

DIGESTIVE SYSTEM

Digestive System

The digestive system of ox is consists of

1.Mouth

2.Pharynx

3.Esophagus

4.Stomach

Rumen

Reticulum

Omasum

Abomasum

5.Small Intestine

Duodenum

Jejunum

Ilium

6.Large Intestine

Caecum

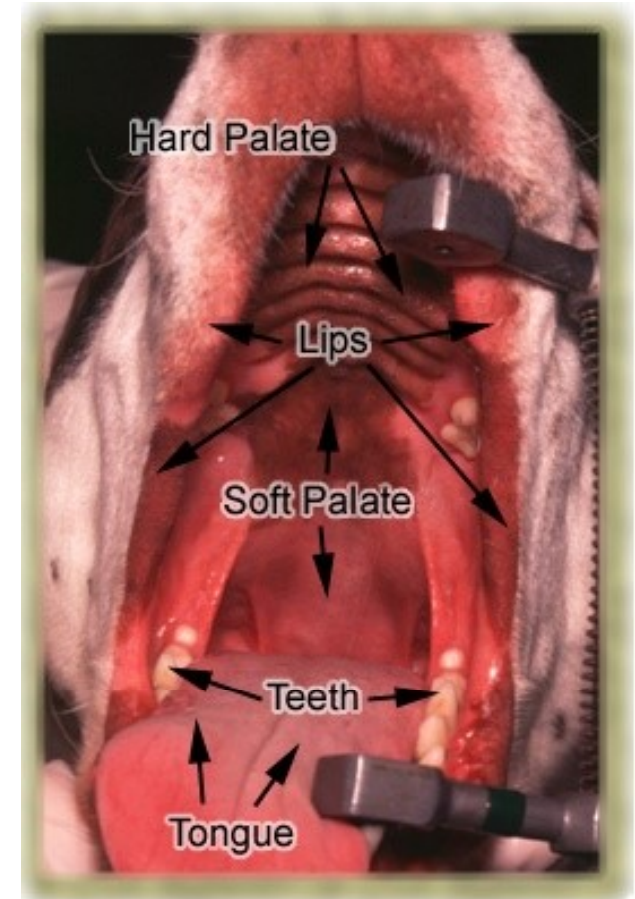
Colon

Rectum

7.Anus

MOUTH or CAVUM ORIS

- first section of the alimentary canal
- short but wide cylindrical cavity
- Boundaries
 - superior - hard palate
 - Inferior - body of the mandible and mylohyoideus muscles
 - Lateral - cheeks,
 - Posterior - soft palate
- Anterior opening - rima oris. it is closed by the lips
- Posterior opening - isthmus faucium communicates with the pharynx



Note - The mouth cavity is lined by mucous membrane, which is pink in colour and more or less pigmented

Species difference

Sheep and Goat

- It resembles ox

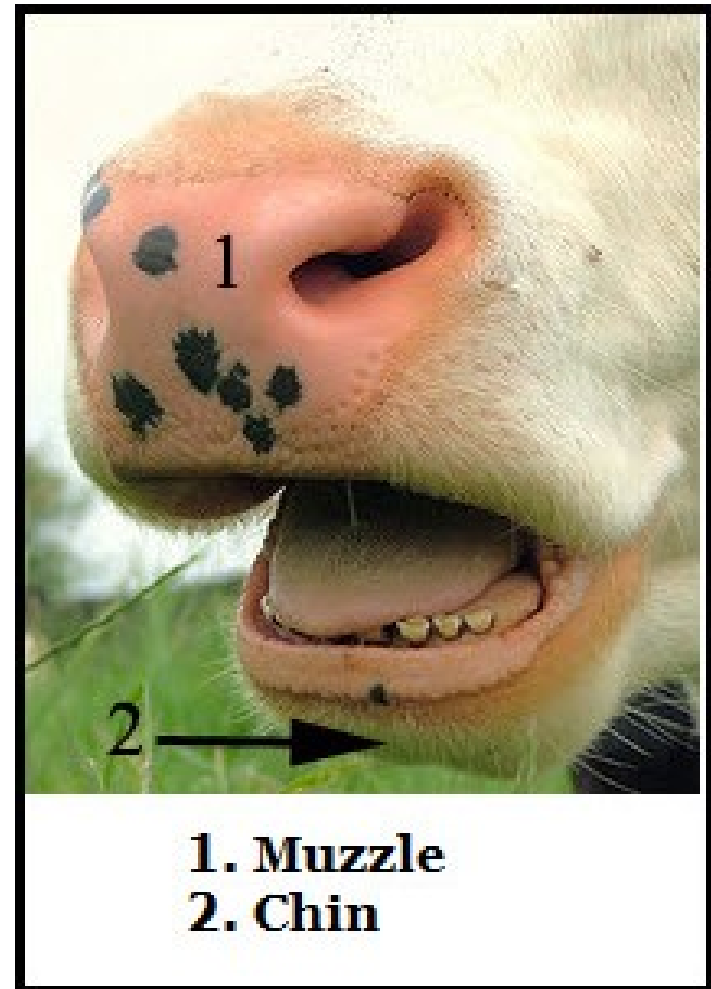
Horse

The cavum oris is longer and narrower

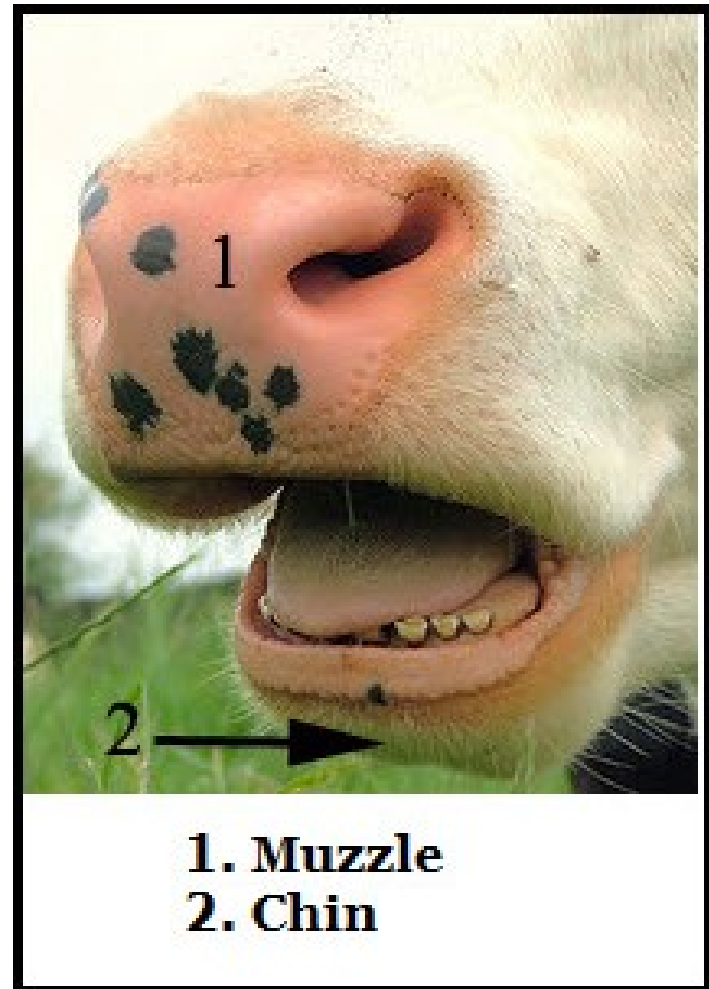
- **Pig**
- The rima oris is extensive and the angle of mouth is situated far back
- **Dog**
- The form and size vary greatly in different breeds, being long and narrow in some, short and wide in others
- Rima oris is extensive
- **Fowl**
- Vestibule is absent, as there is no teeth

LIPS (LABIA ORIS)

- Two - upper and lower and are thick, wide and comparatively immobile musculo- membranous folds, which surround the rima oris
- The middle part of the external surface of the upper lip and the surface between the nostrils is termed as muzzle
- It is kept cool and moist by a fluid secreted by the naso-labial glands present under the skin



- The external surface of the lower lip has rounded prominence, the **chin** and it presents the short and long hairs.

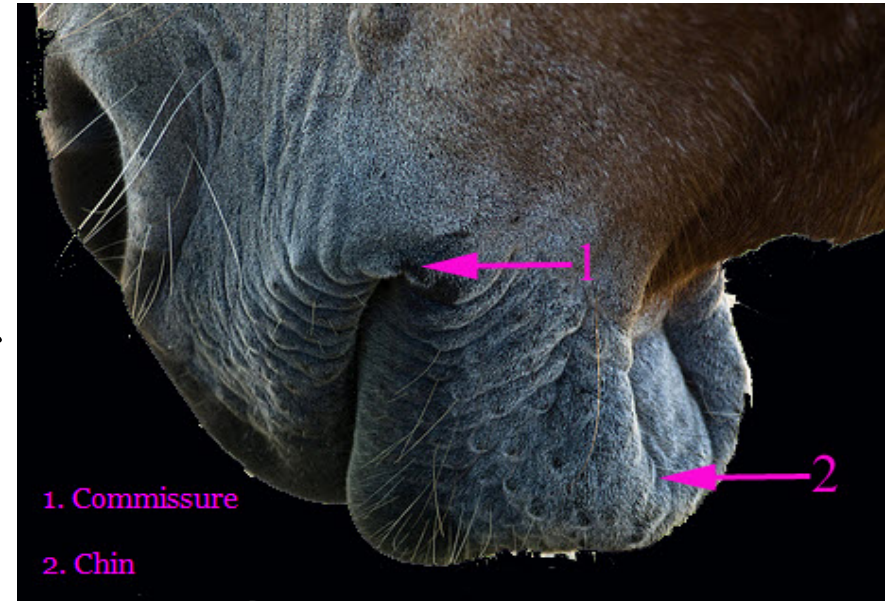


Species difference

Horse

- The lips are thinner, narrower and more mobile.
- The lips are the organs of prehension

Philtrum - The upper lip of horse presents on its external surface a shallow median furrow the, known as Philtrum.



