

Principles of Anatomy and Physiology
14th Edition
Gerard J. Tortora / Bryan Derrickson
WILEY

CHAPTER 4
The Tissue Level of Organization

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Introduction

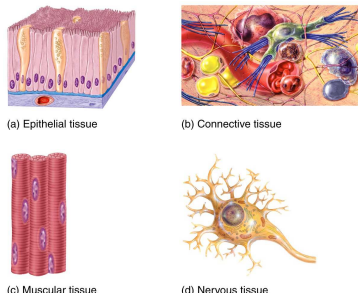
The purpose of this chapter is to:

- Learn about the various types of tissues and their origins
- Discuss how cells of a tissue are held together
- Compare and contrast epithelial, connective, muscular, and nervous tissue
- Learn about the structure and function of membranes
- Understand tissue repair

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The 4 Tissue Types

1. Epithelial
2. Connective
3. Muscular
4. Nervous

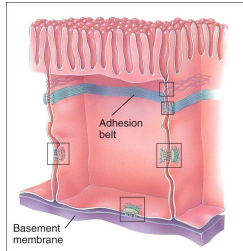


(a) Epithelial tissue (b) Connective tissue
(c) Muscular tissue (d) Nervous tissue

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Cell Junctions

Cells can be held together in a number of ways. These points of contact between cells are called cell junctions.



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Intercellular Junctions

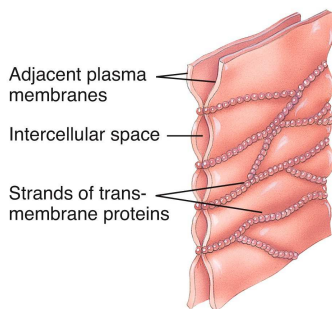
Interactions Animation:

[Intercellular Junctions](#)

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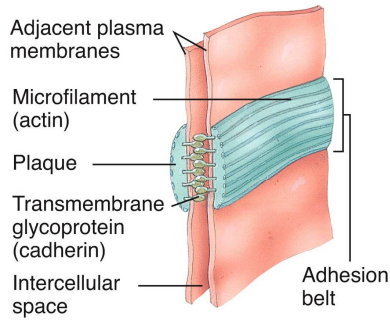
Tight Junctions



(a) Tight junctions

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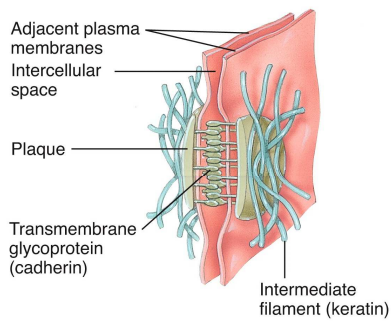
Adherens Junctions



(b) Adherens junction

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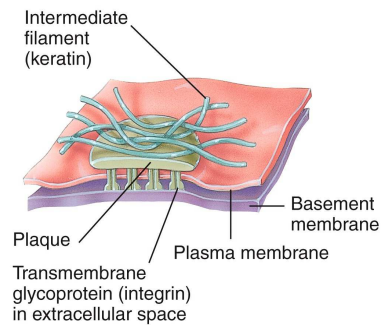
Desmosomes



(c) Desmosome

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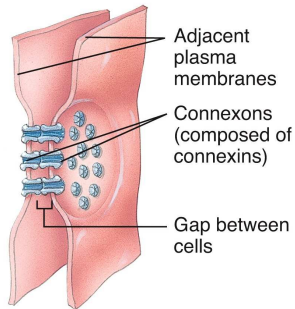
Hemidesmosomes



(d) Hemidesmosome

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Gap Junctions

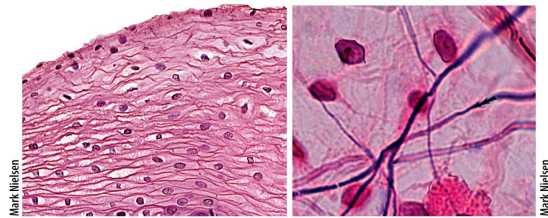


(e) Gap junction

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Epithelial vs. Connective Tissue

What differences can you see?



