**Anatomy First Class 2015-2016 Dr. Khalid k k**

**Anatomy**: a science that deal with form and structures of organ.

**Types:**

1- Special anatomy: Description of the structures of a single type or species.

2- Comparative anatomy: compare (between animals).

3-Applied anatomy: study the relation of anatomy with other science e.g. surgery.

**Veterinary anatomy:** branch that deals with form and structures of principal domesticated animals.

**Methods of study:**

1) Systematic anatomy: (e.g. osteology, myology, neurology).

2) Topographic anatomy: study the organs related in position.

**Anatomical planes:**

1- Median plane: divided the body or organ into two equal parts.

2- Sagittal plane: divided the body or organ into two unequal parts.

3- Transverse plane: divided the body or organ into cranial and caudal parts.

4- Frontal plane: divided the body or organ into dorsal and ventral parts.

**Topographical terms:**

\* Lateral-----Medial

\* Dorsal-----Ventral

\* Cranial----Caudal

\* Superficial-----Deep

**Descriptive terms:**

1- Depressions:

 \* Articular Depressions: (Glenoid and Cotyloid cavity)

 \* Non articular Depressions: (Groove, Fovea, Fossa, Cochlea and Notch)

2- Prominences:

 \* Articular pro.: (Condyle, Head and Trochlea)

 \* Non articular pro.: (Spine, Crest, Tuberosity and Tubercle

**Osteology**

**Skeleton**: Framework of hard structures (bones, cartilage and ligaments) which supports and protects the soft tissues of animals. The skeleton can divide into:

1- **Axial skeleton**: (Skull, Vertebral column, ribs and sternum).

**2**- **Appendicular sk**.: includes (bones of the limbs).

3- **Visceral sk.:** consists of certain bones that developed in soft tissue e.g. (os cardis in ox, os phrenic in camel and os penis in dog).

**Types of bones:**

1- Long bones:

 \* have shaft (body) and two extremities .

 \* Contain medullary cavity---contain marrow

 \* Example the **bones of the limbs**

2- Flat bones:

 \* There is no clear body or shaft

 \* Expended more than two directions

 \* Example the bones of **skull, os coxea and scapula.**

3- Short bones:

 \* Similar in dimensions (equal length, breadth and thickness). e.g. **carpal bones**.

4- Irregular bones:

 \* Irregular in shape

 \* Example **vertebrae**

**Structures of bones:**

The bone is living substance contains organic framework (cells, fibrous tissue) and inorganic salts (give the bone rigidity).

1

1

2

2

3

5

6

6

4

4

1- Compact substance

2- Spongy substance Epiphysis

3- Medullary cavity

4- Periosteum

5- Endosteum Diaphysis

6- Epiphyseal disc

 Epiphysis

(Longitudinal section through Long bone)

**Compact substance:**

Composed of calcified interstitial substance --- to form-- bone matrix—which arrange in layers (lamellae).

The osteocytes—located inside the lacunae—between them there are many canaliculi.

Haversian canal –in the center of the haversian system.

Volkmann’s canal ---between the haversian canals as a transverse canals.

1

2

2

2

3

3

4

5

Bone matrix

1- Osteocyts

2- Haversian canal

3- Lacunae

4- Canaliculi

5- Volkmann’s canal

**Spongy substance:**

Spongy bone is consists of delicate bony plates in various directions. The spaces between them are filled with marrow.

**Marrow**:

Its site in the marrow cavities of the spongy bone and in the medullary cavity of the long bone.

Red marrow-------------blood forming

Yellow marrow--------fat

In adult------------red marrow + yellow marrow

In young----------red marrow only

**Chemical and physical properties of bones:**

Organic substance + inorganic substance (1:2)

(Elasticity) (Hardness)

Called (ossein) or bone collagen mineral salts

When boiled yields gelatin

**Growth of bones: ossification or osteogenesis**

1- **Intramembranous**:

\* Mesanchymal cells------Osteoblast------------ Osteoblast

 Osteocytes

\* center of ossification--------extend from the center to the periphery

\* The superficial part of the tissue becomes the periosteum {the deep face (osteoblast) adds more layers of bone matrix}.

****

 2- **Endochondral** ossification:

\* In the cartilage sample, the old chondrocyte------degeneration in the center of the cartilage (undergo calcification).

\* The blood vessels extend into the center of the dead cartilage –with the (osteoblast) --------center of ossification.

\* The perichondrum ----------becomes ---periosteum (periosteal band) around the cartilage. This will increase the degeneration of the cartilage.

