

INTRODUCTION TO VETERINARY ANATOMY

The term anatomy refers to that science which deals with the form and structures of all organisms. It is often regarded as the firm foundation of the whole art of medicine and its essential preliminary. Whereas the term Veterinary Anatomy refers to that branch of Veterinary Medicine which deals with the form and structure of the principal domesticated animals.

The study of anatomy usually involves dissection of animals in gross anatomy laboratory coupled with close observation of the shape, texture, location and relations of those structures visible to the naked eyes. The use of the microscope with properly prepared tissue section on slides is equally essential for an understanding of structures that are so small to be seen without optical assistance.

DIVISIONS OF ANATOMY

The science of anatomy has become so extensive that it is now divided into many specialized branches. However, the followings are of major interest to now.

- 1) **GROSS (Macroscopic) Anatomy:** is the study of the form and relations (relative positions) of structures of the body that can be seen with the naked eye.
- 2) **Histology (Microscopic Anatomy):** involves study of those tissues and cells that can be seen only with the aid of a microscope.
- 3) **Comparative anatomy:** is a study of the structures of various species of animals, with particular emphasis on those characteristics that aid in classification.
- 4) **Embryology:** is the study of developmental anatomy, covering period from conception (fertilization of the egg with the female) to birth.
- 5) **Ultrastructural cytology:** deals with portions of cells and tissues as they are visualised with the aid of electron microscope. This is a recent development in the study of Anatomy.
- 6) **Applied Anatomy:** Is the application of knowledge of anatomical landmarks in solving clinical problems.

The method of study in Anatomy is chiefly by system and this is referred to as Systemic anatomy. The following are the commonly accepted systems:

<u>Systems</u>	<u>Name of Study</u>	<u>Structures</u>
1. Skeletal system	Osteology	Bones
2. Arthriticular system	Arthrology	Joints
3. Muscular system	Myology	Muscles
4. Viscera systems	Splanchnology	Internal organs
- Digestive system)		- Stomach & Intestine
- Respiratory system)		- Lungs
- Urinary system)		- Kidneys & Bladder
- Reproductive system)		- Ovaries & Testess
5. Endocrine system	Eudocrinology	Ductless gland
6. Nervous system	Neurology	Brain, Spinal cord
7. Circulatory system	Angiology	Heart, Vessels
8. Intecuamentary systems	Dermatology	Skin
9. Sensory system	Esthesiology	Eye, Ear.

The course shall be concerned with all these system and studies as they are related to specifically to domestic animals.

The domestic animals are those animals with mutual relationship with human being and the relationship should be positive. Those include:

- | | |
|---------------------------------------|---------------|
| i) Bovine species e.g. cattle) | |
| ii) Caprine species e.g. goat) | |
| iii) Ovine species e.g. sheep) | |
| iv) Equine species e.g. horse) | Large Animals |
| v) Porcine species e.g. pig (suine)) | |
| vi) Canine species e.g. dog) | |
| vii) Feline species e.g. cat) | Small Animals |
| viii) Avian species e.g. chicken) | |

Note that anatomy requires a lot of imagination, and it is a visual science in which verbal descriptions are always inadequate, therefore, learning it requires careful observation, preferably repeatedly and from different perspectives. In gross anatomy, then, the major study must take place in the dissecting room, where repeated handling and review is possible. Except for the purposes of communication, useful anatomy is visual anatomy: the picture of structures and relationships that can be seen in the “mind’s eye” or “X-ray eye”, not the words used to describe the structure.

Descriptive Terms Useful In The Study Of Anatomy

In order to indicate precisely the position and direction of part of the animals body certain descriptive terms are used. These include –

(A) Directional Terms:

- 1) The Longitudinal axis - This splits the body into equal left and right half (bilaterally symmetrical cut). This is also called longitudinal axis.
- 2) Sagittal plane or sagittal axis – This is a split that is parallel to the median plane. If it is near the middle, it is the mid sagittal plane but if it is far from the middle it is called lateral sagittal plane.
- 3) Transverse plane - Any point perpendicular to the median plane and at right angle to the longitudinal axis. It divides the body into a cranial and a caudal segments.
- 4) The fronal plane - Is at right angles to both the median plane and transverse plane. It divides the body into dorsal (upper) and ventral (Lower) segments.