(a) Epithelial tissue with many cells tightly packed together and little to no extracellular matrix

(b) Connective tissue with a few scattered cells surrounded by large amounts of extracellular matrix

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Epithelial Tissue

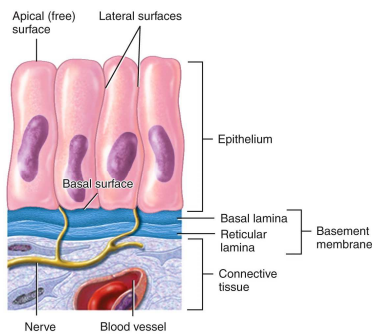
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General Features of Epithelial Tissue

- Cells are arranged in sheets
- Cells are densely packed
- Many cell junctions are present
- Epithelial cells attach to a basement membrane
- Epithelial tissue is avascular but does have a nerve supply
- Mitosis occurs frequently

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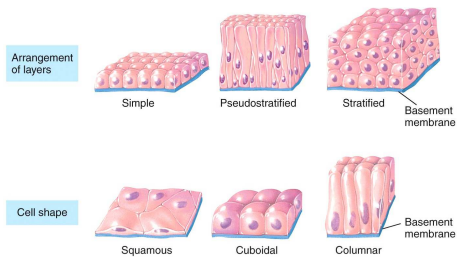
Surfaces of Epithelial Cells and the Basement Membrane



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Classification of Epithelial Tissue

Covering and lining epithelia are classified according to the shape of the cells and how many layers thick they are



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Covering and Lining Epithelial Tissue

The name of the specific type of stratified epithelial tissue depends on the shape of the apical cells

- Table 4.1 in your textbook shows examples of each of the epithelial tissues – notice the similarities and differences!

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Epithelial Tissue

Anatomy Overview:

[Epithelial Tissues](#)

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Epithelial Tissue Naming Combinations

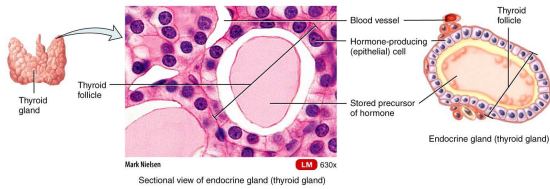
	Squamous	Cuboidal	Columnar
Simple	x	x	x
Pseudostratified			x
Stratified	x	x	x
Transitional			

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Glandular Epithelium

A gland is a single cell or a mass of epithelial cells adapted for secretion

- Endocrine vs. Exocrine Glands

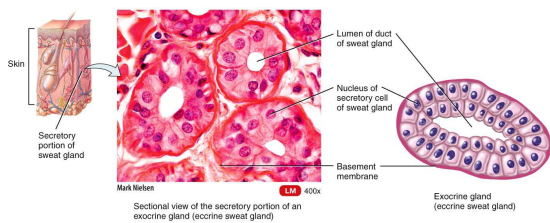


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Glandular Epithelium

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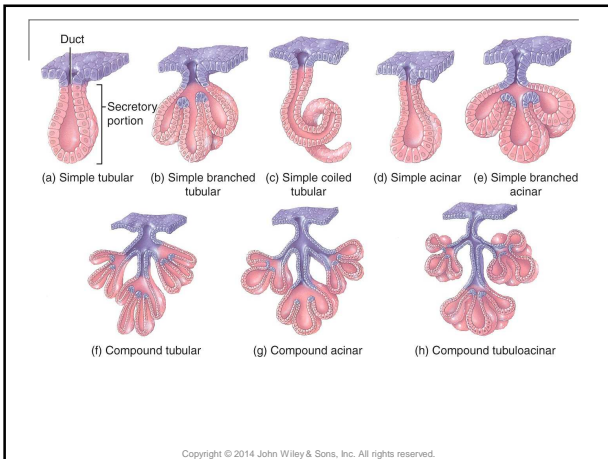