Sheep and Goat

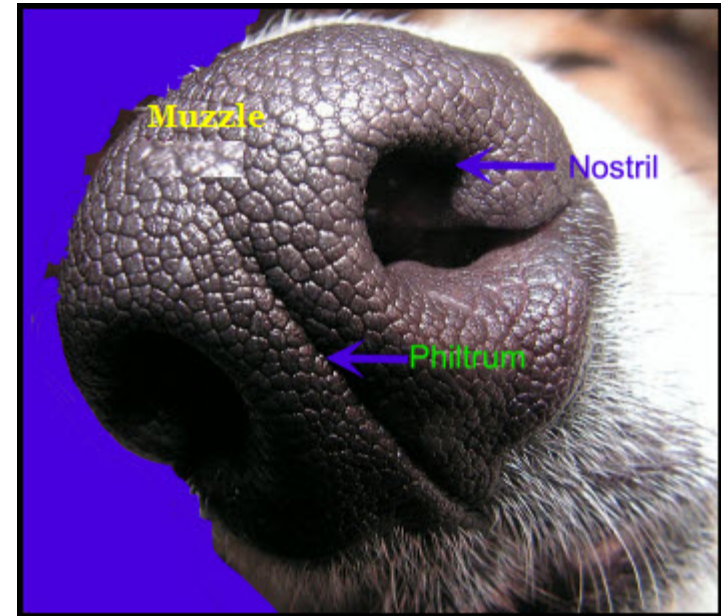
- The lips are mobile and thin and are the organ of prehension

Pig

- The upper lip is thick and short and is blended with snout.
- The lower lip is small and pointed.

Dog

- They are thin and mobile presenting numerous tactile hairs. The upper lip projects over the lower lip and covers it more or less at the sides
- The muzzle presents a deep groove or cleft, the philtrum giving the appearance of harelip.



Fowl

- The lips are absent

CHEEKS

- Form the lateral wall of the mouth cavity and are continuous with the lips in front
- The cheeks consist
 - Skin
 - Muscular and glandular layer
 - Mucous membrane
- The skin of the face continuous over the cheek without any modification
- The muscular layer chiefly made up of buccinator muscle

Species difference

Sheep and Goat

- Resemble with ox

Horse

- Cheeks are less capacious.
- Mucous membrane may be pigmented

Pig

- The mucous membrane of the cheeks is smooth.

Dog

- Loose and capacious

Fowl

- Cheeks are absent

GUMS

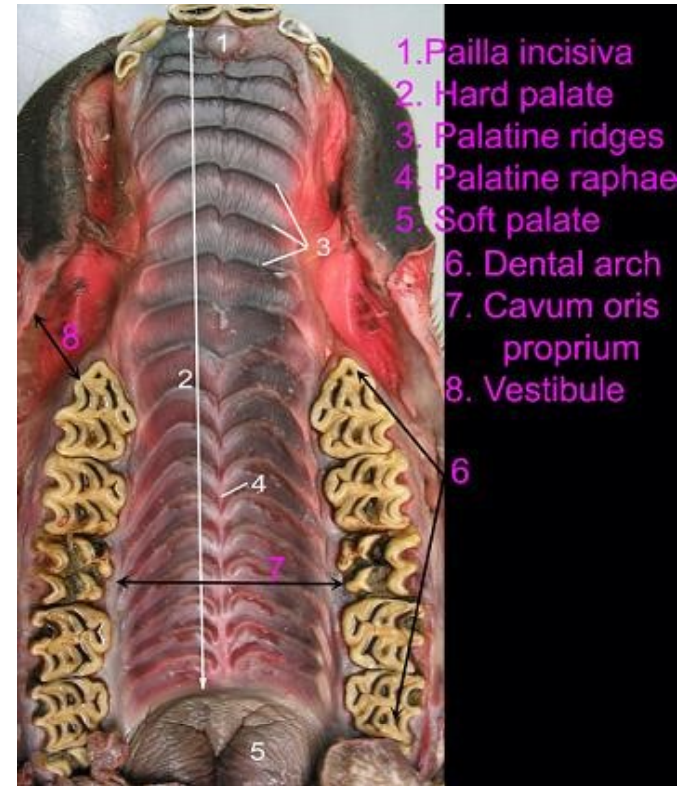
- The gums are composed of dense fibrous tissue intimately blended with the periosteum of the alveolar processes and surround the neck of the teeth

HARD PALATE

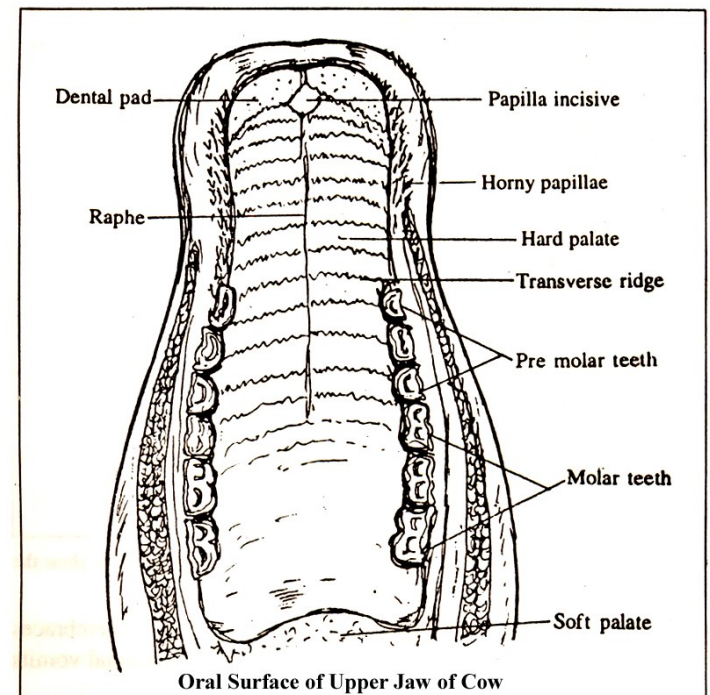
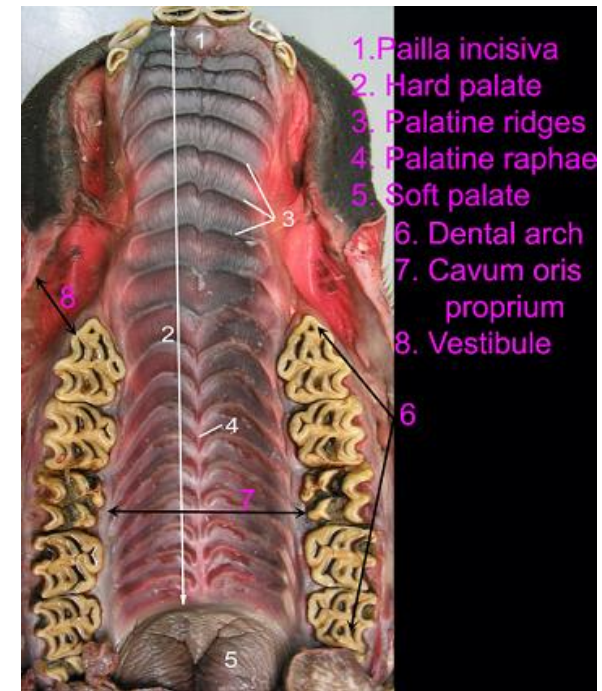
- forms the roof of the cavum oris
- Boundaries

In front - dental pad

continuous behind with the soft palate



Dental Pad - The body of premaxilla is covered with the thick layer of dense fibrous tissue, which is covered by horny epithelium called the dental pad.

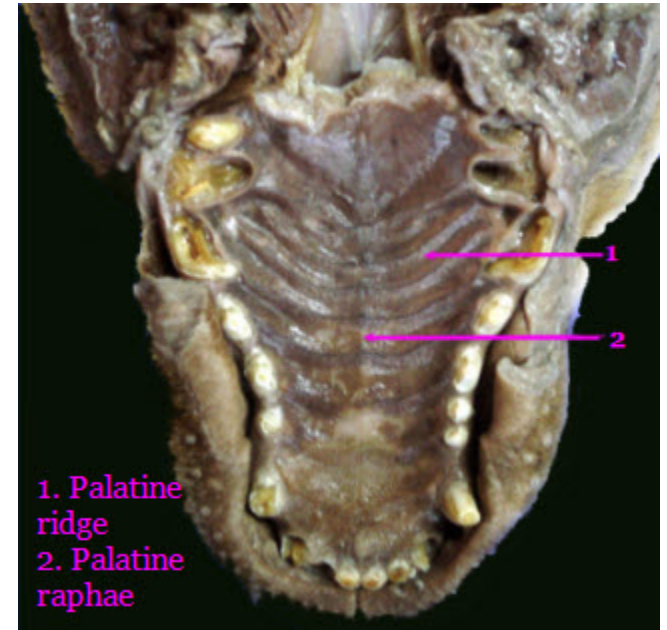


Sheep and Goat

- Dental pad is present
- **Horse**
- The dental pad is absent and instead there are six alveoli for the upper incisors

Dog

- It is widest between the fourth pair of cheek teeth
- It presents 8 to 10 curved ridges