(B) Adjectives of Relative Position:

1. Medial - point closer to the median plane
2. Lateral - a point further away from the median plane
3. Dorsal - is toward the back or closer to the dorsum
4. Ventral - is closer to the lower position
5. Cranial - towards the head (cranium – the brain cavity) or it can be anterior.
6. Rostral - closer to the mouth region or rostrum
7. Deep - internal
8. Superficial – close to the surface. (external)
9. Caudal – tail wards
10. Proximal – toward the front or closer to the body
11. Distal – further away from the body (related to the limbs)
12. Palmar (volar) – the under side of the foot (fore limb)
13. Planter – the dorsal of the limbs
14. Pronation – the dorsal of the limbs
15. Supination – the ventral of the limb
16. Axial – closer to the longitudinal axis

17. Abaxial – away from the longitudinal axis
18. Inspiration – breathing – in
19. Expiration – breathing –out
20. Adduction – bringing together of limbs
21. - Abduction – Keeping apart of limbs

THE SKELETAL SYSTEM

The study of bones that collectively make up the skeleton or framework of the body is called osteology.

The skeleton of a living animal is made up of bones that are themselves living structures. They have blood vessels lymphatic vessels, and nerves. They are subject to disease, and adjust to changes in stretch.

The function of bones include providing protection, giving rigidity and form to the body, acting as levers, storing minerals, and providing a site for bloods formation.

CLASSIFICATION OF BONES

Any bone may be classified in one of the following groups: Long, Short, flat, seas amid, pneumatic or irregular.

1. Long bones – are greater in some dimension than any other. Each consists of a relatively cylindrical shaft (diaphysis) and two extremities called epiphysis with a metaphysis between epiphysis and the diaphysis. Basically the long bones functions as levers and this is to aid locomotion and support and in some cases even prehension e.g. humerus, femur etc.
2. Short Bone - are basically short and they appear cuboidal in shape. They do not have a marrow cavity. They function in absorbing concussion (shocks) and they are often found in complex joint. e.g. carpal and tarsal bones.
3. Flat Bones - are relatively thin and expand in two dimensions. They consists of two plates of compact substance, Lamina external and lamina internal, separated by spongy material called diploe. They protect many of the vital organs e.g. cranium protect brain, the ribs protects heart, lungs.
4. Sessamoid bones - (Seed –like) usually found along the course of tendons. They may also change the angle of pull of muscles and thus give a greater mechanical advantage. e.g. the patellar (knee cap) is the longest sessamoid bone in the body.
5. Pneumatic bones - Contain air sinuses that communicate with the exterior, e.g. the frontal bones or sinuis.
6. Irregular bones – irregular in shape e.g vertebral bone

The Skeleton

The skeleton of the animal can be divided basically into the axial and appendicular skeleton and splanchnic skeleton.

The axial skeleton includes practically all the bones in the body axis. These are the bones that are situated along the median axis to the skeleton. They include the skull, vertebral column, the ribs and the hip bones.

The appendicular skeleton includes both the bones of the limbs, includes fore and hind bones.

Splanchnic skeleton refers to soft bones found in some organs e.g. os sclera in birds, os penis in dog, Lyssa in tongues of dog, os notric in pig, os cordis in bat.

The Skull

That part of the skeleton which forms the basis of the head is called the skull. Its functions include protection of the brain, supports many of the sense organs, and forms passages for the beginning of the digestive and respiratory system.

The Skull consists of:

- 1) a cranial part, which surrounds the brain
- 2) the Facial part

It is this facial part that is used in differentiation between the animal species.

Vertebral Column

Composed of medium, unpaired, irregular bones called vertebrae. These bones vary in number from one animal to the other. As a result there are vertebral formulae. The following patterns are used to designate the respective regions.

- C = Cervical vertebra - neck region
- T = Thoracic or dorsal chest region
- L = Lumbar - loin region
- S = Sacral - in region of pelvis - Fused vertebrae
- LS = Fused lumbar and sacral (fowl)
- CD = Caudal (Coccygeal)

The vertebral formula for a given species of animal consists of the symbol for each region together with the number of bones or the number of vertebrae in that region.