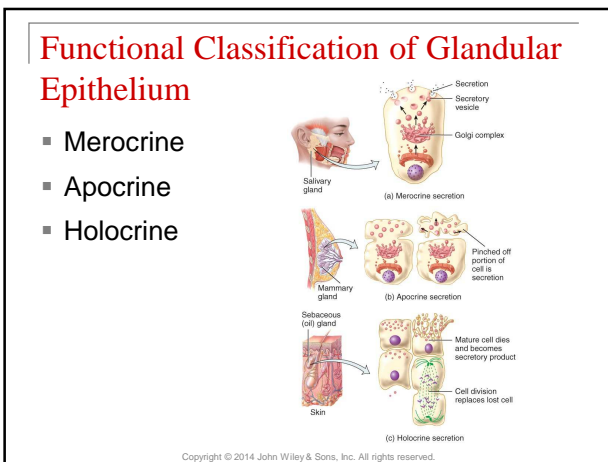
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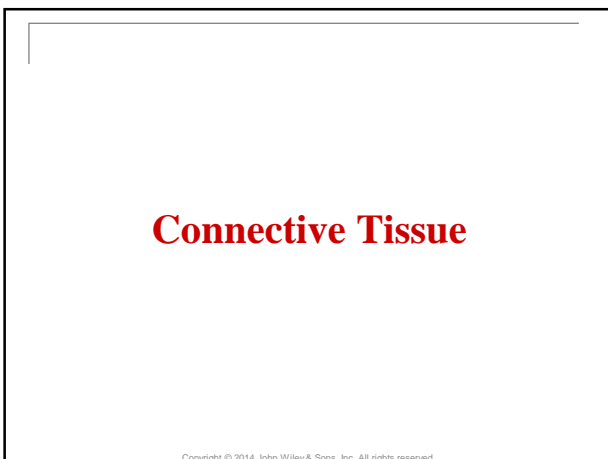
Structural Classification of Glandular Epithelium

- Unicellular – single cells
- Multicellular – composed of many cells that form a distinctive microscopic structure or macroscopic organ
 - Sweat glands
 - Oil glands
 - Salivary glands

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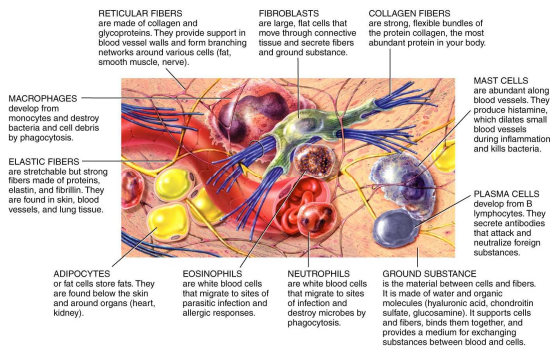


General Features of Connective Tissue

- Consists of two basic elements
 - Cells
 - Extracellular matrix
- Cells do not cover or line (they do not have any free surfaces)
- Epithelial tissue is highly vascularized and has a nerve supply
 - Except tendon and cartilage

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Connective Tissue Cells



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Connective Tissue Extracellular Matrix

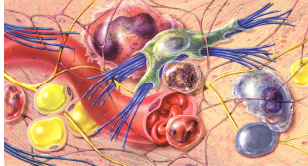
- Extracellular matrix is located in the spaces between connective tissue cells
- Extracellular matrix is composed of:
 - Fibers
 - Ground substance



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Connective Tissue Fibers

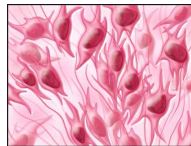
- Fibers in the extracellular matrix provide strength and support to a tissue
 - Collagen fibers
 - Elastic fibers
 - Reticular fibers



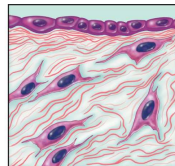
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Classification of Connective Tissue

- Embryonic
 - Mesenchyme
 - Mucous



Mesenchyme



Mucous connective tissue

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Classification of Connective Tissue

- Mature
 - Loose
 - Dense
 - Cartilage
 - Bone
 - Blood

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Connective Tissue

Anatomy Overview:

