

ACTIVITY 2: HISTOLOGY AND INTEGUMENT

Objectives:

- 1) **How to get ready:** Read Chapter 4 and 5, McKinley *et al.*, *Human Anatomy*, 4e. All text references are for this textbook.
- 2) Identify each tissue (26 tissues) in a histology photo or microscope slide.
- 3) Sketch each tissue in the space provided.
- 4) Identify the features of the integument (skin) on a slide and/or model.
- 5) **Before next class:** Preview axial skeleton terms lists from SLCC Anatomy Laboratory website or your printed laboratory manual and your textbook.

EPITHELIAL TISSUES

Cell Shapes:

squamous
cuboidal
epithelium
columnar

Number of Layers:

simple
stratified

pseudostratified

Things to Identify:

- each tissue as an epithelium
- specific type/name of
- shape of cells
- number of cell layers
- specific body location of each tissue
- specialized structures
- basement membrane, basal

surface,

apical surface

TABLE 1. TYPES OF EPITHELIUM (10 tissues to identify)

NAME	BODY LOCATIONS/ STRUCTURES	TEXT REFERENCES & SKETCH
<input type="checkbox"/> simple squamous epithelium	body locations: air sacs in lungs (alveoli), lining of blood vessels, serous membranes of body cavities structure: single layer of thin, flat, shaped cells resembling floor tiles with a single nucleus in its center <input type="checkbox"/> basement membrane <input type="checkbox"/> apical surface <input type="checkbox"/> basal surface function: rapid diffusion, filtration, and some secretion in serous membranes	<p>p. 86, table 4.3a; description pp. 84-85</p>

<p>stratified squamous epithelium</p> <p><input type="checkbox"/> keratinized</p> <p><input type="checkbox"/> non-keratinized</p>	<p>body locations: lining of oral cavity, esophagus, vagina, and anus (non-keratinized); epidermis of skin (keratinized)</p> <p>structure: multiple layers of cells; basal cells cuboidal, apical cells squamous; surface cells are alive and kept moist in nonkeratinized; surface cells in keratinized are dead and filled with the protein keratin</p> <ul style="list-style-type: none"> <input type="checkbox"/> basement membrane <input type="checkbox"/> apical surface <input type="checkbox"/> basal surface <p>function: protection of underlying tissue</p>	<p>p. 89 table 4.4a, b; description pp. 87-88</p>
<p><input type="checkbox"/> simple cuboidal epithelium</p>	<p>body locations: kidney tubules; ducts and secretory regions of most glands</p> <p>structure: single layer of cells as tall as they are wide; spherical, centrally located nucleus</p> <ul style="list-style-type: none"> <input type="checkbox"/> basement membrane <input type="checkbox"/> apical surface <input type="checkbox"/> basal surface <input type="checkbox"/> lumen <p>function: absorption and secretion</p>	<p>p. 86 table 4.3b; description p. 85</p>
<p><input type="checkbox"/> stratified cuboidal epithelium</p>	<p>body locations: found in large ducts in most exocrine glands and in some parts of male urethra</p> <p>structure: two or more layers of cells; cells at apical surface are cuboidal</p> <ul style="list-style-type: none"> <input type="checkbox"/> basement membrane <input type="checkbox"/> apical surface <input type="checkbox"/> basal surface <p>function: protection and secretion</p>	<p>p. 90 table 4.4; description p. 88</p>
<p>simple columnar epithelium</p> <p><input type="checkbox"/> ciliated</p> <p><input type="checkbox"/> non-ciliated</p>	<p>body locations: lining of most of the digestive tract (non-ciliated); lining of uterine tubes and larger bronchioles of respiratory tract (ciliated)</p> <p>structure: single layer of tall, narrow cells; oval shaped nucleus in the basal region of cells</p> <ul style="list-style-type: none"> <input type="checkbox"/> basement membrane <input type="checkbox"/> apical surface <input type="checkbox"/> basal surface <input type="checkbox"/> goblet cells <input type="checkbox"/> cilia (when present) <p>function: absorption and secretion (non-ciliated); secretion of mucin and movement of mucus along apical surface of epithelium by action of cilia (ciliated)</p>	<p>p. 86 table 4.3c, d; description pp. 85-86</p>