The vertebral formula of common animals are as follows:

Species	C	T	L	S	CY
Camel	7	12	7	4	18-0
Sheep/Goat	7	13	6-7	4	12-18
Cattle	7	13	6	5	18-20
Dog	7	13	7	3	20-23
Pig	7	14-15	6-7	4	20-23
Horse	7	18	6	5	15-21
Man	7	12	5	5	4
Bird	16-17	5-6	15 - 16		Pygostyle

Synsacrum
i.e fusions of L and S

Differentiate Chemestastics of Vertebrae

- 1) The cervical do not have long spine; they have large foramina on either side.
- 2) The thoracic has long neural spine. The lengths of the body to that of the neural spine has ratio 1: 2. Another characteristics is the fact that it has 2 facets for articulation with the ribs. Transverse process is absolutely absent.
- 3) The basic characteristic in lumbar is the long transverse process. They have fairy reduced neural spine 1: 1
- 4) The sacral vertebrae are fused into a composite bone called sacrum. On each side of the sacrum bears a large flattened process for articulation with the ilium of the pelvic girdle.

- 5) Coccygeal (caudal) region consists of caudal coccygeal vertebrae which are progressively reduced. They serve as site for the insertion for the muscle which make the tail.

Skeleton of the Thorax

This is made up of the thoracic vertebrae dorsally the ribs and the costal cartilage laterally and the sternum (vertebral) ventrally.

The thoracic cavity is conically shaped. The structure of the lateral wall of the thorax varies from one animal to another. But in general the ribs form the basic bony elements.

A typical rib has a shaft and two extremities which are often termed vertebral and sternal extremity.

The shaft is curved thus, giving the thorax a BARREL like appearance.

The vertebral extremity of the rib has the head, neck and tubercle.

The sternal extremity of the ribs join with the costal cartilage. There are intercostal spaces between the ribs which are occupied by the intercostal muscle as well as intercostal vessels and nerves. Limbs consist of shoulder girdle fore arms.

SCAPULAR BONE

This is a flat bone. It is triangular in shape. It has 2 surface, three borders and three angles

Dorsal border
Causal border
Cranial border

The cranial and the caudal borders converge at the Distal Entremities on which the GLENOID CAVITY for articulation which the HUMERUS is found

Bone of the thoraxis Limb

The thorax limb is attached to the body by the pectorial girdle on the up of 3 bones (scapular, cervical, and cordacord) bones these are present in most domestic animals. The cervical and the coracoil bones have been reduced to more pheminence the scapular.

The cervical is completely absent in Bovine and other domestic animal. The thoracic limb is made up of shoulder, the arm, the fore arm and the manus. The principal bone of this region (The shoulder and girdle) scapular in the arm, radius and ulna in the fore arm, in the menus we have the carpals and method carpat and the phalanges.

THE SCAPULAR SPINE

This divide the lateral surface of the scapular into the supra spinose fossa which is cranial and the intra-spinose fossa is the smaller of the two and it occupies the supra spinose muscle. The intra-spinose fosa duged the intra – spinose muscle. The dorsal end of the scapular carried the GLENOID CAVITY in which the head of the humerous articulate.

In the cattle, it is found the smaller prominent and the sopra-spinose doest't extend to lower part of bone. In the sheep, sub-scapular fossa is more extensive. In the pig the scapular is very wide, it is found to be triangular and it is found in the middle. The spine also curve backward in the middle over the intra spinox fossa.

HUMERUS

In humerus is a long bone and consisting of shaft and two extremities. The shaft twisted half a tongue to form a musallo spiral grope in which runs the Brachio cephalic muscles. The musculo spiralguous located in the lateral side of the shaft. The media surface of the shaft is fairly strength and bears teres tube rosity at its middle. The proximal extremities of the humerous has tuberosity in both the lateral and media surface for both attachment. It is also has head for articulation with the glenoid cavity of the scapular. The dotal extremities of the humerous bears the rounded surface known as **CONDYLES** which articulate with the radius and ulna. The caudal consist of media condial and lateral condial between the two condial is the **OLECRANON** fosa into which the conceal process of the ulna lodges.