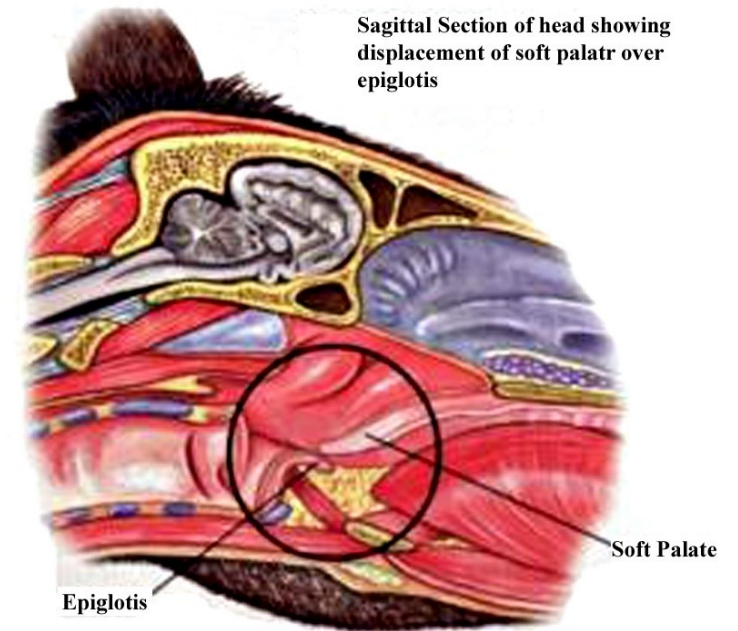


Rabbit

- It presents about 15 ridges

SOFT PALATE

- The soft palate is a musculo-membranous partition, which separates the mouth from that of the pharynx except during deglutition
- It slopes obliquely downward and backward from the hard palate. It presents two surfaces and two borders

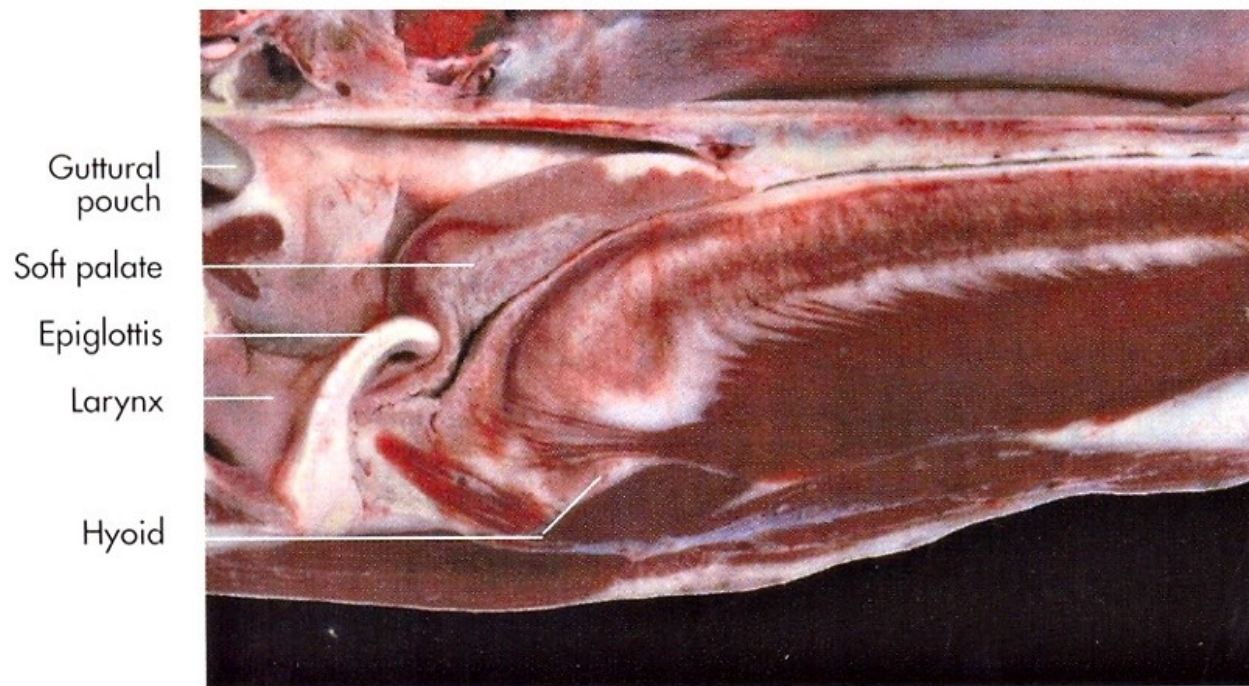


Sheep and Goat

- It resembles ox

Horse

- It is very long and well developed being about 6" in length. It closes the isthmus faucium along with the epiglottis and hence in horse oral breathing is not possible and in vomiting, the ejected matter escapes through the nose



Soft palate of Horse

Pig

- It is very thick. It is entirely horizontal
- It has a small median prolongation termed the **uvula**

