

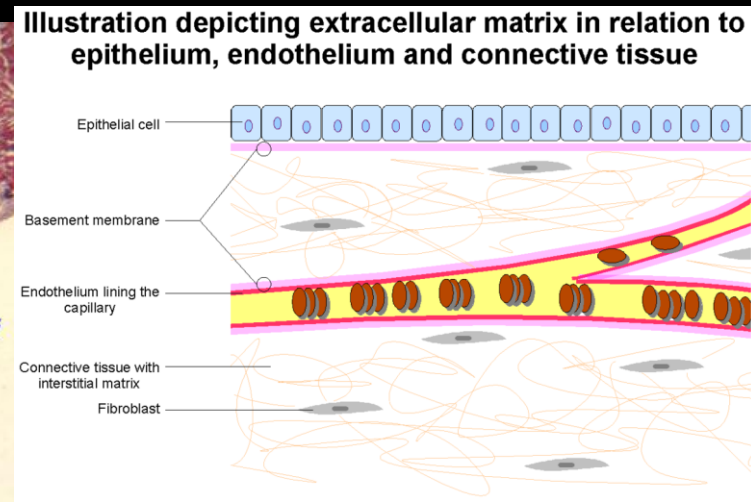
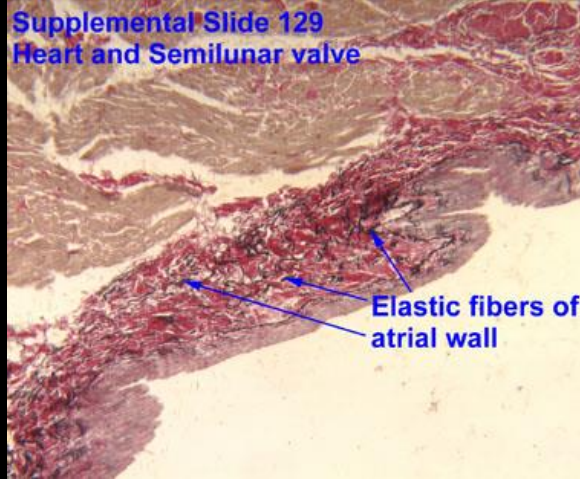
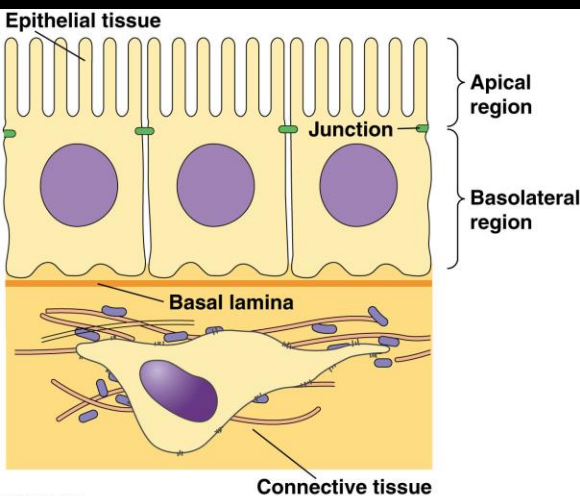
# **The Extracellular Matrix**

# The Extracellular Matrix (ECM)

- An organized network of extracellular materials present beyond the immediate vicinity of the plasma membrane
- Rather than being inert filler material, ECM is a dynamic, physiologically active component of all living tissues.
- In addition to providing structural support for the cells embedded within a tissue, provides both physical and biochemical signals
  - These signals guide their division, growth & development.
  - In other words, ECM largely determines how a tissue looks and functions.
- Many type of animal cells are surrounded by an ECM

# Types of ECMs

- Basement membrane (basal lamina)
  - Epithelia, endothelia, muscle, fat, nerves
- Elastic fibers
  - Skin, lung, large blood vessels
- Stromal or interstitial matrix



