

ACTIVITY 3: AXIAL SKELETON AND LONG BONE DISSECTION

Objectives:

- 1) How to get ready: Read **Chapter 7, McKinley et al., Human Anatomy, 5e**. All text references are for this textbook. Learning the **meanings of the bone markings and features** is very helpful. There are tables provided in your text and at the end of this activity for understanding the meanings of common bone markings. Refer to these as you are studying bone anatomy.
- 2) ★ Observe and dissect a fresh long bone from a cow. **YOU MUST BRING YOUR OWN GLOVES FOR THIS ACTIVITY. Read dissection instructions BEFORE coming to lab.**
- 3) Identify the **cranial and facial bones and important bone markings** on each.
- 4) Identify the **types of vertebrae and other features of the vertebral column, and important bone markings on each.**
- 5) Identify the **ribs and sternum and important bone markings** on each.
- 6) Before next class: **Preview Appendicular Skeleton terms lists from SLCC Anatomy Laboratory website or your printed laboratory manual and your textbook.**

★ COW BONE DISSECTION

Dissection Instructions:

1. **Acquire all dissection materials. (1 set per table)**
 - Dissection tray
 - Scalpel
 - Probe
 - Cow bone
 - Gloves (Supply your own)
 - Forceps
2. After bringing the cow bone back to your table, place it on your tray, cut side up, and begin to examine it closely. Notice that within the compact bone there are red dots, which are blood vessels within the compact bone.
3. **Procedure**
 - A) Take probe and carefully dig into the yellow bone marrow in an attempt to find a nutrient artery (unlikely). Bone is living tissue and is highly vascular. Next, dig out all of the marrow from the cavity to expose the **trabeculae** (spongy bone portions) visible on the side toward the **epiphysis**. These **trabeculae** are the network that makes up the spongy bone. Within this spongy bone you will find an area that will be red and bloody, this is the red bone marrow and the site of blood cell production (**hematopoiesis**).
 - B) Now look toward the outside of the bone to the outer lining of the shaft. Take forceps and peel away the **periosteum**. The **periosteum** serves as a site of attachment for tendons and ligaments and an anchor for blood vessels.
 - C) Now look for cartilage. **Hyaline cartilage** will form the **articular cartilage** at the ends, where the bone will articulate with another bone. In some cases **fibrocartilage** will be visible in the shape of a 'C' on the end of the cow tibia. Closely look at the difference between the two cartilages.
 - D) Identify all of the structures on the following list before properly disposing of your specimen.
 - E) **YOU MUST DISPOSE OF THE COW BONE AS INSTRUCTED, AND COMPLETELY CLEAN, DRY, AND PUT AWAY ALL INSTRUMENTS AND TRAYS IN ORDER TO EARN YOUR PARTICIPATION GRADE FOR THE LAB.**

- diaphysis
- compact bone tissue (forming most of the diaphysis and the outside of all bones)
- proximal and distal epiphysis (form the ends of the long bone)
- articular surface *with* articular (hyaline) cartilage
- metaphysis
- epiphyseal line *or* epiphyseal (growth) plate
- medullary (marrow) cavity
- yellow bone marrow
- spongy bone tissue
- red bone marrow
- trabeculae (thin bony plates running within spongy bone tissue) within spongy bone
- periosteum (dense irregular connective tissue covering the outside of all bones)
- endosteum (tissue lining the inside of the medullary cavity in the diaphysis)
- nutrient artery (if visible)

AXIAL SKELETON BONES AND FEATURES

STRUCTURES TO IDENTIFY:

TEXT REFERENCES

SUTURES: Know which bones are joined by each major suture, and be able to identify these from any view.

fig. 7.5, 7.6, p. 179-180;
described: p. 185

- coronal suture
- sagittal suture
- squamous suture
- lambdoid suture

PARANASAL SINUSES: Air-filled chambers named for the bone in which they are housed. They can be identified in different sections of the skull.

fig. 7.3; p. 176, fig. 7.24; p.200

- frontal sinus
- ethmoidal sinus
- sphenoidal sinus
- maxillary sinus

FONTANELLES: Features (soft spots) of the fetal skull.

fig. 7.27; p. 203

- anterior/frontal fontanelle
- sphenoidal fontanelle
- mastoid fontanelle
- posterior fontanelle

TABLE 1. CRANIAL AND FACIAL BONES. You are responsible for determining **left or right** on all paired cranial and facial bones. Paired bones are indicated by (2) in parentheses.