Dog

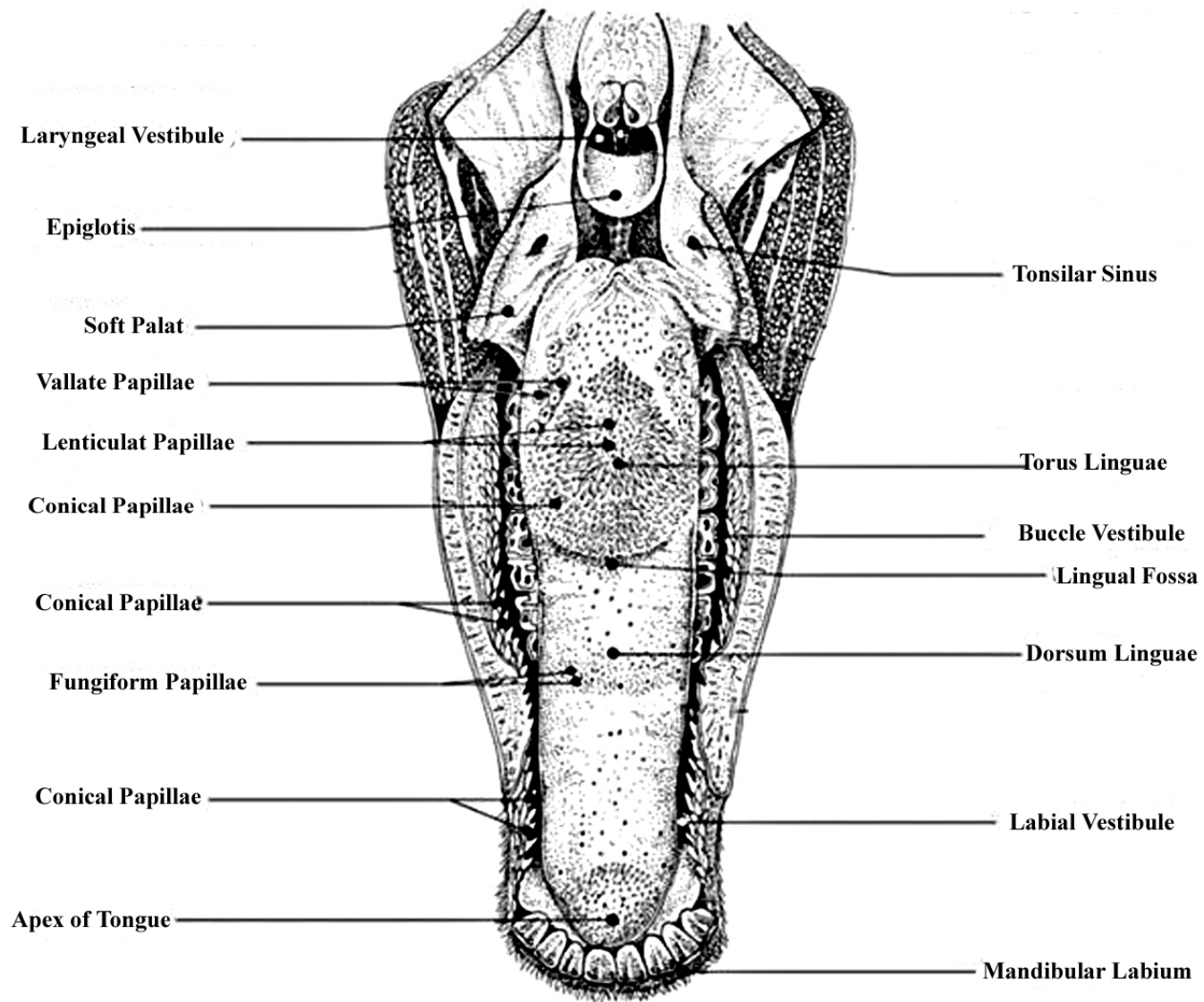
- It is thick

Fowl

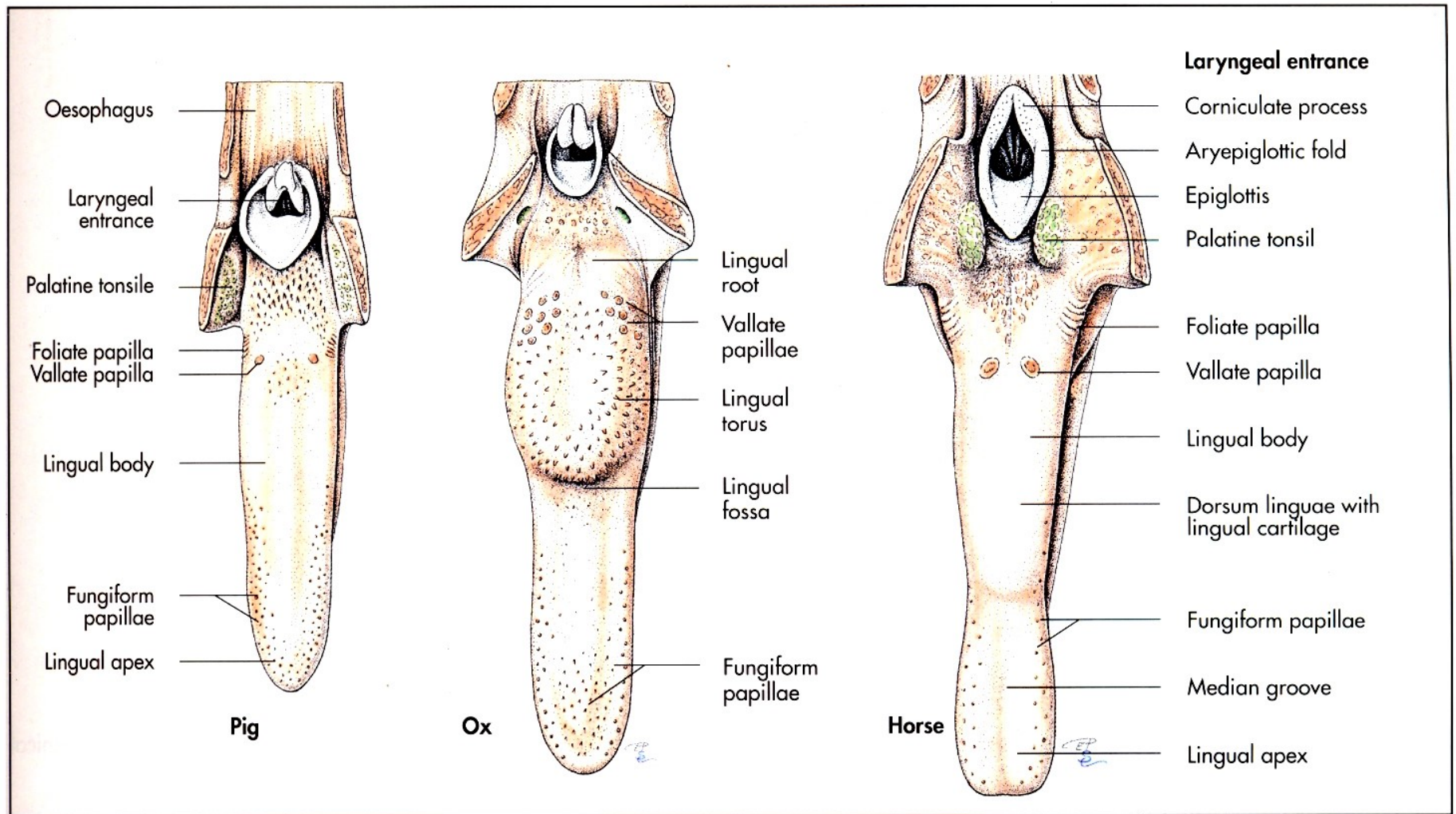
- The soft palate is absent

TONGUE (LINGUA)

- The **tongue** is situated on the floor of the mouth, between the rami of the mandible. It is highly protractile and is the chief organ of prehension. It consists of *a root, a body and the tip*.



Dorsal View og Tongue of Ox



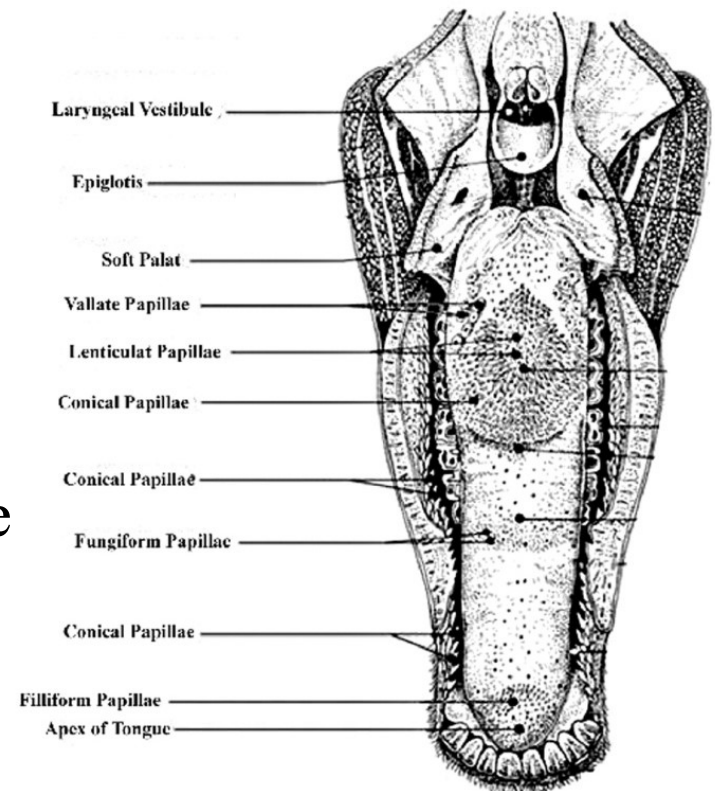
Tongue, pharynx and oesophagus (sectioned in the median plane) of pig, ox and horse (schematic, dorsal aspect).

Structure of Tongue

- Mucous membrane
- Muscles and glands
- Vessels and nerves
- The surface of the mucous membrane presents various kinds of papillae.
- In front of the prominence are large *horny papillae*, which are conical and filiform.

Filiform Papillae
Fungiform Papillae
Circumvallate Papillae
Lenticular Papillae

Note - The fungiform and vallate papillae are furnished with taste buds



Dorsal View og Tongue of Ox

TEETH

- The teeth are hard, white or yellowish-white structures implanted in the alveoli of the jaws
- They are organs of prehension, mastication and sometime of defence
- The domestic mammals have two sets of teeth

Milk Or Deciduous Teeth (temporary)

Permanent Teeth

- According to their position they are classified as,
 - **Incisors** or cutting teeth are implanted, in front in the alveoli of the premaxilla and mandible
 - **Canines** which are situated a little backwards.
 - **Premolars** and **Molars** (cheek teeth) - forming the sides of the dental arch.

Dental formula of different domesticated animal

$$\text{Ox} = 2 (\text{I} - 0/4 \text{ C} - 0/0 \text{ PM} - 3/3 \text{ M} - 3/3) = 32$$

Sheep and Goat = Same as ox.

$$\text{Horse} = 2 (\text{I} - 3/3 \text{ C} - 1/1 \text{ PM} - 3 \text{ or } 4/3, \text{ M} - 3/3) = 40 \text{ or } 42.$$

$$\text{Pig} = 2(\text{I} - 3/3 \text{ C} - 1/1 \text{ PM} - 4/4 \text{ M} - 3/3) = 42$$

The canines or tusks of the male are greatly developed and project out of the teeth

$$\text{Dog} = 2 (\text{I} - 3/3 \text{ C} - 1/1 \text{ PM} - 4/4 \text{ M} - 2/3) = 42$$

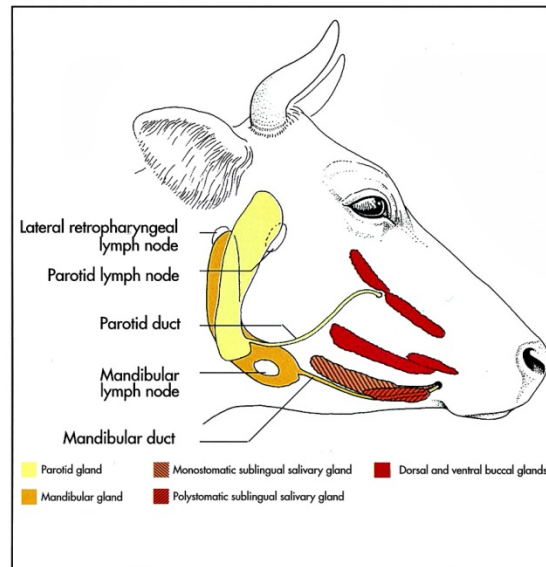
A ring is present between the crown and root known as cingulum in dog

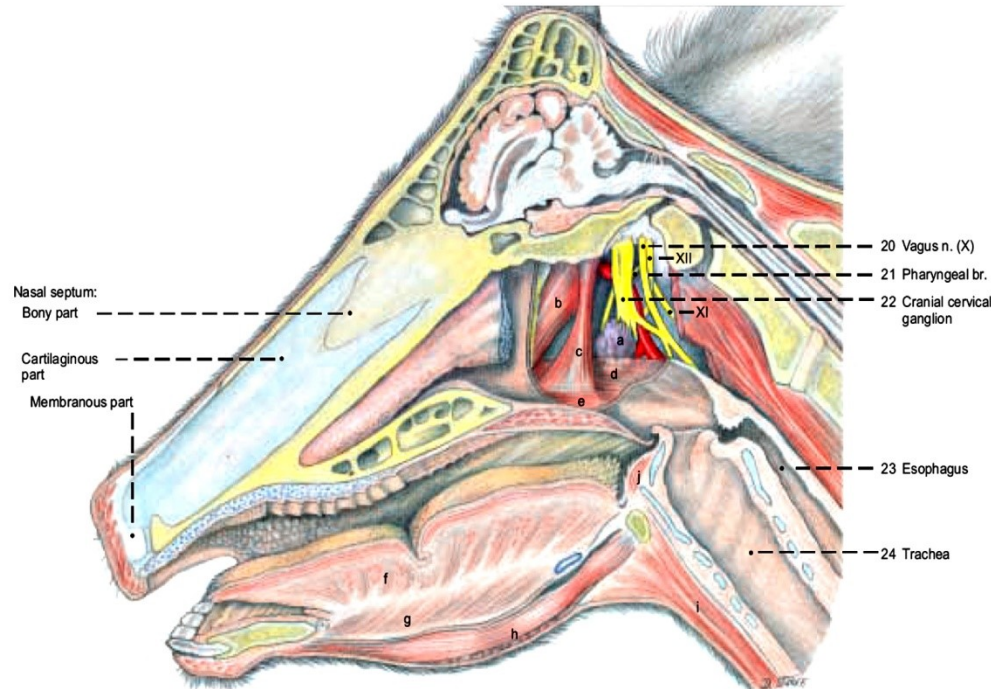
$$\text{Rabbit} = 2(\text{I} - 2/1 \text{ C} - 0/0 \text{ P} - 3/2 \text{ M} - 3/3)$$