Radius and Ulnar

The radius and ulna form the bones of the fore arm. The radius is bigger than the ulna, the radius is located in the cranio – medial aspect of the ulna.

In most livestock or domestic animals the radius is fused with the ulna. The ulna is located cranial - laterally at the proximal extremity. At the proximal extremities of the radius are rough prominences on the lateral and medial aspects for the attachment of ligaments. The distal extremities of the radius broaden out laterally and medially to articular surfaces for the bones of the carpus.

The ulna is fused to the radius except that “the proximal and distal interosseous spaces”. The ulna has a prominent olecranon process which projects orderly about the elbow joint. The development of ulna is variable in different spp of animal “except in the fowl where the ulna is not developed then the radius”. In cattle, sheep and pigs the shaft of the ulna extends as far as the distant end of the radius.

THE CARPAL BONE

They are short bones. They are seven in number and they are arranged in two rows. The first row is the proximal row and the second row is the distal.

The proximal row articulates with the ulna and radius bone ends consist of three carpal bones. They are named from medial to lateral as radial carpal, intermediate carpal and Ulna carpal bone.

The distal row of the carpal bones articulates with the metacarpal bones. It consists of four carpal bones 1st median carpal bone, 2nd M. C. B, 3rd M. C. B. and 4th M.C.B. from medial to lateral side. And the accessory carpal bone is situated behind the corpus.

THE METACARPAL BONE

These bones are distal to the carpal and prominently consist of five bones. The human has 5 M C B and pig has 4 M C B and Bovine has 2 fixed M C B i.e the 3rd and 4th M C B with the 1st, 2nd and 5th M C missing.

The horse has only one large M C B which is 3rd so the 1st, 2nd, 4th and 5th are absent or have been reduced to thin vestigial bone known as splint.

The Phalanges (Digits)

The number of functional distal corresponding to the number of functional meta carpal bone. Three phallanges are contained in each functional mammalian digits. This consist of propermmal phalanx which articulate with the M C B then the middle phalange and distal phalanx. The distal phalanx is enclose in the hoof.

BONES OF THE PELVIC GIRDLE

In the adult, three bone unted to form the pelvic, these includes the ilium, pubis and ischium. The three bones.

DIAGRAM OF PELVIC LIMB

The three bones of the pelvic girdle of one side is correctly fused in an adult form a single oscoxas. The pubis bone of opposite side, the left and right oscoxae unite as the acetabulon in. The three bones from each side are united at the acetabullin.

The ilium is the largest and the most dorsal of the bone of OSCOXAE. It is made up of the wing and shaft of the body.

ISCHIUM

Ischium - The ischium form the posterior part of the ventral wall in floor of the bony pelvis. The ischium. The ischium has a large, rough, caudal, prommenc known as Tuber ischi commonly called the bone.

The pubis is the smallest of the pelvic three bones end become the cranial part of the top of the pelvic. The pubis enter into the formation of the acetabulum.

The femur – is the major bone of the high extends on the hind joint to the stifle joint. It is known as knee joint. It is a long bone and has a shaft at two extremities. The proximal extremities of the femur has s smooth rounded edge adaptated to fit a top – line acetabulium of the os coxas . The proximal extremities also has a large rough tuberosity with lateral side known as the greater trochanter. The head of the femur has small depression in his middle

known as foveae capitis for the attachment of round ligament that attaches the head of the femur to the acetabulum. The distal extremities of the femur is more larger than the proximal extremities. It has Trochlear cranially and condyles caudally. The two trochlear are separated by groove in which slides a large sessanoid known as the patella or the knee cap.

Tibia and Fibular

A tibia is long bone that has a body and 2 extremities. The bone is larger proximally and dually decrease in size distally. It articulate with candyle of the femur proximally and with the dorsal of the common livestock only the pig has the complete fibular which the rummats, the proximal head of the fibular is highly and fused with the tibia.

TARSAL BONE

In domestics animal, this consist of between 5 -7 short tarsal bone they area arrange in two row. A proximal row and the distal row. The largest two of these bones in the proximal row, they include the Talus or Tibia dorsal bone and the ealomeus bone or tibular tarsal bone. The bones of distal row are also numbered at the median to the lateral 1,2,3,4 these bones are band together by strong short ligament.

