Immunoglobulin

Structure and Function

Immunogobulin, Ig

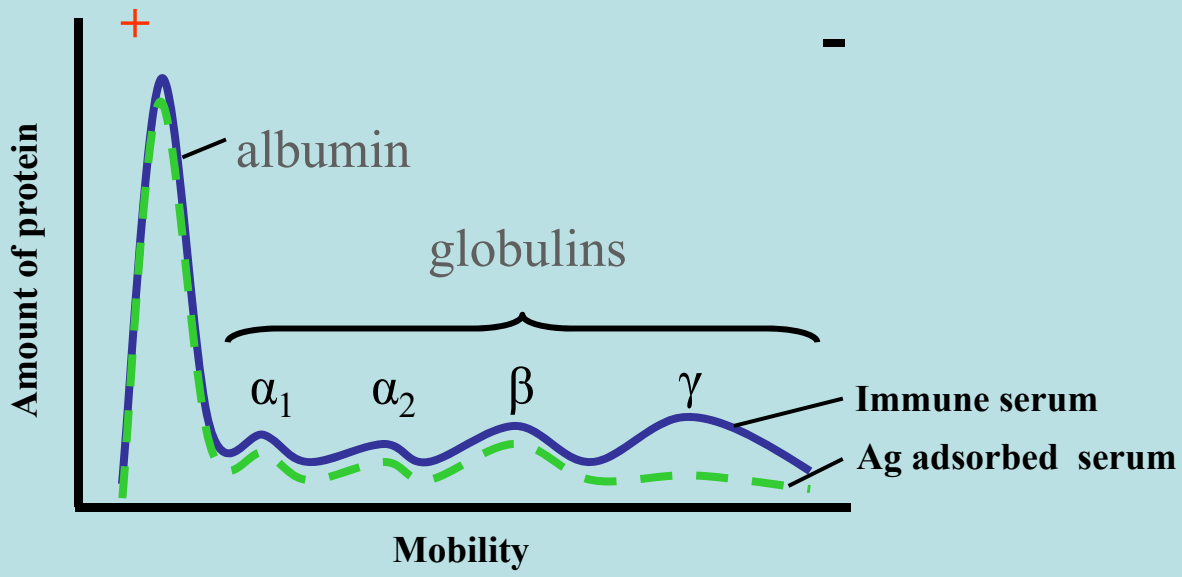
- **What are Immunoglobulins?**

Immunoglobulins are the critical ingredients of humoral acquired immune response.

- The immunoglobulins are a group of glycoproteins present in the serum and tissue fluids of all mammals.

Immunoglobulins:Structure and Function

- Definition: Glycoprotein molecules that are produced by plasma cells in response to an immunogen and which function as antibodies



General Functions of Immunoglobulins

- Ag binding
  - Can result in protection
- Effector functions (Usually require Ag binding)
  - Fixation of complement
  - Binding to mast cells , macrophages, NK cell