Fowl = Teeth are absent

SALIVARY GLANDS

- There are 3 pairs of salivary glands situated on the sides of the face and the adjacent part of the neck,
 - The parotid
 - Mandibular or submaxillary and
 - Sublingual
- Of these, the parotid gland is of serous type, while the other two are of the mixed type





PHARYNX

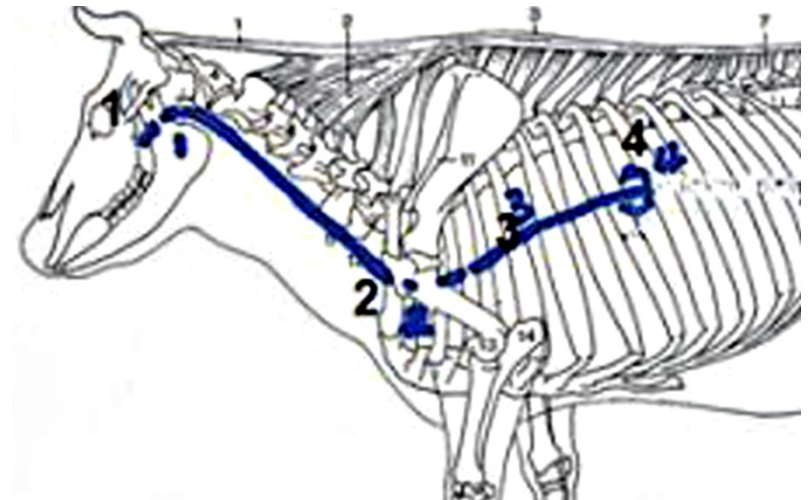
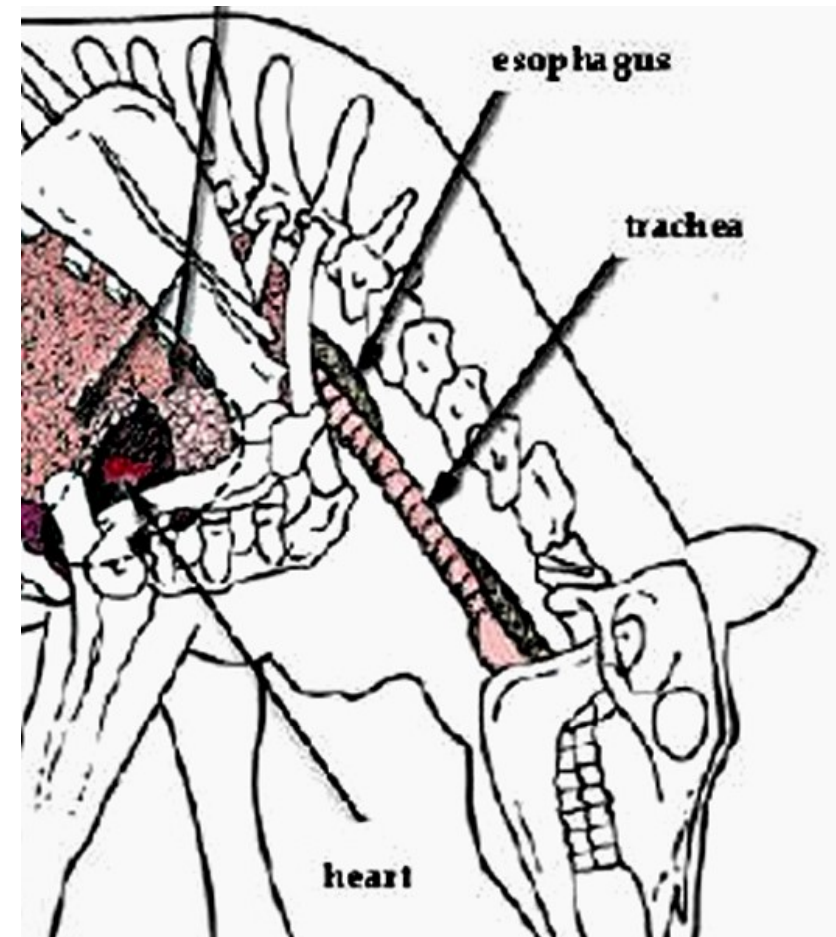
- The pharynx is a musculo-membranous passage common to both the digestive and respiratory systems
- It is a funnel shaped organ, the broad end of which continuous with the mouth and nasal cavities, while the oesophagus continues the narrow portion
- It is directed obliquely downwards and backwards and is attached by muscles to the palatine, pterygoid and hyoid bones and to the cricoid and thyroid cartilages of larynx

OESOPHAGUS

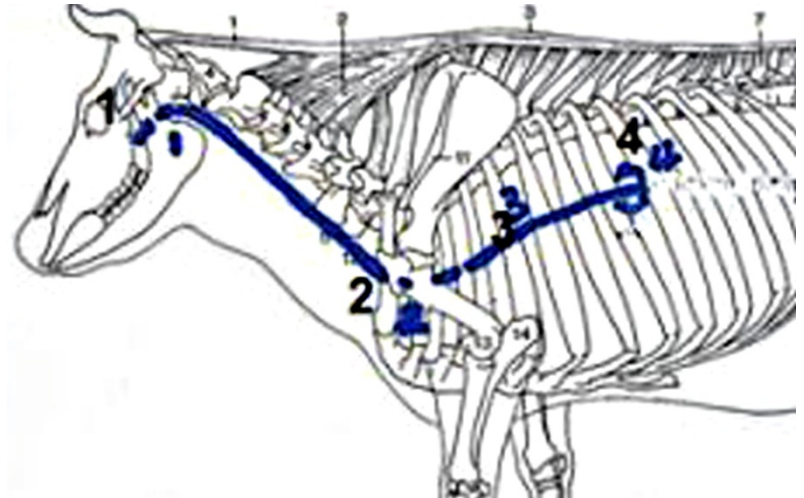
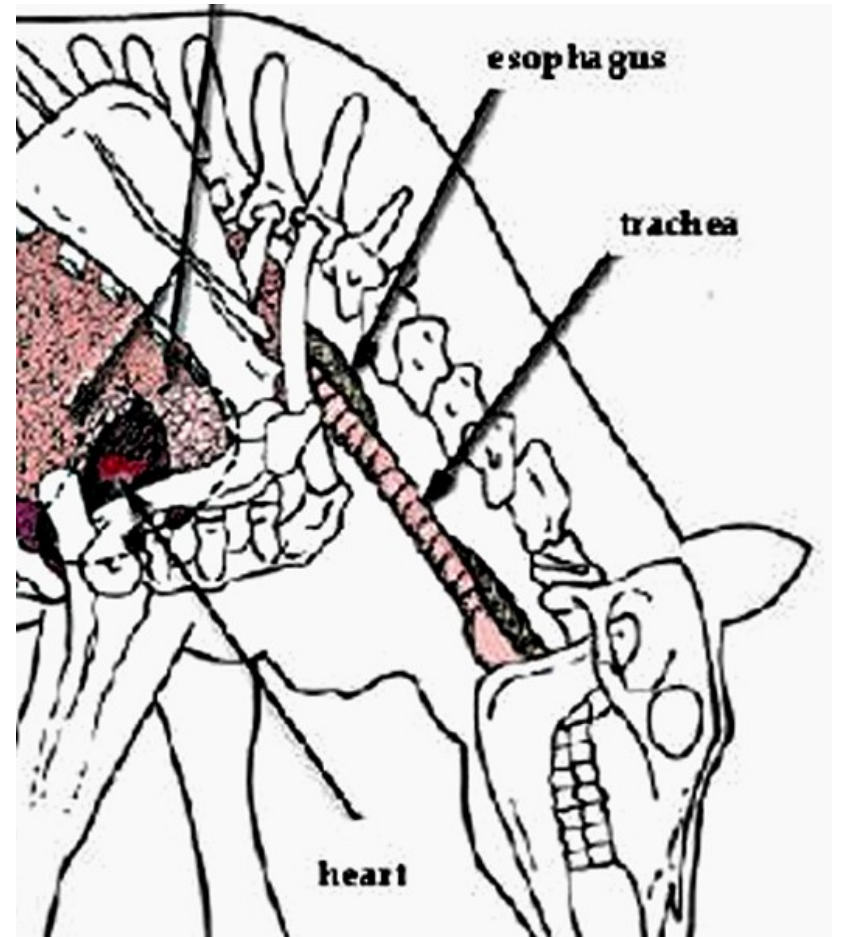
- It is a musculo-membranous tube, which extends from the pharynx to the stomach. It is divided into cervical and thoracic parts

Cervical Part: begins at median line above the cranial border of the cricoid cartilage of larynx

- At the level of the fourth cervical vertebra, it passes to the left of the trachea and continues this relation on the left side of the neck and enters the thoracic cavity



Thoracic Part: begins at the level of the first rib.