THE METATARSAL BONE

They are long bones with extremities and a shaft. The metatarsal bone of the mammal are longer than the metal carpal bone but they show similar reduction in number when comprised the two species as the metal carpal.

The phalanges / Digits - The bones of the hind digits also resembler those of the thoracic limb.

MYOLOGY

This is the study of muscles and their accessories structure. They are active organs of mition. There are 3 types of muscle in the organs of animal.

- (i) Skeleton muscles or striated muscles
- (ii) Non-striated or smooth muscles
- (iii) Cardial muscle

A non-striated muscles are often describes as visceral muscles.

A striated muscles cover the greater part of the skeleton. They are red in colour and connect directly or indirectly with the skeleton upon which they acted. Some of these muscles are

intimately associated and attached to the skin and are called cutaneous muscles its contraction twitches the skin and thus get rid of insects and other irritants.

The description of skeletal muscles may be based on the name, position of the muscles, attachment of the muscles, action of the muscles, relation of the muscles as well as bloods and nerves supplied. The name of the muscles may be determined by various considerations such as action, attachment, shape, position and direction. In most cases two or more of these factors are combined to produce a name e.g.

The attachment of skeletal muscles are in most cases to bones. Many muscles are attached to cartilage, ligaments, facial or skin

MUSCLES OF THE THORAXIC LIMB

Muscles acting on the shoulder girdle include:

- 1) Trapezius Muscles
- 2) Rhomboideus Muscles.

DIGESTIVE SYSTEM

This consists of organs which are involved in the ingestion, mastication, digestion and absorption of food as well as the expulsion of the unabsorbed residues. It consists of the mouth, pharynx, oesophagus, stomach and the intestine. The accessory organs which aid the functions of the digestive systems – are the teeth, the salivary gland, the liver and pancreas.

THE MOUTH

The cavity of the mouth is divided by the teeth into an outer part which is called vestibule (between the teeth and lips) while the oral cavity proper is enclosed by the teeth and dental pad.

In the ruminants, the cavity of the cheek or buccal is capacious but the vestibule is small because the rimeoris (opening to the teeth) is short. “The remarkable feature of bovine oral cavity is the large number of sharp, modified projections erected towards the back of the mouth”.

The tongue and palate are not so rough in the sheep and goat. Lips in the Bovine are thick and comparably immobile. The tongue is wide and thin rostrally. It is very mobile not pigmented but has a bright red colour.

DENTAL FORMULAR OF SOME DOMESTIC ANIMALS

For Ruminants $2 (I^{0/4}, C^{0/0}, P^{3/3}, M^{3/3}) = 32$

For Pig	$2 (I^{3/3}, C^{1/1}, P^{4/4}, M^{3/3})$	=	44
For Horse	$2 (I^{3/3}, C^{1/1}, P^{3-4/3}, M^{3/3})$	=	40 or 42
In the Dog	$2 (I^{3/3}, C^{1/1}, P^{4/4}, M^{2/3})$	=	42
Cat	$2 (I^{3/3}, C^{1/1}, P^{3/2}, M^{1/1})$	=	30
	$I_s C_s P_{pd} M_{p4}$		

PHARYNX OF THE RUMINANT

The cranial end of the pharynx is approximately in the plan of the caudal end of the

The pharynx is attached dorsally by its muscle and axial to the bone of the skull. The floor of the pharynx is formed by the nod of the tongue and the pharynx.

OESOPHAGUS

It is highly dilatable of varying diameter. In bovine, it is about 90 – 105 cm in length from its junction with the pharynx to the caudal of the stomach.

There are cervical and thoracic parts of the oesophagus that because the stomach is in close contact with the diaphragm, there is no abdominal part of the oesophagus.

THE STOMACH

This is dilatable between the oesophagus and small intestine.

Functions

- | | |
|--------------------------|-----------------------------|
| (i) Microbial activities | (ii) Digestive of foods |
| (iii) Absorption of food | (iv) Reservoir for ingester |

There are two type of stomach

- (i) Simple and Complex Stomach.

The simple stomach – There are three portions in the simple stomach.