<input type="checkbox"/> stratified columnar epithelium	<p>body locations: rare, found in large ducts of some exocrine glands and in some regions of the male urethra</p> <p>structure: two or more layers of cells; cells at the apical surface are columnar</p> <ul style="list-style-type: none"> <input type="checkbox"/> basement membrane <input type="checkbox"/> basal surface <input type="checkbox"/> apical surface <p>function: protection and secretion</p>	<p>p. 90 table 4.4d; description p. 88</p>
<input type="checkbox"/> pseudostratified columnar epithelium	<p>body locations: ciliated form lines most of the respiratory tract; non-ciliated form is rare and lines the epididymis and part of male urethra</p> <p>structure: single layer of cells with varying heights that appear multi-layered; all cells connect to the basement membrane but not all cells reach the apical surface</p> <ul style="list-style-type: none"> <input type="checkbox"/> basement membrane <input type="checkbox"/> apical surface <input type="checkbox"/> basal surface <input type="checkbox"/> cilia <input type="checkbox"/> goblet cells <p>function: protection; ciliated form also involved with secretion of mucin and movement of mucus across surface with ciliary action</p>	<p>p. 91 table 4.5a; description p. 88</p>
<input type="checkbox"/> transitional epithelium	<p>body locations: lining of urinary bladder, ureters, and part of urethra</p> <p>structure: epithelial appearance varies, depending on whether the tissue is stretched or relaxed; shape of cells on the apical surface changes.</p> <ul style="list-style-type: none"> <input type="checkbox"/> basement membrane <input type="checkbox"/> apical surface <input type="checkbox"/> basal surface <p>function: distention and relaxation to accommodate urine volume changes in the bladder, ureters, and urethra</p>	<p>p. 91 table 4.5b; description p. 88</p>

CONNECTIVE TISSUES

Identify on each slide:

- each tissue as a connective tissue
- fluid vs. connective tissue proper vs. supporting connective tissue
- for connective tissues proper: identify loose vs. dense connective tissues
- specific name of each connective tissue
- cells, fibers, ground substance or matrix
- any special structure

TABLE 2. TYPES OF CONNECTIVE TISSUE (12 tissues to identify)

NAME	BODY LOCATIONS/ STRUCTURES	TEXT REFERENCES & SKETCH
FLUID CONNECTIVE TISSUE (1 tissue)		
<input type="checkbox"/> blood	<p>location: primarily within blood vessels (arteries, veins, and capillaries), and the heart</p> <p>structure: contains</p> <ul style="list-style-type: none"> <input type="checkbox"/> erythrocytes <input type="checkbox"/> leukocytes <input type="checkbox"/> platelets <input type="checkbox"/> plasma (matrix) <p>function: erythrocytes transport gases, leukocytes control immune response, platelets help with blood clotting; plasma transports nutrients, wastes, and hormones throughout the body, and contains clotting elements to stop blood loss.</p>	<p>p. 108, table 4.13; description p. 105</p>
<p>CONNECTIVE TISSUES PROPER: include the LOOSE CONNECTIVE TISSUES and the DENSE CONNECTIVE TISSUES</p>		
<p>LOOSE CONNECTIVE TISSUES (3 tissues): generally have a loose association of fibers in extracellular matrix</p>		
<input type="checkbox"/> areolar connective tissue	<p>location: subcutaneous layer under the skin; surrounds organs</p> <p>structure: vascularized, ground substance is gel-like with</p> <ul style="list-style-type: none"> <input type="checkbox"/> fibroblasts <input type="checkbox"/> collagen fibers <input type="checkbox"/> elastic fibers <input type="checkbox"/> ground substance <p>function: surrounds and protects tissues and organs; loosely binds epithelium to deeper tissues; provides nerve and blood vessel packing.</p>	<p>p. 102 table 4.9a; description p. 100</p>