Species difference

Horse

- It is longer, being about 125 to 150 cm.
- At its origin it is related to the guttural pouches

Pig

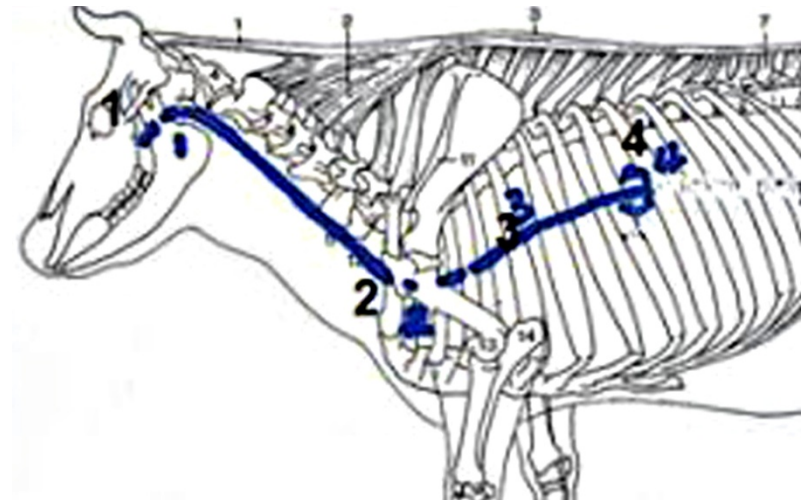
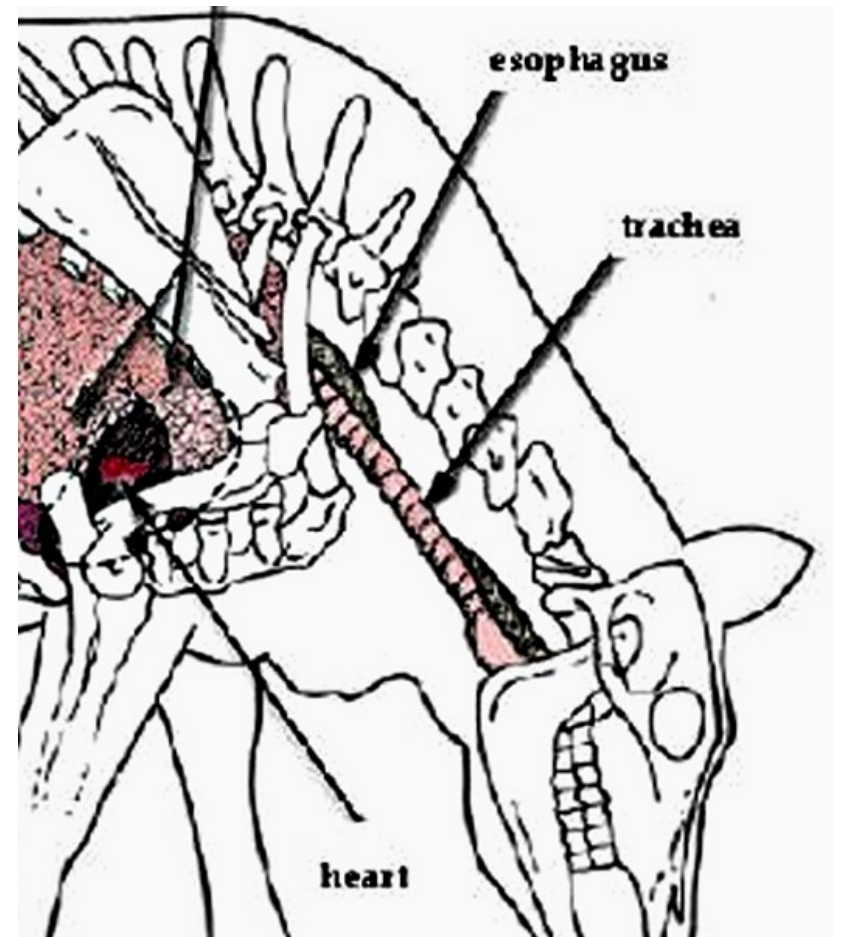
- Short and nearly straight
- There are numerous tubulo-alveolar glands are present in the cranial part of the tube

Dog

- Wide and relatively more dilatable except at the origin where there is a constriction
- Muscular tissue is striated

Fowl

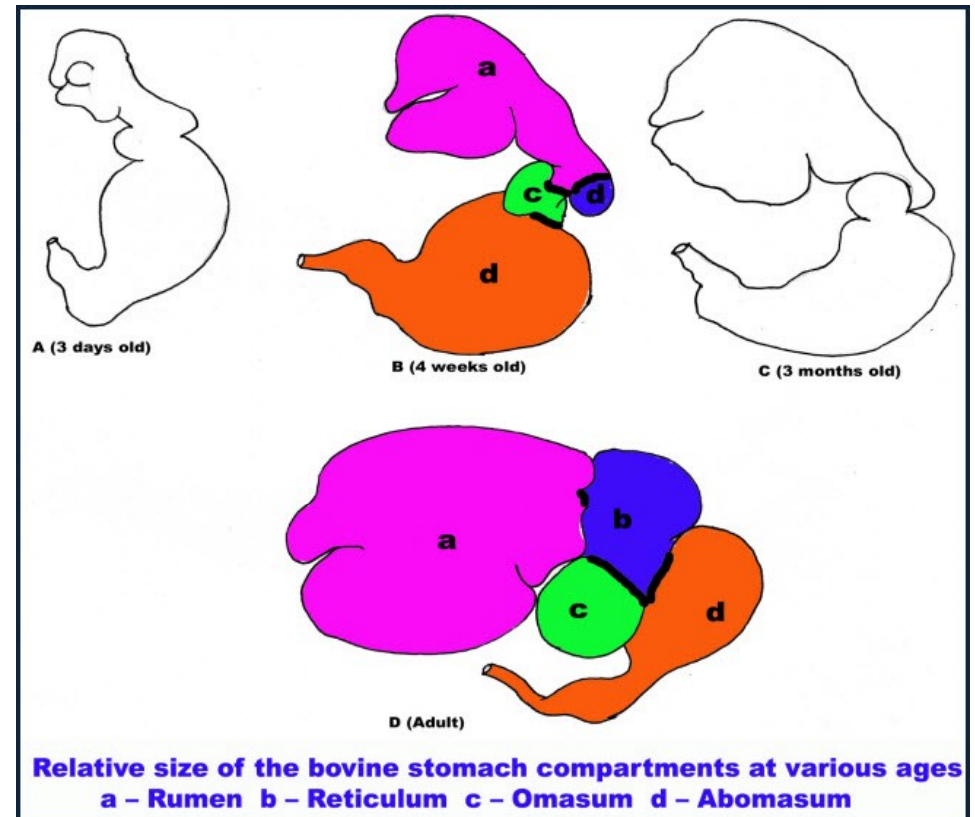
- It extends from the pharynx to the proventriculus
- It is greatly dilatable



RUMINANT STOMACH

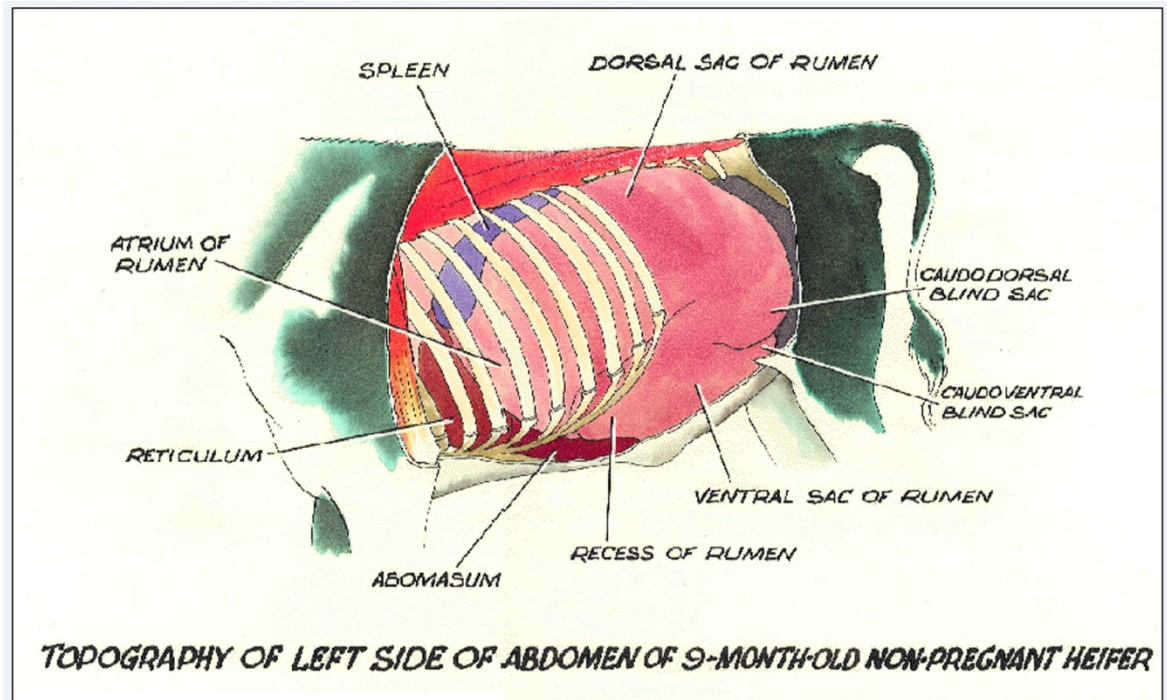
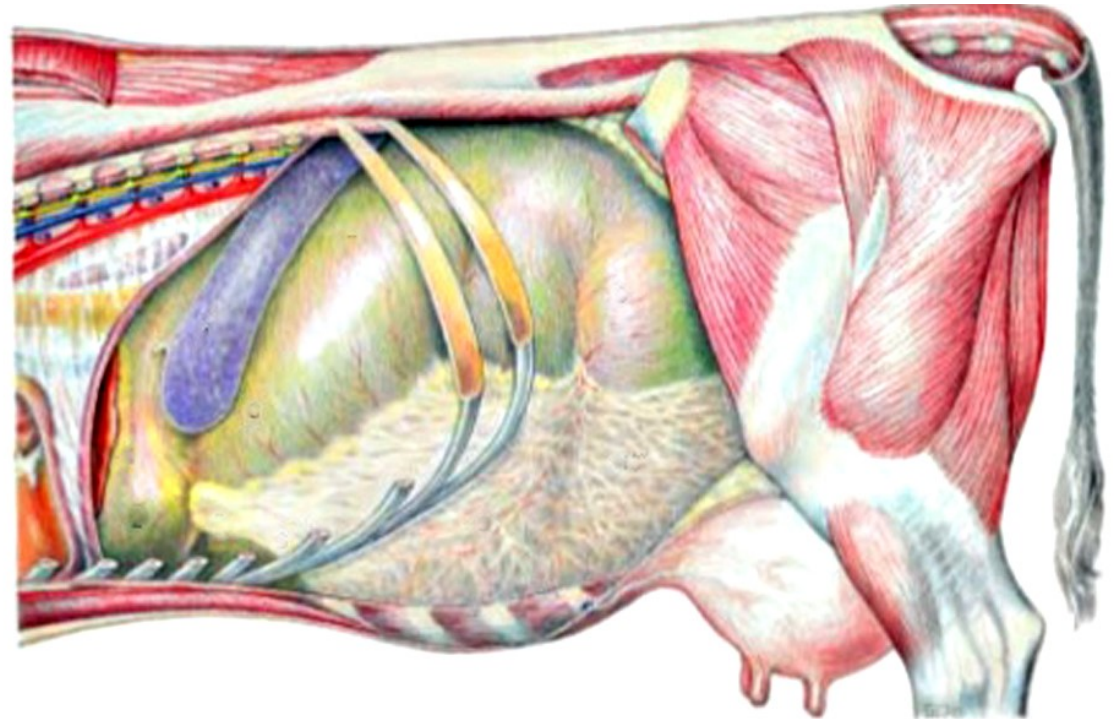
- The stomach of the ox is very large and occupies nearly three-fourth of the abdominal cavity
- It has four compartments,
 - Rumen (*paunch*)
 - Reticulum (*honeycomb*)
 - Omasum -(*many folds, many plies or psalterium*) and
 - Abomasum, (*rennet or true stomach*). The division is indicated by grooves
- **Capacity**
- Varies according to the age, size, breed, etc. Medium size is 30 or 40 gallons