Immunoglobulin

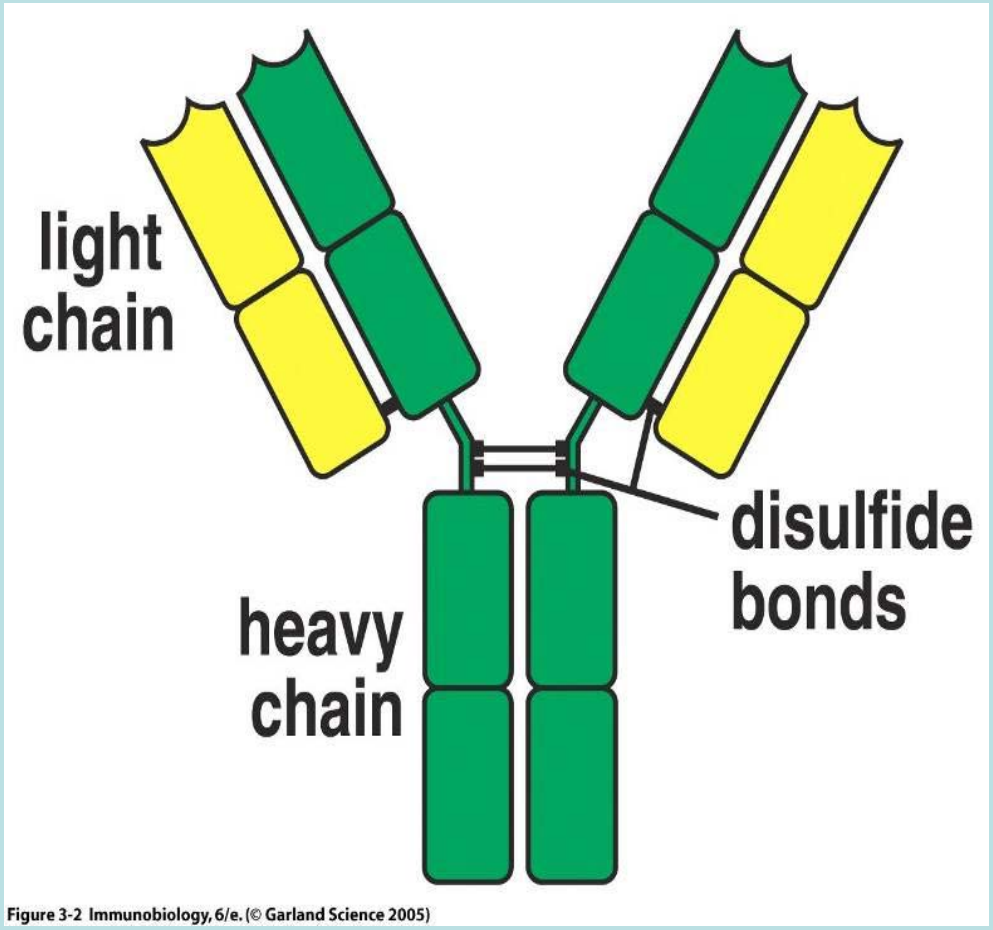
