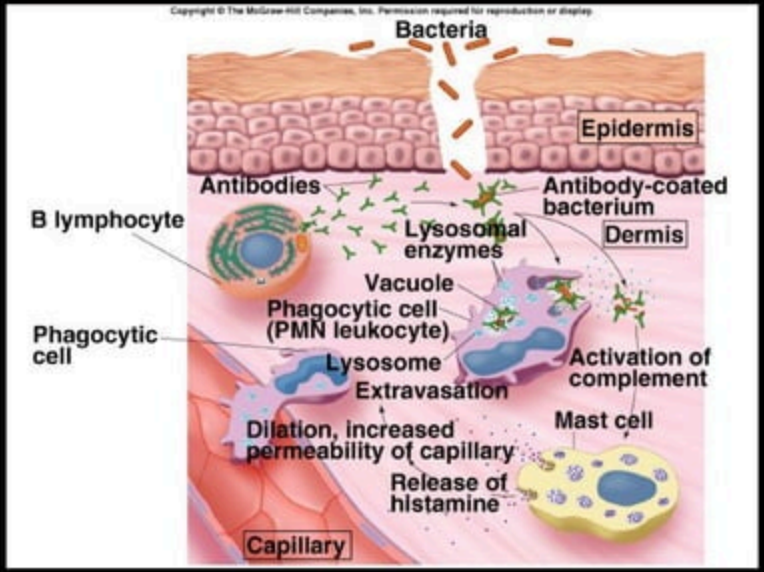
IMMUNOGLOBULINS

FEATURE	IgG	IgA	IgM	IgD	IgE
H chain	γ	α	μ	δ	ε
L chain	K or λ	K or λ	K or λ	K or λ	K or λ
Mol wt (kd)	150	160-385	900	180	190
Serum conc	12	2	1.2	0.03	0.00004
Half life	21	6	5	3	2
Placental T	Yes	No	No	No	No
Compleme nt fixation	C	A	C	N	N
ROLE	Body fluids	Body surface	Blood stream	Not known	Type 1 hypersens itivity

THANK YOU



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Bacteria
Epidermis
Antibodies
Antibody-coated bacterium
B lymphocyte
Lysosomal enzymes
Dermis
Vacuole
Phagocytic cell (PMN leukocyte)
Phagocytic cell
Lysosome
Activation of complement
Extravasation
Mast cell
Dilation, increased permeability of capillary
Release of histamine
Capillary