\* The large cells (osteoclast) will absorb the dead cartilage and the primitive bone marrow cavities formed.

Epiphysis

 Epiphyseal disc

Diaphysis

Epiphysis Epiphyseal disc

**Vertebaral column:**

Consists of a chain of irregular bones (vertebrae) extend from the skull to the tail.

In adult---certain vertebrae have become fused to form single bone (fixed or false vertebrae).

The true vertebrae------- movable

The vertebral column subdivided into:

Cervical, thoracic, lumbar, sacral and caudal.

Formula:

Horse----- C7 T18 L6 S5 Ca15-21

Cow ------- C7 T13 L6 S5 Ca18-20

Sheep------ C7 T13 L6-7 S4 Ca16-18

Dog-cat---- C7 T13 L7 S3 Ca20

**Typical vertebrae:**

In this type the vertebrae has:

1- Body- intervertebral fibrocartilage disc.

2- Arch- vertebral canal.

3- Vertebral notch (cranial and caudal) – intervertebral foramen.

4- Articular process- (cranial and caudal).

5- Spinous process.

6- Transverse process with transverse foramen (in cervical vertebrae only).

7- Mammillary process (in last thoracic and lumber vertebrae).

8- Accessory process (in last thoracic and lumber vertebrae) in dog.

**The ribs:**

Curved bones from the lateral thoracic walls. The ribs are articulates dorsally with the thoracic vertebrae and ventrally with the costal cartilage.

The intercostal space -------- space between two ribs.

Types:

Sternal ribs (or true ribs) ----- articulate with sternum.

Asternal ribs (or false ribs) ------ articulate with costal arch.

Floating ribs (free ribs) -------- not attached (free end). Found in sheep

**The sternum:**

Segments of bones (sternebrae) 7 (horse)

It’s consist of:

1- Manubrium sterni (the first segment).

2- Cartilage of manubrium. Ribs Ribs

3- Xiphoid process (the last segment).

4- Xiphoid cartilage.

5- Intersternebral cartilage.

 **Sternum**

**Bones of the thoracic limbs:**

There are four main segments: (A)- Thoracic girdle (B)- Arm (C)- forearm (D)- Manus.

**A)**- **Thoracic girdle**: (shoulder). Consists of:

1- Scapula - (flat bone) - well developed in domestic animals .

- Coracoid - (reduce bone) as a process fused with scapula, well developed in bird.

- Clavicle - absent (not present) in domestic animals.

**B)- Arm:**

2- Humerus - long bone.

Extend from the shoulder proximally (join the scapula) to the elbow distally (join the radius and ulna).

**C)- Forearm:**

3- Radius - well developed

4- Ulna - less developed

**D)- Manus:** shoulder joint

5- Carpal bones: Two rows

|  |  |  |  |
| --- | --- | --- | --- |
| R.c.b | I.c.b | U.c.b | Ac.c.b |
| 1.c | 2.c | 3.c | 4.c |  |

 Elbow joint

**6- Metacarpal bones:**

First Second Third Fourth Fifth carpal joint

 X X Fetlock

 Pastern

**7- Digits:** phalanges; (First, second and third). Coffin

8- Proximal sesamoid bones (two bones-fetlock).

9- Distal sesamoid bones (on bone-coffin).

**Bones of the pelvic limb:**

There are four main segments: (A)- Pelvic girdle (B)- Thigh (C)- Leg (D)- Pes.

**A) Pelvic girdle: os coxae (or hip bone)**

The right and left os coxae fuse at pelvic symphysis to form the hip bone.

Os coxae: largest flat bone – consists from three bones:

Ilium, Pubis and Ischium---the bodies of these bones fused to form the Acetabulum (Cotyloid cavity).

**Bony pelvis -** (the right and left os coxae +Sacrum + First and second caudal vertebrae).

**B) Thigh:**

Femur (or thigh bone) os coxae

Patella (or knee-cap) - short bone.

**C) Leg:** Hip joint

Tibia--- well developed femur

Fibula ---Less developed Patella

**D) Pes:** Stifle joint

Tarsus (or hock joint). It’s consisting of two rows:

**In horse** Tibia & Fibula

Talus + Calcaneus (proximal row)

Central tarsal bone (between rows) tarsal bones

First T.b - Second T.b - Third T.b - Fourth T.b

**In cow** metatarsal bones

Talus + Calcaneus (proximal row) proximal sesamoid

 Central T.b

First T.b - Second T.b - Third T.b - Fourth T.b Distal sesamoid