- (i) Caudal : Into which the oesophagus empties
- (ii) Funds: It represent the body of the stomach
- (iii) Pylorus : It is the outlet from the stomach.

The caudal and pylorus are closer to each other there by turning the stomach into a curve tube. The greater length of distal tube is called greater curvature while the lesser length is called lesser Curvature. The oesophagical fascial is at the caudal while that of the duodenum is at the pylorus and both are guided by the sphincter consisting of smooth muscle.

THE RUMINANTS STOMACH

The ruminants stomach is complex and different from that of other type of animal. It consists of 4 parts .

- (i) Reticulum (ii) Rumun (iii) Omasum (iv) Abomasum

The first three parts are lined by stratified squamous epithelium. They are not-glandular and represent the fore stomach while the abomasum is the true-glandular stomach. The entire stomach in cattle is very large and occupies about $\frac{3}{4}$ of the abdominal cavity. At birth, the abomasum is about twice other 3 compartments. Differentiation and growth take place gradually and it is intensified when dry feed become the staple diet. In the adult, total capacity of the stomach is showed as follows

Rumen	80%	Omasum	7 . 8 %
Reticulum	5 %	Abomasum	7. 8%

Rumen extend from the 7th to 8th inter coastal space to the pelvic area. It divided into dorsal and ventral sacs by the right and left longitudinal grooves at the respective and of the rumens.

Caudally, there is a dorsal blind sacs as well as ventral blind sacs which are demarcated from the dorsal and ventral sacs proper by the dorsal and ventral coronary grooves and from each other by the other groove.

The reticulum is separated from the rumen by rummo-reticular groove which is prominence laterally and ventrally but not dorsally.

RETICULUM

This is the smallest and the most anteriorly place of the compartment. It is the blind sac which blind with the dorsal part of the rumen. It is wholly placed more on the left and its conoex surface faces anteriorly and its in close contact with the diaphragm and the liver. It is usually called HONEY CONB

OMASUM

It is clearly marked – off from other three compactment and can only be observed from the right side of the animal. It is rounded ball – like structure attached by its other ends to the reticulum and by a short neck on the lesser curvature of the abomasums. Because of the present of several plicae it contains. It is literally called Bull stomach in many plies.

ABOMASUM

This is an enlongated sac resting on the abdominal floor. It extends from the Xyphoid cartilage to the 10th inter coastal space. It then turns dorsally to lie between the omasum and the central part of the rumen.

The parts of the abomasun are those of a typical glandular stomach.

INTERNAL APPEARANCE

The grooves that are found externally forms holes that are Collnet pillar. In the reticulum, the muscles membrane is raised into pole which are about 4cm high and enclose 5 to 6 sided cells.

Omasum is occupied by convex longitudinal poles which spring from the side. These poles are called Lamma and they are absorptive Abomasum is the true glandular stomach consisting of the same features as the single stomach.

SMALL INTESTINE

Generally, the total length of the large and small intestine is about 20 times the length of the body in horse, 25 times the length of the body in sheep and goats. The small intestine consist of the following –

- (i) Duodenum (ii) Jejunum (iii) Ileum

The duodenum has 3 sections – The 1st part is continuous in pharynx of the stomach and form an S-shaped curve which makes contact with the liver. The pancreatic and biliary duct opens into the part. The second part of the duodenum was caudally in the right side of the median plane and extends as far as to the kidney. The 3rd part crosses to the left of the median plane and was anteriorly to the roof of the greater mesentery.

Jejunum and Ileum

This portion is fairly freely movable and there is no clear demarcation between the jejunum and the ileum and the latter terminates as the caecum.

Larger Intestine

Generally, it performs some absorption function and helps to lubricate and transport ingesta. It is also a major site for microbial activities. It consists of these parts.

- (i) Caecum (ii) Colon (iii) Rectum

LARGE INTESTINE

However, the large intestine of cattle is very long and is for most of its lengths not greater in diameter than small intestine. It has no longitudinal bands and haustrations. These two features are absent in the ruminant intestine except for the caecum. The large intestine lies in the supra-omental recess with the small intestine.

THE CAECUM

Is about 30 inches long with a blind end that point caudally. The blind end usually lies on the right side of pelvic inlet. The caecum opens to the colon at the caecocolic orifice which is not guarded by a sphincter.