- At 1 1/2 years
omasum equals abomasum,
rumen : 80%
reticulum : 5%
Omasum : 7 to 8%,
abomasum : 8 or 7%
(In adult)

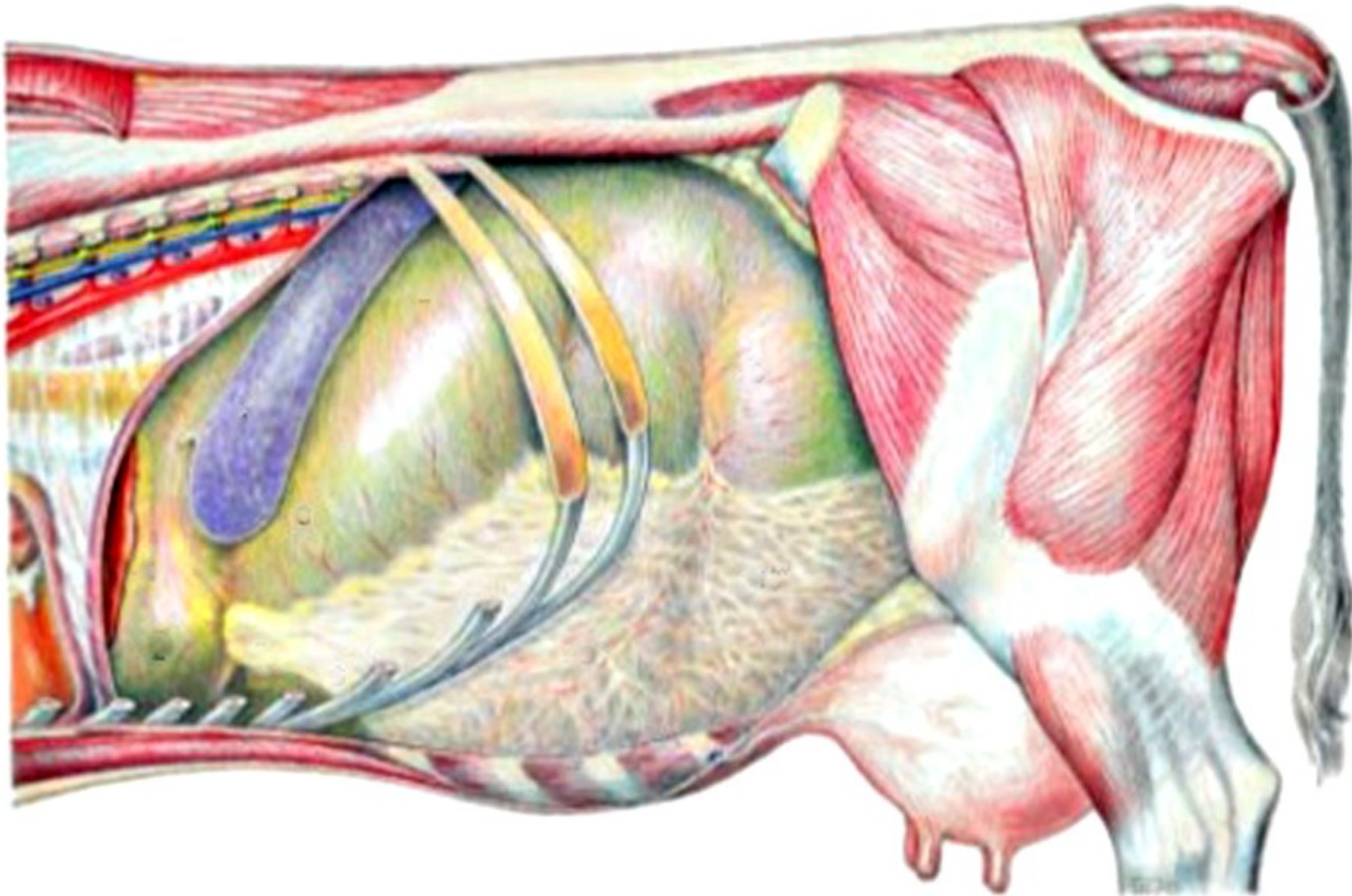


Rumen - Exterior

- The rumen occupies most of the left half of the abdomen and extends considerably over the median plane to the right
- It extends from the lower part of the 7th or 8th inter costal space to the pelvic inlet
- It is slightly compressed laterally and presents two surfaces, two borders and two extremities



The *parietal surface* is convex and is related to the diaphragm, left wall of abdomen and spleen



Reticulum - Exterior

- The *reticulum* is the most cranial and smallest of the four compartments
- It extends from the 6th to the 8th ribs

OMASUM - Exterior

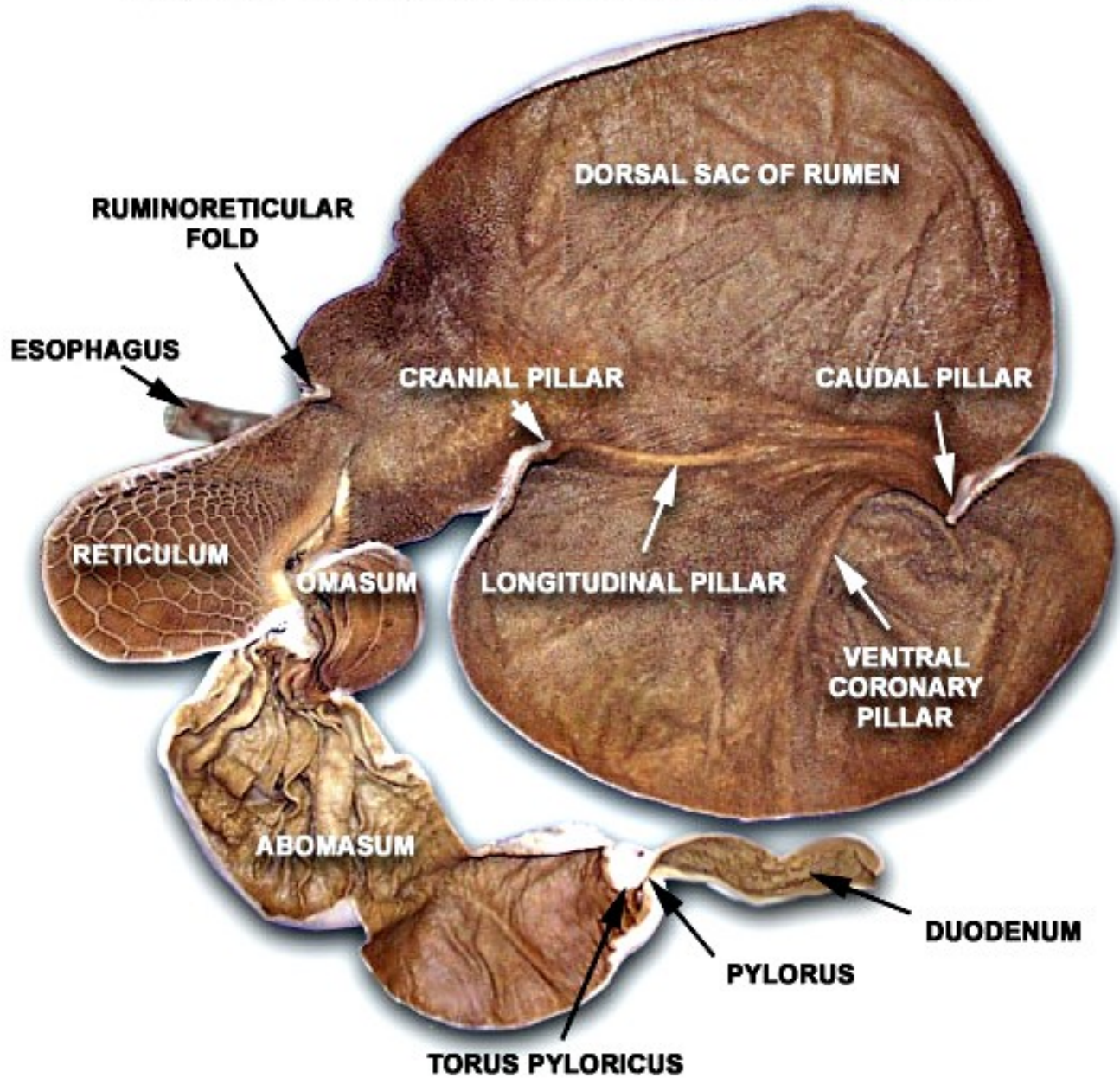
- The *omasum* is ellipsoidal in form and is somewhat compressed between the two surfaces
- It is very clearly marked off from the other compartments and lies to the right of median line from the 7th to the 11th rib
- The *parietal surface* faces to the right and forwards and is related to the diaphragm and liver
- The visceral surface faces to the left end backwards and is in contact with right face of rumen, reticulum and abomasum