<input type="checkbox"/> reticular connective tissue	<p>location: forms stroma of lymph nodes, spleen, thymus, and bone marrow</p> <p>structure: ground substance is gel-like liquid; scattered arrangement of</p> <ul style="list-style-type: none"> <input type="checkbox"/> reticular fibers <input type="checkbox"/> extracellular matrix <p>function: provides supportive framework for spleen, lymph nodes, thymus, and bone marrow</p>	<p>p. 103 table 4.9c; description p. 100</p>
<input type="checkbox"/> adipose connective tissue	<p>location: subcutaneous layer; covers and surrounds some organs</p> <p>structure: closely packed</p> <ul style="list-style-type: none"> <input type="checkbox"/> adipocytes, with nucleus squeezed to one side <input type="checkbox"/> lipid vacuole (fat droplet) <p>function: stores energy; protects, cushions, and insulates.</p>	<p>p. 102 table 4.9b; description p. 100</p>
<p>DENSE CONNECTIVE TISSUES (<i>3 tissues to identify</i>): generally have a dense association of fibers in the extracellular matrix</p>		
<input type="checkbox"/> dense regular connective tissue	<p>location: forms tendons, most ligaments</p> <p>structure:</p> <ul style="list-style-type: none"> <input type="checkbox"/> collagen fibers (densely packed, parallel) <input type="checkbox"/> fibroblast nuclei <input type="checkbox"/> ground substance (scarce) <p>function: attaches muscle to bone and bone to bone; resists stress applied in one direction</p>	<p>p. 104 table 4.10a; description p. 101</p>
<input type="checkbox"/> elastic connective tissue	<p>location: walls of elastic arteries; trachea; bronchial tubes; true vocal cords; suspensory ligaments of penis</p> <p>structure:</p> <ul style="list-style-type: none"> <input type="checkbox"/> elastic fibers (parallel) <input type="checkbox"/> fibroblast nuclei <input type="checkbox"/> ground substance <p>function: allows stretching of some organs</p>	<p>p. 105 table 4.10c; description p. 101</p>

<input type="checkbox"/> dense irregular connective tissue	<p>location: dermis; periosteum covering bone; perichondrium covering cartilage, organ capsules</p> <p>structure: predominantly</p> <ul style="list-style-type: none"> <input type="checkbox"/> collagen fibers (bundled; randomly arranged) <input type="checkbox"/> fibroblasts <input type="checkbox"/> ground substance (more than in dense regular connective tissue) <p>function: withstands stresses applied in all directions; durable</p>	<p>p. 104 table 4.10b; description p. 101</p>
<p>SUPPORTING CONNECTIVE TISSUES: includes bone tissue and 3 cartilage tissues</p>		
<p>BONE OR OSSEOUS TISSUE (<i>1 tissue to identify</i>)</p>		
<input type="checkbox"/> compact bone	<p>location: exterior of bones of the body</p> <p>structure: calcified matrix arranged in</p> <ul style="list-style-type: none"> <input type="checkbox"/> osteons <input type="checkbox"/> osteocytes in lacunae <input type="checkbox"/> lamellae (concentric) <input type="checkbox"/> central canal <input type="checkbox"/> canaliculi <p>function: supports soft structures; protects vital organs; provides levers for movement; stores minerals</p>	<p>p. 107 table 4.12; description, p. 104-105</p>

CARTILAGE TISSUES (3 tissues to identify)		
<input type="checkbox"/> hyaline cartilage	<p>location: most of fetal skeleton; covers articular ends of long bones; costal cartilage; most of the larynx, trachea, and nose.</p> <p>structure:</p> <ul style="list-style-type: none"> <input type="checkbox"/> extracellular matrix <input type="checkbox"/> lacunae <input type="checkbox"/> chondrocytes <input type="checkbox"/> perichondrium (often visible) <p>function: smooth surfaces for movement at joints; model for bone growth; supports soft tissue.</p>	<p>p.106 table 4.11a; description p. 103</p>
<input type="checkbox"/> fibrocartilage	<p>location: intervertebral discs; pubic symphysis; menisci of knee joints.</p> <p>structure:</p> <ul style="list-style-type: none"> <input type="checkbox"/> collagen fibers (parallel) <input type="checkbox"/> extracellular matrix <input type="checkbox"/> lacunae <input type="checkbox"/> chondrocytes <p>function: resists compression; absorbs shock in some joints.</p>	<p>p. 106 table 4.11b; description p. 103</p>
<input type="checkbox"/> elastic cartilage	<p>location: external ear; epiglottis of the larynx.</p> <p>structure: contains abundant</p> <ul style="list-style-type: none"> <input type="checkbox"/> elastic fibers (branching) <input type="checkbox"/> lacunae <input type="checkbox"/> chondrocytes <p>function: maintains structure and shape while permitting flexibility.</p>	<p>p. 107 table 4.11c; description p. 103</p>

