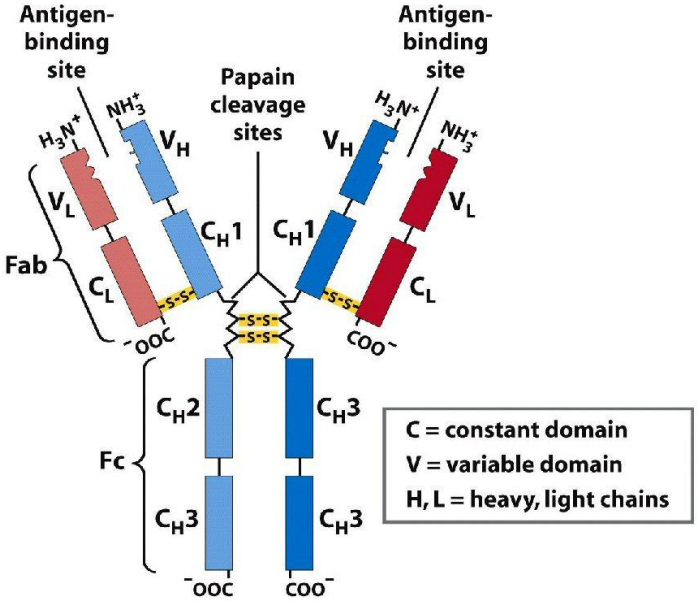
Unit I – Problem 6,7 – Immunology: Introduction to Immune System (Part 2)

- **Innate vs. adaptive immunity:**

	Innate immunity	Adaptive immunity
Components	Neutrophils, macrophages, monocytes, dendritic cells, NK-cells and complement system	T-cells, B-cells and circulating antibodies
Resistance	Germline encoded; resistance persists through generations and does not change within an organisms lifetime	Variation through V-(D)-J recombination during lymphocyte development; microbial resistance is not heritable
Response to pathogens	Non-specific; occurs rapidly (minutes to hours)	Highly-specific; develops over long periods; memory response is faster and more robust
Physical barriers	Epithelial tight junctions and mucus	-
Secreted proteins	Lysozyme, complement, C-reactive protein and defensins	Immunoglobulins (antibodies)
Key features in pathogen recognition	Toll-Like Receptors (TLRs): recognize Pathogen-Associated Molecular Patterns (PAMPs)	Memory cells: subsequent exposure to a previously encountered antigen → stronger, quicker immune response

- **When B-lymphocytes are exposed to antigen, they will be converted to plasma cells which will produce antibodies.**
- **(CD8+) cytotoxic T-lymphocytes kill virus-infected and tumor cells.**
- **The basic chain structure of immunoglobulins:**



- Variable part of light (L) and heavy (H) chains recognizes antigens.
- Fc portion of IgM and IgG fixes complement.
- **Fc characteristics**: constant; carboxy terminal; complement binding; carbohydrate side chains; determines isotype (IgM, IgD… etc).
- **Antibody diversity is generated by**: random recombination of VJ (in light chain) or VDJ (in heavy chain).

- **Methods of detection of antibodies:**
  - ✓ Soluble antigens (proteins and polysaccharides):
    - ❖ Antigen + antibody → precipitate
  - ✓ Particulate antigens (cells):
    - ❖ Antibody + cells → clumping (agglutination).
- **Techniques of antibody detection:**
  - ✓ Soluble antigens:
    - ❖ *Immunopercipitation.*
    - ❖ *Enzyme-Linked Immunosorbent Assay (ELISA).*
  - ✓ Particulate antigens:
    - ❖ *Agglutination.*
    - ❖ *Immunofluorescence:*
      - ➢ Direct: detecting antigens.
      - ➢ Indirect: detecting antibodies.

- **Immunoglobulin isotypes:**

IgG	• Main antibody in secondary (delayed) response to an antigen. • Crosses the placenta. • Fixes complement. • Opsonizes bacteria.
IgA	• Prevents attachment of bacteria and viruses to mucous membranes. • Monomer (in circulation); dimer (when secreted). • Released into breast milk and other secretion.
IgM	• Produced in the primary (immediate) response to an antigen. • Fixes complement. • Does not cross the placenta. • Monomer (on B-cell); pentamer (when secreted).
IgD	• Unclear function. • Found on the surface of many B-cells and in serum.
IgE	• Binds mast cells and basophils. • Cross-links when exposed to allergen. • Mediating immediate (type-I) hypersensitivity through release of inflammatory mediators such as histamine. • Mediates immunity to worms by activating eosinophils. • Lowest concentration in serum.