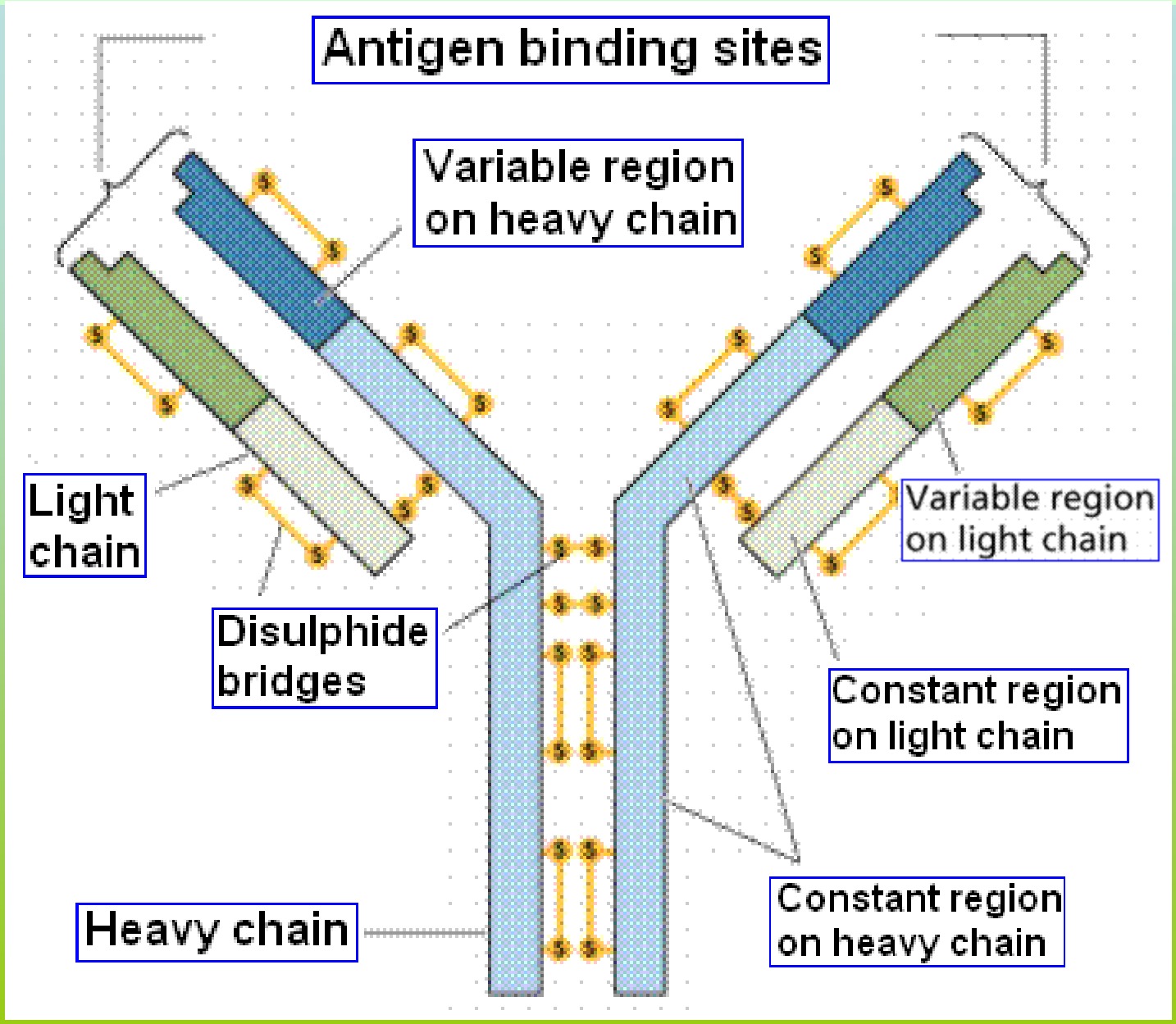
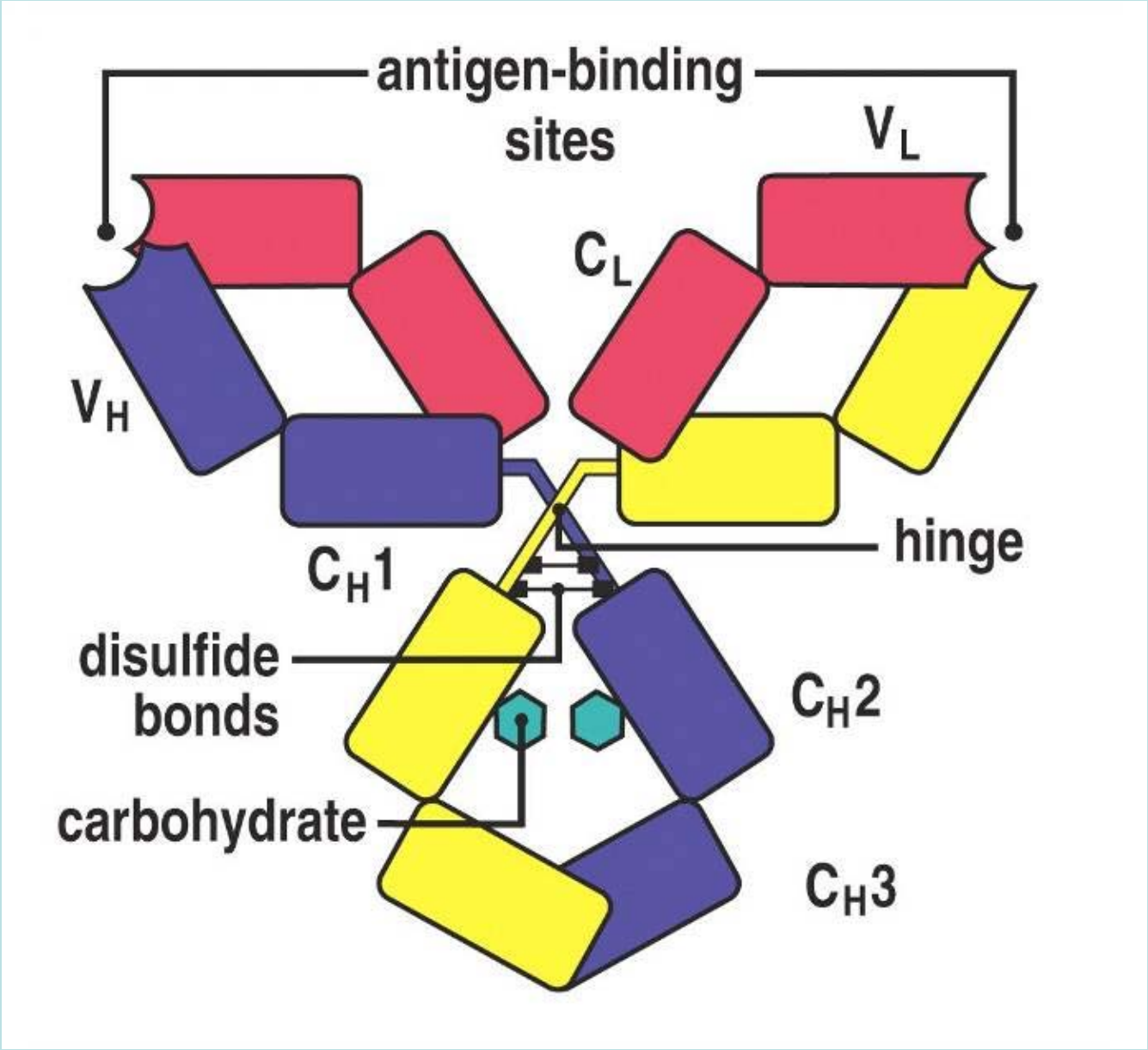