# Basement Membrane (basal lamina)

- One of the best defined extracellular matrices
- A continuous sheet; 50-200 nm thick
  - Surrounds muscle and fat cells
  - Underlies the basal surface of epithelial tissues such as the epidermis of the skin or the lining of the digestive & respiratory tracts
  - Underlies the inner endothelial lining of blood vessels

# Basement Membrane (basal lamina)

## Functions:

- Provides mechanical support for the attached cells
- Generates signals that maintain cell survival
- Serves as a substratum for cell migration
- Separates adjacent tissues within an organ
- Acts as barrier to the passage of macromolecules
  - Prevents the passage of proteins out of the blood as it flows through porous-walled capillaries and the capillaries of the glomerulus

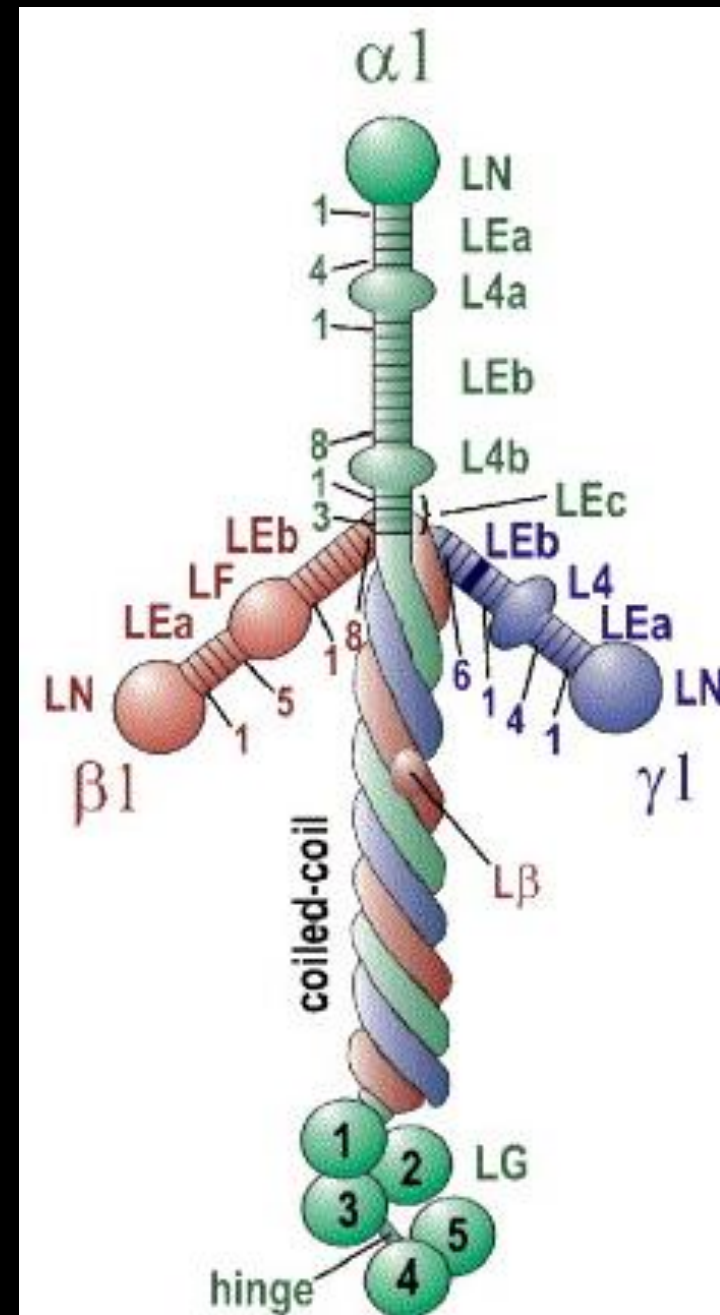
# Macromolecular organization of ECM

Components include fibrous proteins & Polysaccharides

- Laminin
- Collagen
- Proteoglycan
- Fibronectin

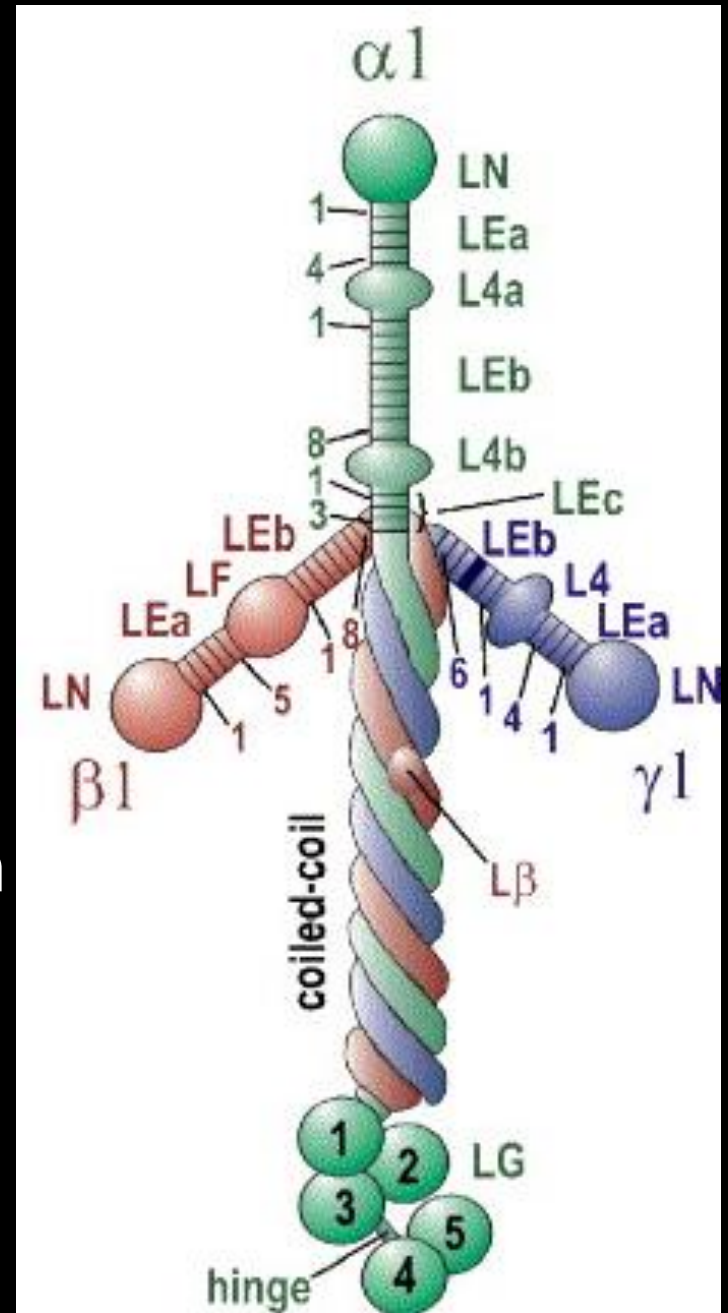
# Laminin

- Laminins – a family of extracellular glycoproteins
- Consist of 3 different polypeptide chains linked by disulfide bonds
- Organized into a molecule resembling a cross with 3 short arms and a long arm - Trimeric proteins
- Contain globular, rod, and coiled-coil domains
- Contain an  $\alpha$ -chain, a  $\beta$ -chain, and a  $\gamma$ -chain, found in 5, 4, & 3 genetic variants, respectively



# Laminin

- The 3 shorter arms bind to other laminin molecules - allows them to form sheets.
- The long arm binds to cells - helps anchor organized tissue cells to the membrane
- At least 15 laminins have been identified





# Laminin: Functions

- An integral part of the structural scaffolding in almost every tissue of an organism
- Extracellular laminins greatly influence the cell's potential for migration, growth & differentiation
  - Play a critical role in the migration of primordial germ cells
    - During their migration, the primordial germ cells traverse surfaces particularly rich in laminin
    - Primordial germ cells possess a cell-surface protein that adheres strongly to one of the subunits of the laminin molecule