BONE	BONE MARKINGS	SIGNIFICANCE	TEXT REFERENCE
<input type="checkbox"/> frontal	<input type="checkbox"/> supraorbital foramen		pp. 176,178
	<input type="checkbox"/> frontal sinus	moistens air	
<input type="checkbox"/> parietal (2)			
<input type="checkbox"/> nasal (2)			pp. 176,178
<input type="checkbox"/> sphenoid	<input type="checkbox"/> greater wing		pp. 182,184, 190-191
	<input type="checkbox"/> lesser wing		
	<input type="checkbox"/> sella turcica	houses pituitary gland	
	<input type="checkbox"/> optic foramen/canal	CNII (optic nerve)	
	<input type="checkbox"/> foramen ovale	CNV	
	<input type="checkbox"/> foramen rotundum	CNV	
	<input type="checkbox"/> foramen spinosum		
	<input type="checkbox"/> foramen lacerum ¹		
	<input type="checkbox"/> superior orbital fissure	CNIII, CNIV, CNV, CNVI	
	<input type="checkbox"/> inferior orbital fissure ²	CNV	p. 178
	<input type="checkbox"/> sphenoidal sinus	moistens air	p. 181
	<input type="checkbox"/> pterygoid processes		
	<input type="checkbox"/> lateral and medial plates		
<input type="checkbox"/> ethmoid	<input type="checkbox"/> perpendicular plate	superior part of nasal septum	pp. 184,193
	<input type="checkbox"/> superior & middle nasal concha	increase surface area for warming and filtering air	
	<input type="checkbox"/> cribriform plate (and foramina)	passageway for olfactory nerves	
	<input type="checkbox"/> crista galli	attachment site for dura mater to skull	
<input type="checkbox"/> inferior nasal concha (2)		increase surface area for warming and filtering air	p. 178
<input type="checkbox"/> lacrimal (2)	<input type="checkbox"/> lacrimal groove (nasolacrimal canal)	passageway for nasolacrimal duct	p. 180
<input type="checkbox"/> zygomatic (2)	<input type="checkbox"/> temporal process	form anterior portion of zygomatic arch	p. 180
<input type="checkbox"/> maxilla (2)	<input type="checkbox"/> infraorbital foramen	CNV	pp. 178,180,197
	<input type="checkbox"/> alveolar processes	contain upper teeth	
	<input type="checkbox"/> palatine process	form anterior portion of hard palate	
	<input type="checkbox"/> incisive foramen (fossa)	branch from CNV	

¹ Between sphenoid and temporal bones

² Between sphenoid and maxilla bones

TABLE 1, CONTINUED.

BONE	BONE MARKINGS	SIGNIFICANCE	TEXT REFERENCE
❑ mandible	❑ body		pp. 178, 180, 198
	❑ ramus		
	❑ alveolar processes	contain lower teeth	
	❑ angle		
	❑ mental foramen	CNV (mandibular branch); vessels	
	❑ coronoid process	insertion point of temporalis muscle	
	❑ mandibular condyle and condylar process	forms joint with mandibular fossa of temporal bone	
	❑ mandibular notch		
❑ temporal (2)	❑ zygomatic process	forms posterior portion of zygomatic arch	pp. 180-181, 188
	❑ squamous region	squamous = flat	
	❑ styloid process	attachment for hyoid bone and tongue muscles	
	❑ mastoid process	insertion for sternocleidomastoid muscle	
	❑ external acoustic/auditory meatus	opening to the auditory canal	
	❑ petrous part	houses inner ear structures	
	❑ jugular foramen ⁴	internal jugular vein; CNIX, CNX, CNXI	
	❑ carotid canal	internal carotid artery	
	❑ mandibular fossa	forms joint with mandibular condyle	
	❑ internal acoustic/auditory canal (meatus)	CNVII, CNVIII and blood vessels to inner ear	
❑ occipital	❑ foramen magnum	spinal cord; vertebral arteries; CNXI	pp. 179, 182, 184, 189
	❑ hypoglossal canal	CNXII (hypoglossal nerve)	
	❑ external occipital protuberance and crest	attachment site for neck/back muscles	
	❑ occipital condyles	articulates with atlas (C1 vertebra)	
❑ palatine (2)	❑ horizontal plate	form posterior portion of hard palate	pp. 181-182, 192, 196
❑ vomer		forms inferior part of nasal septum	pp. 178, 181-182, 195
❑ hyoid	not a cranial or facial bone	articulates with no other bones; supports tongue and soft tissue	p. 201

⁴ Between temporal and occipital bones

TABLE 2. VERTEBRAE: Most of the 32 vertebrae have the following features to identify: lamina, pedicle, transverse process, articular processes, vertebral foramen, body, intervertebral foramen.