THE COLON

This consists of the following segments –

- (i) Proximal loop (ii) Spiral loop (iii) Distal loop (iv) Transverse colon and
(v) Descending colon.

The proximal loop begins as a direct continuation of the caecum which moves caudally and then flexes upon.

It then moves cranio-dorsally to enter into the spiral loop.

The spiral loop in the ox usually consists of 2 full centerpetal turns as well as 3rd full centrifugal turns and a central flexure.

In the sheep and Goat, there may be up to 3 centripetal turns as well as 3 centrifugal turn each. The distal loop continues from the last centrifugal turn caudally and dorsally. It is transform into the transverse colon which is rather short and is in turn continue by descending colon. The descending colon moves caudo – dorsally to form a slide sigmoid and a flasure at the pelvic inlet where it join the rectum.

RECTUM

This is the terminal part of the large intestine and is located the pelvic cavity. Mesorectum ligament support the rectum. The intestinal tract terminates at the anus where the presence of 2 sphincters namely an internal sphincter of smooth muscles and an external sphincter of started muscles. It is the external sphincter that closes the anus.

LIVER

Is one of the accessory gland of the digestive system. It is the largest gland in the body situated on the abdominal surface of the diaphragm. In ruminants due to the size of the stomach, the liver is pushed the right than the median plain. The liver has 2 surfaces. The diaphragmatic surface and the visceral surface.

The diaphragmatic surface is generally model to the shape of the diaphragm and is therefore convex. The visceral surface is concave and represent the portal entry through which the portual veins, hepatic entry and veins and lymph enter or leave the liver. The visceral surface also represents many impression of other structures that are in close contact of the liver from the abdominal cavity. The liver is held on position largely by the pressure of the other visceral and also by its class attachment to the diaphragm. Additional, this attachment are facilitated by ligaments which may be up to 6 in number.

- (i) Coronary ligament - This is present in all animals and attaches the liver to the diaphragm.
- (ii) Falciform ligament - This is continuous with the coronary ligament and attaches the liver to the floor of the abdominal cavity as well as the sternal part of the diaphragm.
- (iii) Right and left lateral ligament - When present they attached the dorsal boarder of the respective portion of the liver to the diaphragm.
- (v) Caudate or Hepatorenol Migament - This is rather inconsistency, when present it attaches the caudate loop of the liver to the right kidney.

This is continues with the form ligament. It is the ally present only in young animals.

LOBATION OF THE LIVER

The liver has four major lobes. The left lobes and the right lobes. The interpose between 2 lobes and the caudate lobe and the Quadrate lobe end. The proximal lobe which is superior to the portion is the caudate lobe and the distal one are the Quadrate lobe.

REPRODUCTIVE SYSTEM

The male reproductive system consists of the following –

- (i) Scrotum
- (ii) Testes
- (iii) Epididymis
- (iv) Penis and Prepuce
- (v) Accessory sex gland.

THE SCROTUM

This is a cutaneous sac which houses the two testes. The shape and size of the scrotum is similar to those of the testicle. The two scrotal sacs are often synovial though the left is likely longer than the right. The division of the scrotal sac is marked centrally by a longitudinal raphe.

THE TESTES

This represents the essential reproductive organ responsible for the production of spermatozoa and testosterone. To reach from the skin externally to the testicular parenchyma one has to pass through the following structures.

- (i) Skin
- (ii) Fascia
- (iii) Cutaneous muscles
- (iv) Tunica vaginalis parietalis
- (v) Peritoneal cavity
- (vi) Tunica vaginalis visceralis
- (vii) Tunica albuginea.

ORIENTATION OF THE TESTES

In the Bull, the testes are cranial to the sigmoid flexure and the long axis is vertically and lies cranial to the sigmoid flexure and it is found in Bull, Ram and Buck.

In the Horse and Dog, the long axis of the testes is nearly horizontal and the testes is close to the abdominal wall where the external inguinal ring.

In the Boar, the testes descend much further caudally than in others. The testes is caudal to the sigmoid flexure. The long axes of the testes is nearly vertically but in the wrong direction.

EPIDIDYMIS

This is responsible for relating and transporting the spermatozoa. It is very close attach to the testicle along caudal boarder. It is made up of three parts.