Figure 3-2 Immunobiology, 6/e. (© Garland Science 2005)

Structural Regions

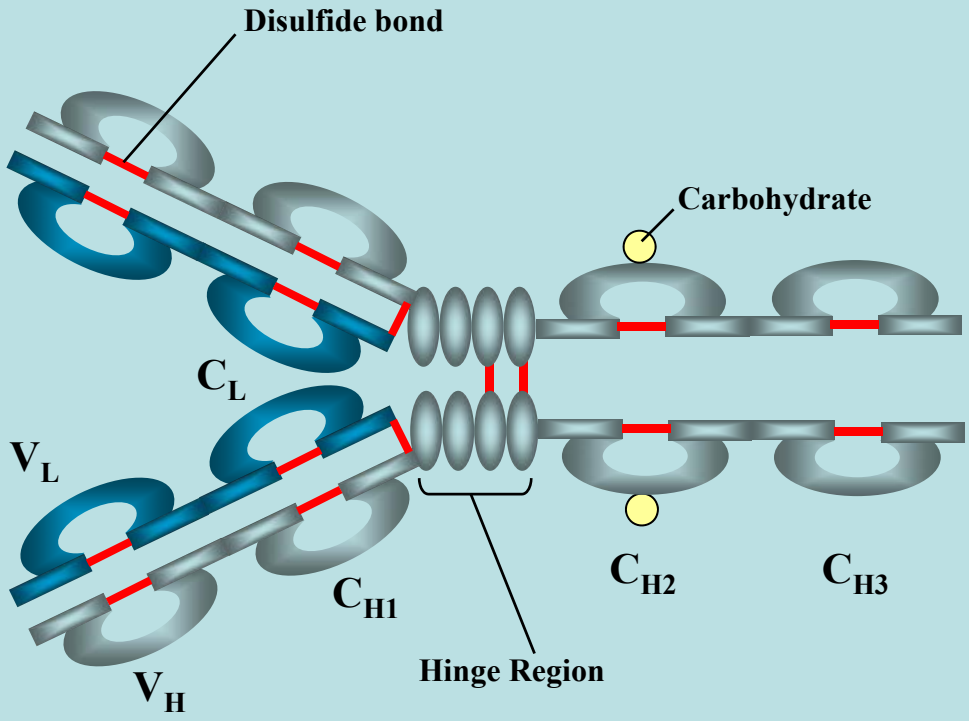


Domains of Immunoglobulin



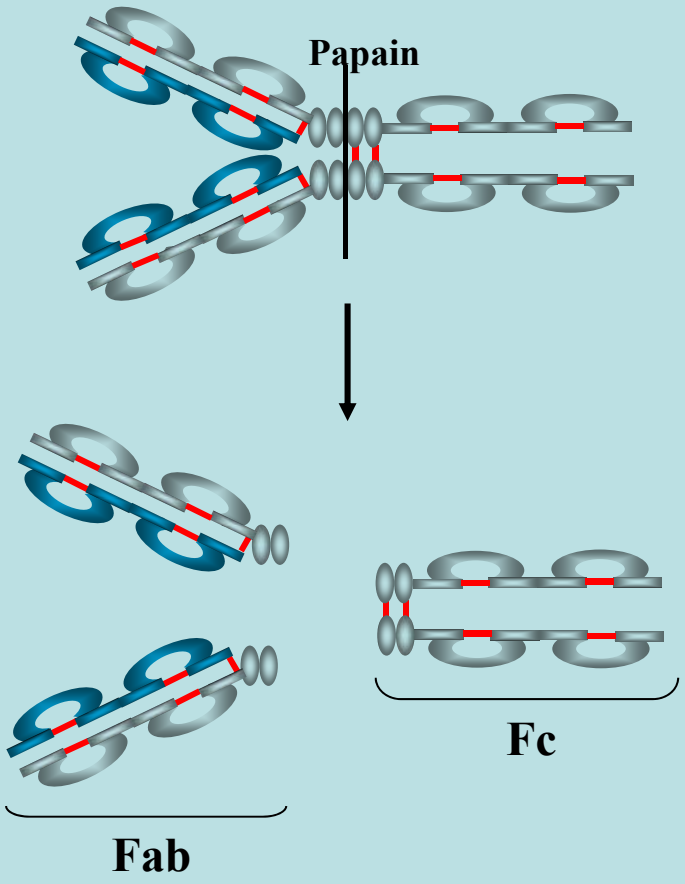
Immunoglobulin Structure

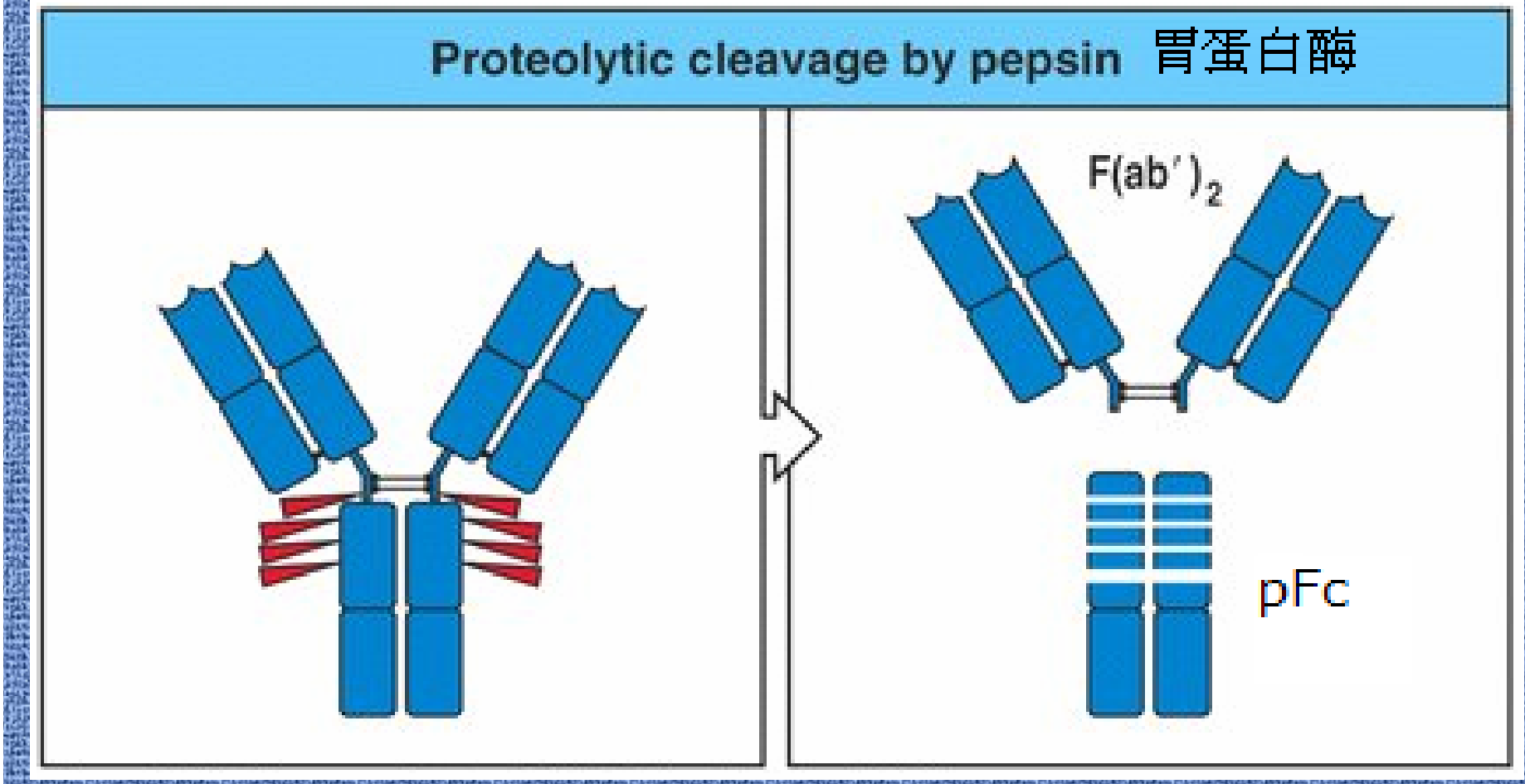
- Variable(V) & Constant (C) Regions
  - V_L & C_L
  - V_H & C_H
- Hinge Region



Enzymatic Digestion Products of Immunoglobulins

- Fab
  - Ag binding
  - Valence = 1
  - Specificity determined by V_H and V_L
- Fc (crystallizable)
  - Effector functions




Proteolytic cleavage by pepsin 胃蛋白酶
F(ab′)2
pFc

Function of Immunoglobulins

- Recognition of antigen
- Activation of complement
- Opsonization Antibody-dependent cell-mediated cytotoxicity,ADCC Mediate hypersensitivity type I

Immunoglobulin Classes and Subclasses

Immunglobulin molecules are divided into distinct classes and subclasses in terms of the differences in amino acid sequence of constant region of heavy chain,
i.e. γ , α , μ , δ , and ε chains.