BONE NAME	# BONES	BONE MARKING	DESCRIPTION & RELATED STRUCTURES OF IMPORTANCE
pp. 205- 210, fig. 7.28, 7.29, table 7.5			
<input type="checkbox"/> <i>typical vertebra</i> (pl. <i>vertebrae</i>)	<input type="checkbox"/> 32 total	<input type="checkbox"/> lamina	connects transverse to spinous process
		<input type="checkbox"/> pedicle	connects body to transverse process
		<input type="checkbox"/> transverse process	process directed laterally
		<input type="checkbox"/> spinous process	process directed posteriorly
		<input type="checkbox"/> articular processes and facets (superior and inferior)	form joints between adjacent vertebrae
		<input type="checkbox"/> vertebral foramen	contains spinal cord
		<input type="checkbox"/> body	largest part of the vertebra
		<input type="checkbox"/> intervertebral disc (not a bone)	fibrocartilage found between adjacent vertebral bodies
<input type="checkbox"/> intervertebral foramen	between any two vertebrae, contains spinal nerves		
<input type="checkbox"/> <i>cervical vertebra</i>	7	<input type="checkbox"/> transverse foramen	contains vertebral artery and vein
<input type="checkbox"/> <i>atlas (C1)</i>			C1 has no body
<input type="checkbox"/> <i>axis (C2)</i>		<input type="checkbox"/> odontoid process (dens)	dens articulates with C1
<input type="checkbox"/> <i>vertebra prominens (C7)</i>		<input type="checkbox"/> spinous process	very large, easily felt under the skin
<input type="checkbox"/> <i>thoracic vertebra</i>	12		transverse process contains facets for articulation of the angle of a rib
<input type="checkbox"/> <i>lumbar vertebra</i>	5		
p. 211, fig. 7.31			
<input type="checkbox"/> <i>sacrum</i>	5 (fused)	<input type="checkbox"/> anterior sacral foramina	contain ventral rami of sacral spinal nerves
		<input type="checkbox"/> posterior sacral foramina	contain dorsal rami of sacral spinal nerves
		<input type="checkbox"/> median sacral crest	represents fused spinous processes of sacral vertebrae
		<input type="checkbox"/> auricular surfaces	ear-like process, articulates with the ilium
		<input type="checkbox"/> superior articular processes	articulate with inferior articular processes of L5
<input type="checkbox"/> <i>coccyx</i>	2 to 3 (fused)	<input type="checkbox"/> cornu (horns)	small horns that point superiorly

TABLE 3. STERNUM AND RIBS

BONE	BONY LANDMARK	TEXT REFERENCE
<input type="checkbox"/> STERNUM		described: p. 212; fig. 7.32
<input type="checkbox"/> manubrium	<input type="checkbox"/> sternal (jugular) notch	
	<input type="checkbox"/> sternal angle	
	<input type="checkbox"/> clavicular notch	
	<input type="checkbox"/> costal notches	
<input type="checkbox"/> body	<input type="checkbox"/> costal notches	
<input type="checkbox"/> xiphoid process		
Separator		
<input type="checkbox"/> RIBS		described: p. 213; fig. 7.33
<input type="checkbox"/> true ribs (1-7)	<input type="checkbox"/> head (<i>capitulum</i>) of rib	
	<input type="checkbox"/> neck of rib	
	<input type="checkbox"/> tubercle of rib	
	<input type="checkbox"/> angle	
	<input type="checkbox"/> costal groove	
	<input type="checkbox"/> shaft (body)	
<input type="checkbox"/> false ribs (8-12)	no direct contact with sternum	
<input type="checkbox"/> floating ribs (11-12)	no contact with sternum	