MUSCLE TISSUES

TABLE 3. TYPES OF MUSCLE TISSUE (3 tissues to identify)

NAME	BODY LOCATIONS/ STRUCTURES	TEXT REFERENCES AND SKETCH
<input type="checkbox"/> smooth muscle	location: walls of hollow internal organs, such as vessels, airways, stomach, bladder, and uterus structure: <ul style="list-style-type: none"><input type="checkbox"/> muscle fiber (spindle-shaped)<input type="checkbox"/> nucleus (centrally located) function: involuntary movements and motion; moves materials through internal organs.	p. 111 table 4.14c; description, p.109
<input type="checkbox"/> skeletal muscle	location: attaches to bones or sometimes skin structure: <ul style="list-style-type: none"><input type="checkbox"/> muscle fiber (long, cylindrical, unbranched)<input type="checkbox"/> nuclei (multiple per fiber)<input type="checkbox"/> striations function: moves skeleton; responsible for voluntary body movements, locomotion, and heat production.	p.110 table 4.14a; description p. 109
<input type="checkbox"/> cardiac muscle	location: heart wall (myocardium) structure: <ul style="list-style-type: none"><input type="checkbox"/> muscle fiber (or cardiomyocyte; short, branched)<input type="checkbox"/> nucleus (one per cell)<input type="checkbox"/> striations<input type="checkbox"/> intercalated discs (between cells) function: involuntary contraction and relaxation pump blood in the heart.	p. 110 table 4.14b; description p. 109

NERVOUS TISSUE

TABLE 4. NERVOUS TISSUE (1 tissue to identify)

NAME	BODY LOCATIONS/ STRUCTURES	TEXT REFERENCES AND SKETCH
<input type="checkbox"/> nervous tissue (from multipolar neuron smear slide)	location: brain, spinal cord, peripheral nervous tissue structures: <ul style="list-style-type: none"> <input type="checkbox"/> neuron <input type="checkbox"/> soma (cell body) <input type="checkbox"/> axon <input type="checkbox"/> dendrites <input type="checkbox"/> neuroglia (glial cells) function: control and communication between tissues	p. 112 table 4.15; description p. 111

INTEGUMENTARY SYSTEM: skin and accessory structures

STRUCTURES TO IDENTIFY ON SKIN MODEL AND/OR SLIDES

TEXT

REFERENCES

Layers of the skin/ integument/ cutaneous membrane, from superficial to deep:
table 5.2

p.119; fig. 5.1;

- EPIDERMIS** -- most superficial layer; keratinized stratified squamous epithelium

LAYERS OF THE EPIDERMIS: FROM BASEMENT MEMBRANE TO APICAL SURFACE

p.121; fig. 5.2

- stratum basale
 - melanocytes
 - keratinocytes
- stratum spinosum
 - epidermal dendritic (Langerhans) cells
- stratum granulosum
- stratum lucidum (thick skin only)
- stratum corneum

- DERMIS** – deep to the epidermis

p.126; fig. 5.6

- papillary layer (areolar connective tissue)
 - dermal papillae
 - epidermal ridges
- reticular layer (dense irregular connective tissue)
 - hair follicles
 - sebaceous glands
 - sudoriferous glands
 - sensory receptors

- HYPODERMIS OR SUBCUTANEOUS LAYER** (not part of the integument proper) – areolar connective tissue and adipose tissue; often called superficial fascia