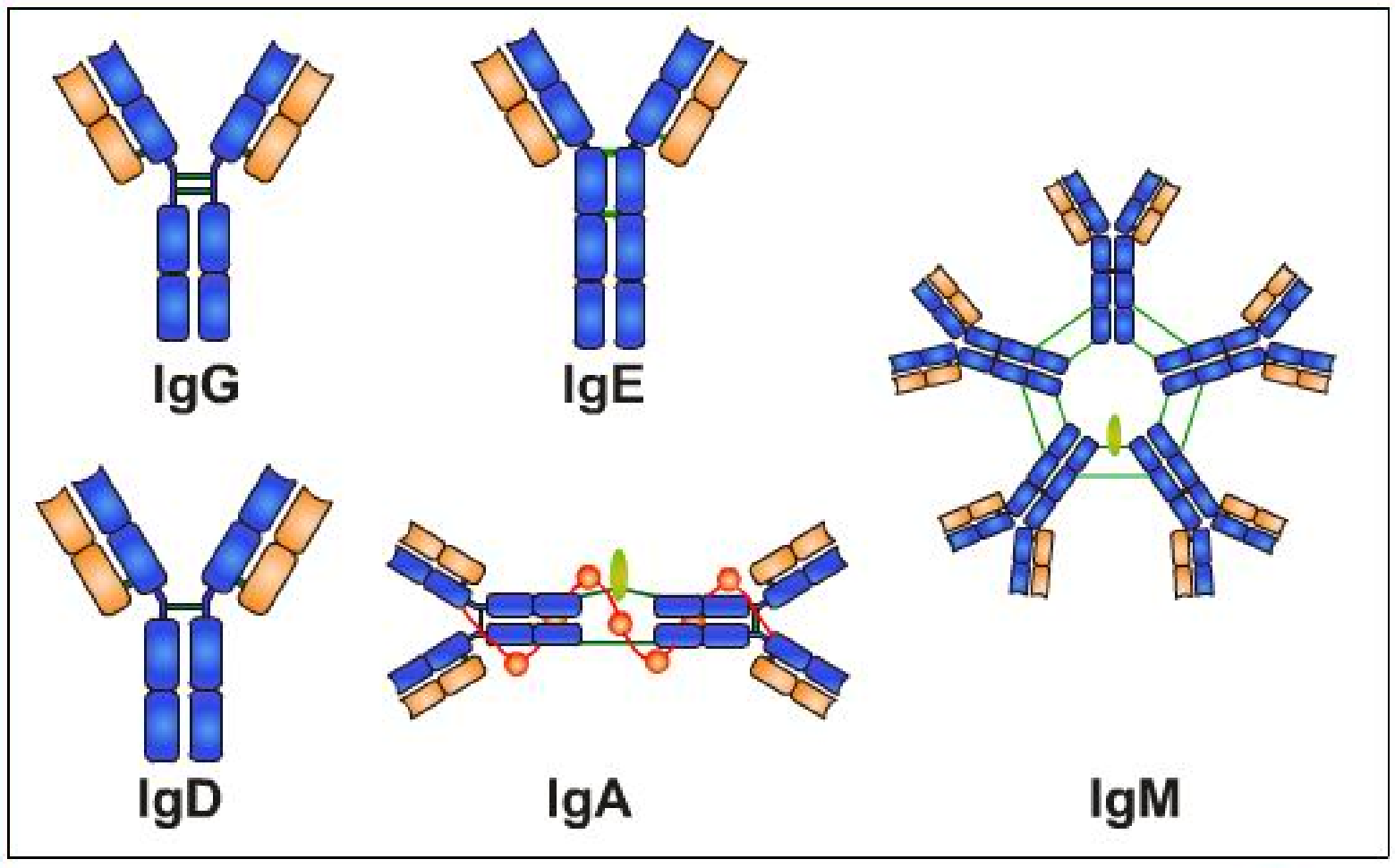
Light Chain Types of Immunoglobulin

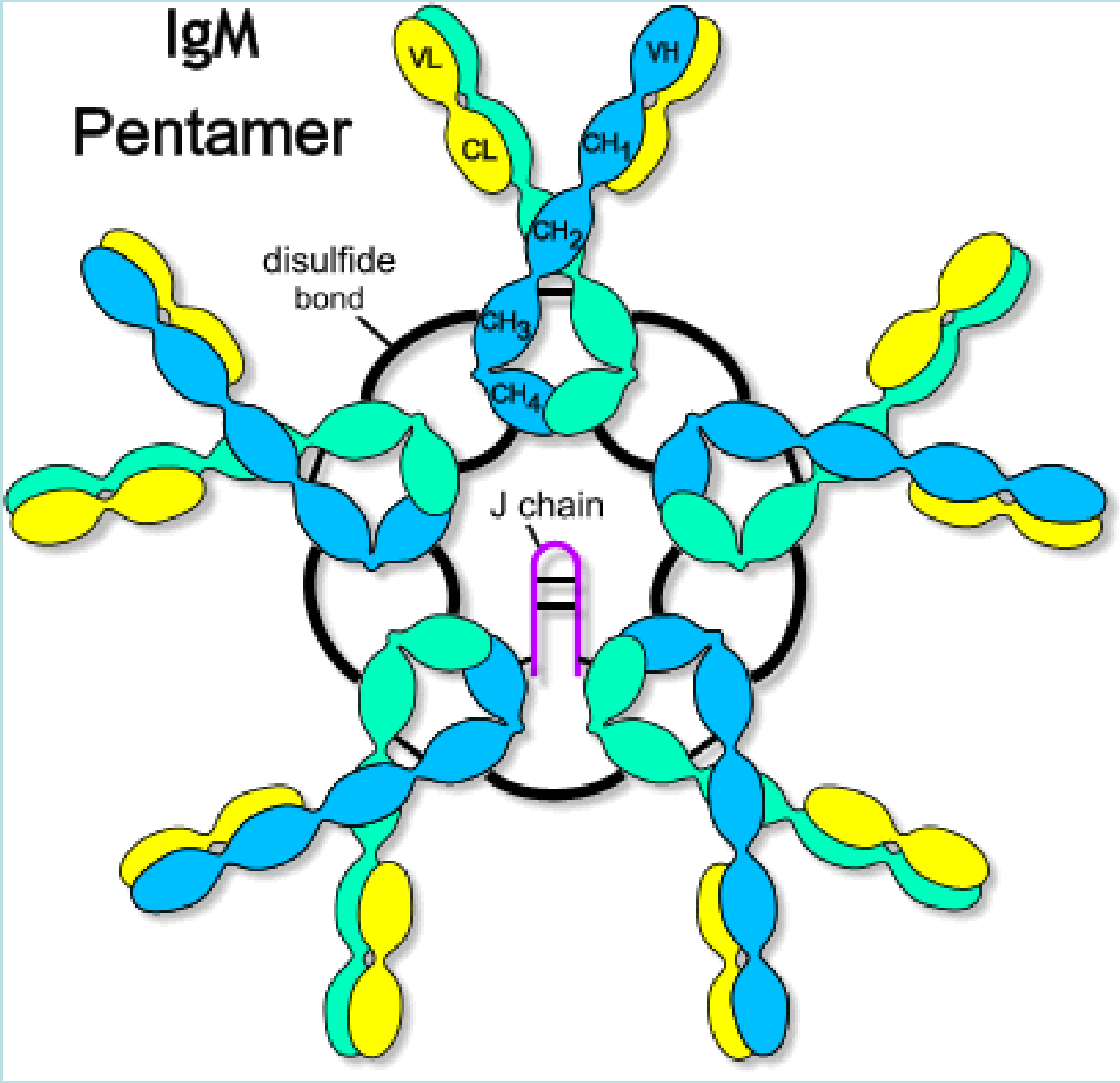
- Kappa (κ)
- Lambda (λ)
- All light chains have protein molecular weights of approximately 23,000 but can be divided into two distinct types, namely λchain, κchain, respectively

Immunoglobulin Classes of Mammals

- IgG - Gamma (γ) heavy chains
- IgA - Alpha (α) heavy chains
- IgM - Mu (μ) heavy chains
- IgD - Delta (δ) heavy chains
- IgE - Epsilon (ε) heavy chains