Connective Tissues

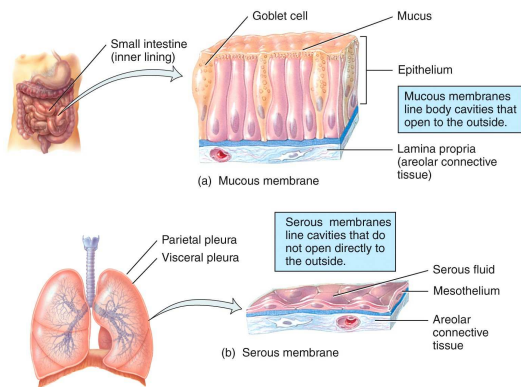
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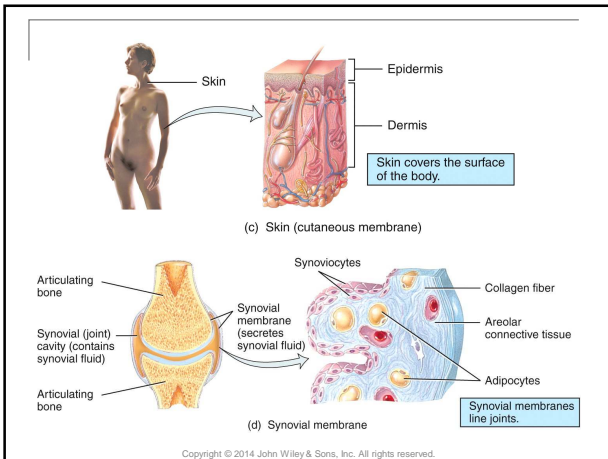
Membranes

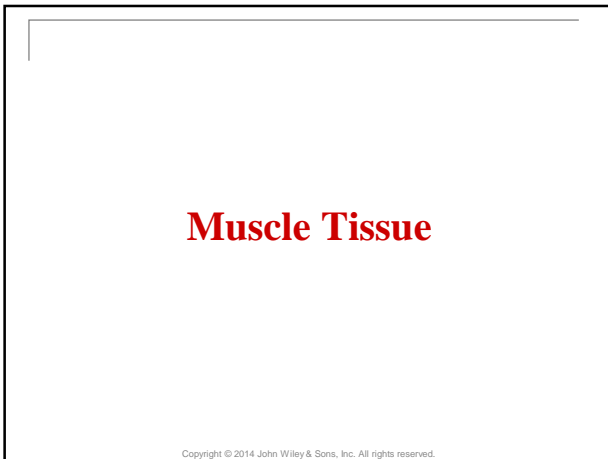
- Membranes are flat sheets of pliable tissue that cover or line a part of the body
- 2 types of membranes
 1. Epithelial membranes
 - Mucous membranes
 - Serous membranes
 - Cutaneous membranes
 2. Synovial membranes

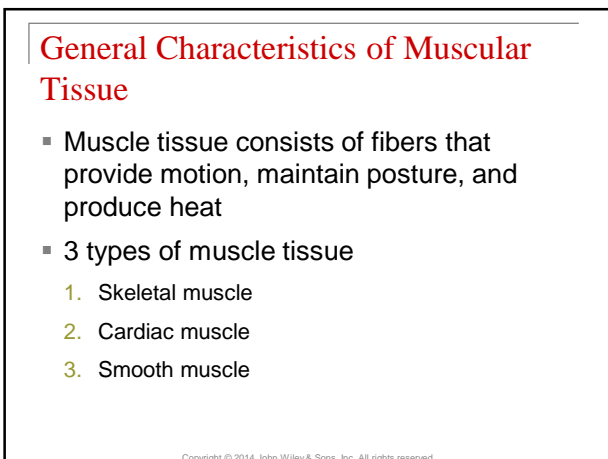
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Muscle Tissue

Anatomy Overview:

Muscle Tissue

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Nervous Tissue

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General Characteristics of Nervous Tissue

- Two kinds of cells:
 1. Neurons
 2. Neuroglia
- Most neurons have a cell body, dendrites, and axons. They carry sensory and motor information and perform integrative functions.
- Neuroglia protect and support neurons

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Nervous Tissue

Anatomy Overview:

Nervous Tissue

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Tissue Repair, Aging, and Disorders

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Tissue Repair

- Tissue repair is the process that replaces worn out, damaged, or dead cells.
 - Epithelial cells are replaced by the division of stem cells or undifferentiated cells
 - Not all connective tissue cells have the ability to repair
 - Muscle cells can perform limited repair
 - Some nervous cells can perform limited repair, others cannot
- Fibrosis is the formation of scar tissue

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Aging

- Younger bodies generally experience:
 - A better nutritional state
 - A better blood supply to tissues
 - A faster metabolic rate

- Aging slows the process of tissue repair

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Disorders

- Disorders of epithelial tissues tend to be specific to individual organs
 - Skin cancer
- Disorders of connective tissues tend to be autoimmune in nature
 - Lupus
- Disorders of muscular and nervous tissues will be discussed in later chapters

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End of Chapter 4

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