- (i) Capict or head
- (ii) Corpus body
- (iii) Caudal (Tail)

The tail is largest and is mostly attached to the ventral extremity of the testes. It is continous by DUCTUS DEFERENCE. The ductus deference ascend in the in qermal canal as part of spermatic cord.

THE PENIS

This is the main organ of corpulation. It consist of three part. The root (crural) the body (shaft). The terminal part (glands)

The root of the penis are inform of 2 crural which are attached to ischia arch. The body is that portions that actually contain the erectile tissues which is organized into 2 –

- (i) Corpus cavermosum
- (ii) Corpus spongiosum

When the corpus cavermosum amd spongiosum are on blood they become the turgid. Insome animals, the penis prevent the flexure at about the middle of the length. This flexure is called Sigmoid flexure.

THE ACCESSORY SEX GLAND

They produced secretory fluid which contribute to the formation of semens. The secretion are usually formed into the urethra. They developed under them inflexure of Anrigeib. In castrated

animal, the accessory sex glands undergo ATROPHY (i.e reduction in size). All the accessory sex glands are paired except the prostate gland. The male accessory sex glands includes –

- (1) Vas deferens
- (2) Seminal vesicle
- (3) Prostate gland
- (4) Bulbo urethra gland

FEMALE REPRODUCTIVE SYSTEM

This consists of the following –

- (1) Ovary
- (2) Vagina
- (3) Vestibule
- (4) Mammary gland
- (5) Vulva
- (6) Oviduct
- (7) Uterus
- (8) Cervix
- (9) Uterine horns.

THE OVARIES

The two ovaries are the essential reproductive organ in which the ova are produced. The oviduct convey the ova to the uterus and fertilization usually occur. The development of the fertilized ovum take place in uterus and foetus is expelled from the uterus through the vagina. The vestibule is the ventral part of the genitalia into which the urethra opens. The Vulva is the caudal external limit of the genitalia while clitoris which is the homologous of the male penis i.e. equivalent is located in the ventral extremity. The vestibule of the vagina is enclosed by loose skin folds called LABIA. This may be well developed in carnivorous and primate. However only primate possess true labia majora.

THE OVIDUCT

This is a slender structure fertilization of the ovum usually occur at its upper end so that the trophoblast is developed before the uterus is reached. The oviduct is considered to have 3 parts – Isthmus (i) infundibulum (ii) Ampulla

THE UTERUS

This is a thick wall muscular structure in which the embryo developed with it enclosed with vascular epithelium called the endometrium. Its growth pattern is controlled by the hormones of ovarian origin. The placenta which provide the maternal nourishment for the developing embryo that formed as fusion of uterine endometrium and external membrane embryo. Generally, the uterus is bi-horned in most domestic animal.

THE CERVIX

This assumes special importance in parturition and artificial insemination and separates the vagina from the uterus. The cervix is closed at all times except at estrus of estrous cycle and parturition.

THE VAGINA

The vagina receives penis, it is a canal and extends from the cervix to the vulva. The vulva represents the terminal part.

THE MAMMARY GLAND

The mammary gland are of economic important for female animals because of the milk they produced. There are 3 group of mammary gland.

- (i) Pectorial group (ii) Abdominal group (iii) Inguinal group
They have mammary gland in pectorial region

In many domestics animals, it is the inguinal group that developed. In some like dog and pig there is complete development.

MAMMARY GLAND OF COW

This consists of 2 halves.

Each has a cranial and caudal quarter, each quarter is a separate mammary gland and developed in its own. There is an inter mammary group which separate the half. Often there is a shallow transverse furrow separating the two halves quarter but each quarter is completely separated from the other quarter. In duct formation unlike the different between 2 halves, the quarter of 2 halves have a common blood vessel supplied and lymph drainage. The suspensory ligament of the udder consist of median suspensory ligament and lateral suspensory ligament.

In the mare (female horse) the mammary has two teat canal in the inguinal region. In the Bitch, there are 5 pairs of mammary gland. In the sow there are 10 to 14 pairs of glands. In the ewe as in the cow there are 2 glands one in either side as in the mare. Only the inguinal paired developed.