Five Classes of Immunoglobulin



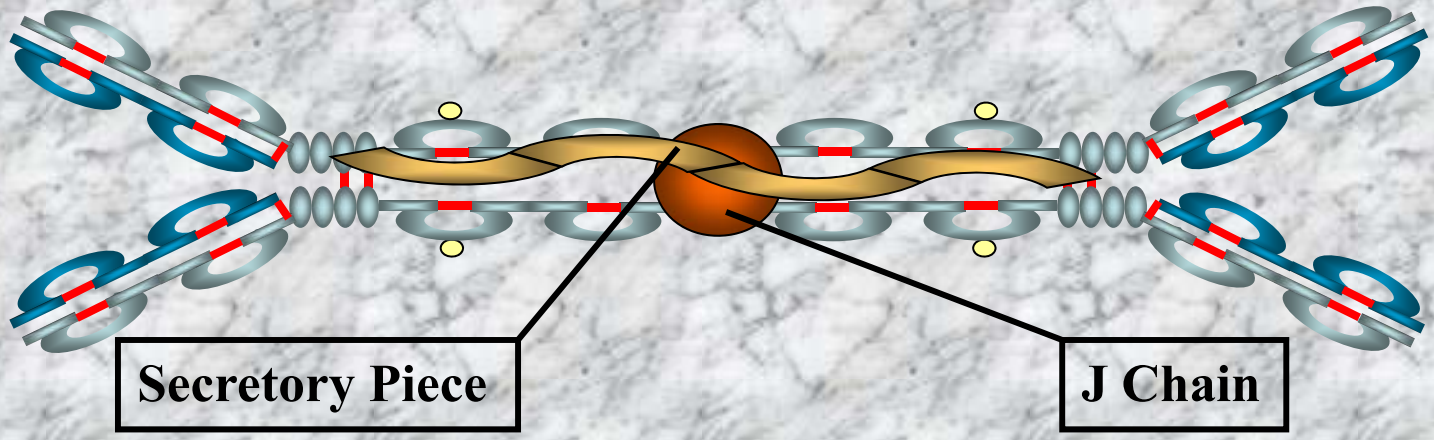

IgM
Pentamer
VL
VH
CL
CH1
CH2
disulfide
bond
CH3
CH4
J chain

- IgG has a family of subclass, IgG1, IgG2, IgG3, IgG4

- IgA is divided into two subclasses, IgA1 and IgA2(sheep).

IgA

- Structure
  - Serum - monomer
  - Secretions (sIgA)
    - Dimer (11S)
    - J chain
    - Secretory component

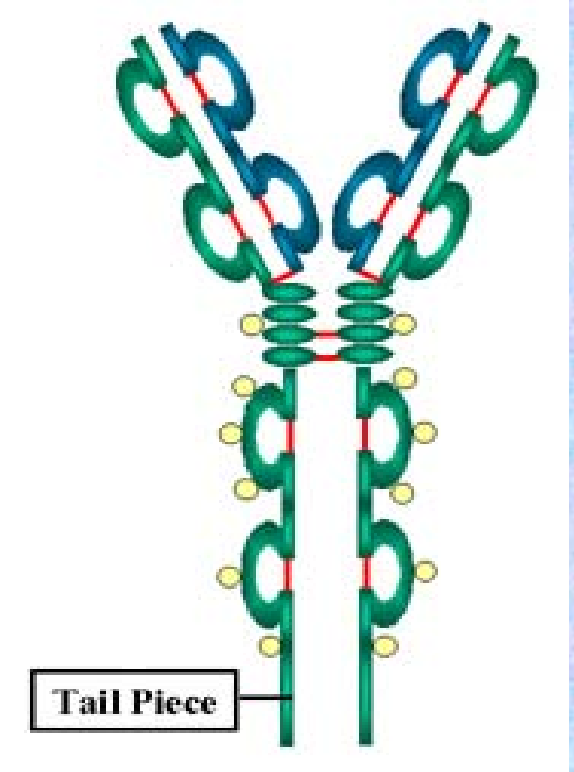


IgA

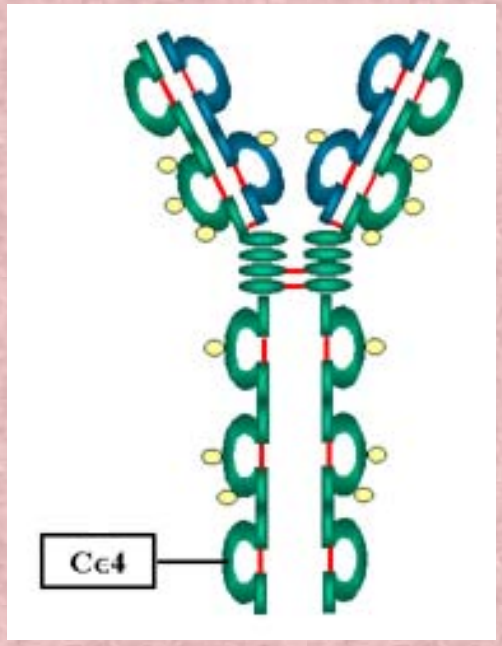
- Properties
  - 2nd highest serum Ig
  - Major secretory Ig (Mucosal or Local Immunity)
    - Tears, saliva, gastric and pulmonary secretions
  - Does not fix complement (unless aggregated)
  - Binds to Fc receptors on some cells

IgD

- Structure
- Properties
  - 4th highest serum Ig
  - B cell surface Ig
  - Does not bind complement



IgE



- Structure
- Properties
  - Least common serum Ig
    - Binds to basophils and mast cells (Does not require Ag binding)
  - Allergic reactions
  - Parasitic infections (Helminths)
    - Binds to Fc receptor on eosinophils
  - Does not fix complement