



MARTINI | NATH

FUNDAMENTALS OF

ANATOMY & PHYSIOLOGY

Eighth Edition

Chapter 4

The Tissue Level of Organization

**PowerPoint® Lecture Slides
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CLE 3251.1.2 Investigate the interrelationship between the structures and functions of the main body systems

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Four Types of Tissues

- Tissues are collections of cells and cell products that perform specific, limited functions
- Types of tissue
 - **Epithelial tissue**
 - Covers exposed surfaces
 - Lines internal passageways
 - Forms glands

Four Types of Tissues

- Types of Tissue (cont'd)
 - **Connective tissue**
 - Fills internal spaces
 - Supports other tissues
 - Transports materials
 - Stores energy
 - **Muscle tissue**
 - Specialized for contraction
 - Skeletal muscle, heart muscle, and walls of hollow organs
 - **Neural tissue**
 - Carries electrical signals from one part of the body to another

Epithelial Tissues

- **Epithelia**

- Layers of cells covering internal or external surfaces

- **Glands**

- Structures that produce secretions

Epithelial Tissues

- **Characteristics of Epithelia**
 - Cellularity (cell junctions)
 - Polarity (apical and basal surfaces)
 - Attachment (basal lamina)
 - Avascularity
 - Regeneration

Epithelial Tissues

- **Functions of Epithelial Tissue**
 - Provide physical protection
 - Control permeability
 - Provide sensation
 - Produce specialized secretions (glandular epithelium)

Epithelial Tissues

- **Specializations of Epithelial Cells**
 - Move fluids over the epithelium (protection)
 - Move fluids through the epithelium (permeability)
 - Produce secretions (protection and messengers)
- **Free Surface and Attached Surface**
 - Polarity
 - Apical surfaces:
 - **microvilli** increase absorption or secretion
 - **cilia** (ciliated epithelium) move fluid
 - Basolateral surfaces

Epithelial Tissues

- Maintaining the Integrity of Epithelia
 - Intercellular connections
 - Attachment to basal lamina
 - Epithelial maintenance and repair

Epithelial Tissues

- Attachment to the Basal Lamina
 - **Clear layer** (Lamina lucida)
 - Thin layer
 - Secreted by epithelia
 - Barrier to proteins
 - **Dense layer** (Lamina densa)
 - Thick fibers
 - Produced by connective tissue
 - Strength and filtration

Epithelial Tissues

- Epithelial Maintenance and Repair
 - Epithelia are replaced by division of **germinative cells** (stem cells)
 - Near basal lamina

Classification of Epithelia

- Singular epithelium; plural epithelia
- Classes of Epithelia
 - **Based on shape**
 - Squamous epithelia: thin and flat
 - Cuboidal epithelia: square shaped
 - Columnar epithelia: tall, slender rectangles
 - **Based on layers**
 - Simple epithelium: single layer of cells
 - Stratified epithelium: several layers of cells

Classification of Epithelia

- Squamous Epithelia
 - **Simple squamous epithelium**
 - Absorption and diffusion
 - **Mesothelium**
 - Lines body cavities
 - **Endothelium**
 - Lines heart and blood vessels

Classification of Epithelia

- Squamous Epithelia
 - **Stratified squamous epithelium**
 - Protects against attacks
 - **Keratin** protein adds strength and water resistance

Classification of Epithelia

- Cuboidal Epithelia
 - **Simple cuboidal epithelium**
 - Secretion and absorption
 - **Stratified cuboidal epithelia**
 - Sweat ducts and mammary ducts

Classification of Epithelia

- **Transitional Epithelium**

- Tolerates repeated cycles of stretching and recoiling and returns to its previous shape without damage
- Appearance changes as stretching occurs
- Situated in regions of the urinary system (e.g. urinary bladder)

Classification of Epithelia

- Columnar Epithelia
 - **Simple columnar epithelium**
 - Absorption and secretion
 - **Pseudostratified columnar epithelium**
 - Cilia movement
 - **Stratified columnar epithelium**
 - Protection

Classification of Epithelia

- Glandular Epithelia
 - **Endocrine glands**
 - Release hormones:
 - into interstitial fluid
 - no ducts
 - **Exocrine glands**
 - Produce secretions:
 - onto epithelial surfaces
 - through ducts

PLAY

Mechanisms of Glandular Secretion

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Classification of Epithelia

- Glandular Epithelia
 - Types of secretions
 - **Serous glands:**
 - watery secretions
 - **Mucous glands:**
 - secrete mucins
 - **Mixed exocrine glands:**
 - both serous and mucous

Classification of Epithelia

- Glandular Epithelia
 - Gland structure
 - **Unicellular** glands
 - **Mucous (goblet) cells** are the only unicellular exocrine glands:
 - » scattered among epithelia
 - » for example, in intestinal lining