ABOMASUM

- The *abomasum* is an elongated sac, which lies on the abdominal floor from the xiphoid cartilage backwards
- The *cranial blind end* is at the xiphoid region in relation with the reticulum
- The *body* extends back between the ventral sac of rumen and the omasum and turns to the right behind the omasum

- The *parietal surface* is in contact with the abdominal floor.
The *visceral surface* is related to the rumen and omasum

INTERNAL FEATURES OF RUMINANTS' STOMACH



Stomach (Sheep and Goat)

- The stomach of sheep and Goat generally resembles that of ox with the few differences

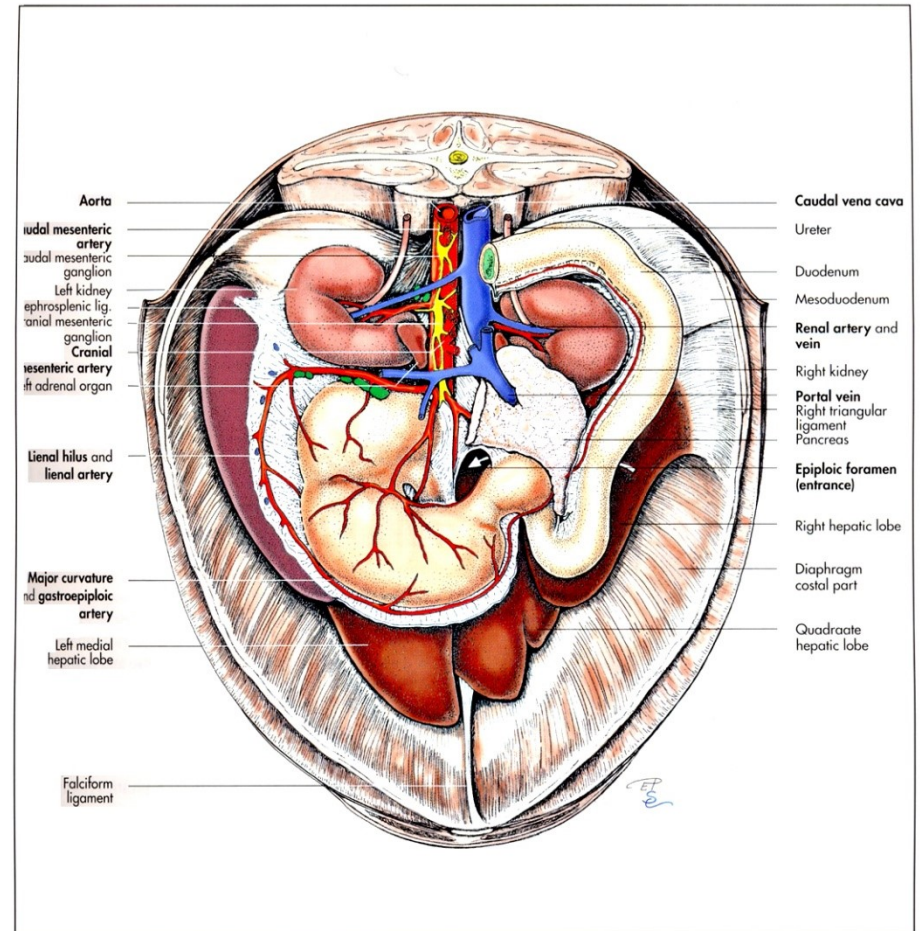
Exterior - Stomach

- The rumen has the average capacity is 18 litres
- The dorsal sac of the rumen is longer than the ventral one
- Its caudal blind sac extends further back than that of the dorsal sac
- The reticulum is relatively larger than the ox.
- Omasum is much smaller than the reticulum.
- It is situated on the opposite to 9 th or 10 th ribs higher than ox
- The abomasum is relatively larger and longer than in ox

Stomach Of Horse

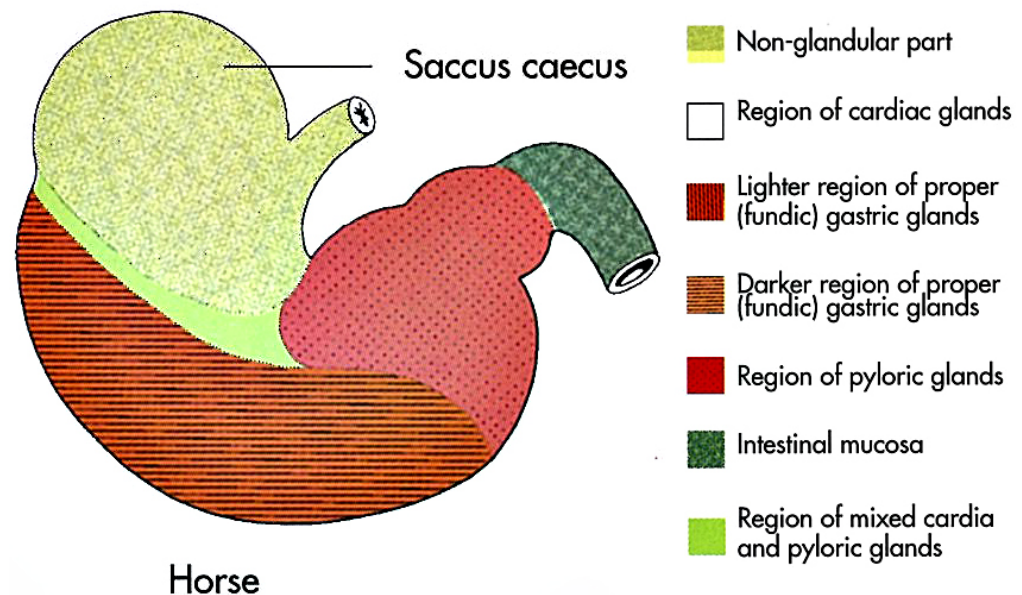
Exterior

- The stomach is in the form of a simple saccular structure. The capacity is about 12 litres
- It is curved and J shaped sac



Intrathoracic abdominal organs of the horse (schematic, caudal aspect).

- The right extremity is smaller and is continued by the duodenum. It is attached by,
- Gastrophrenic ligament
- Greater omentum
- Gastrosplenic omentum
- Lesser omentum
- Gastropancreatic fold

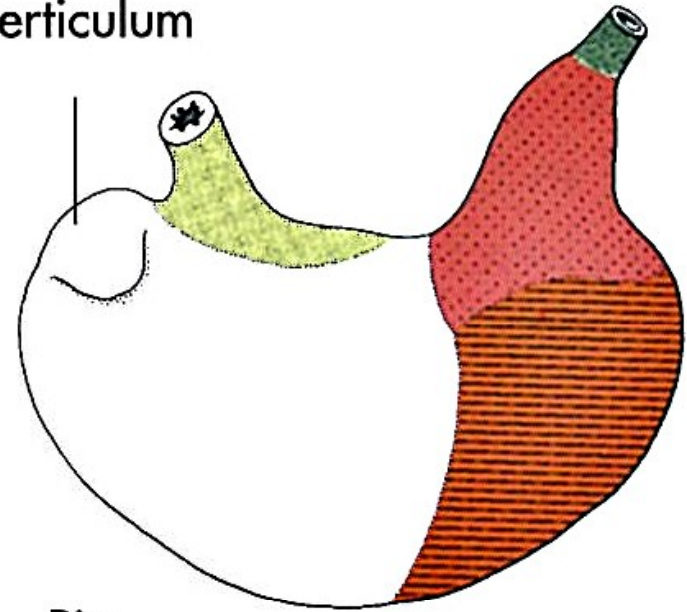


Stomach of Pig

Exterior

- The stomach is simple and comparatively large
- Capacity is 6 litres.
- The cardiac opening is slit like and is bounded by a fold

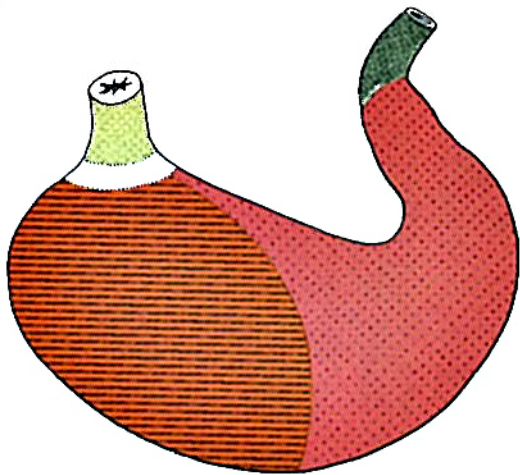
Ventricular
diverticulum



Pig

Stomach of Dog

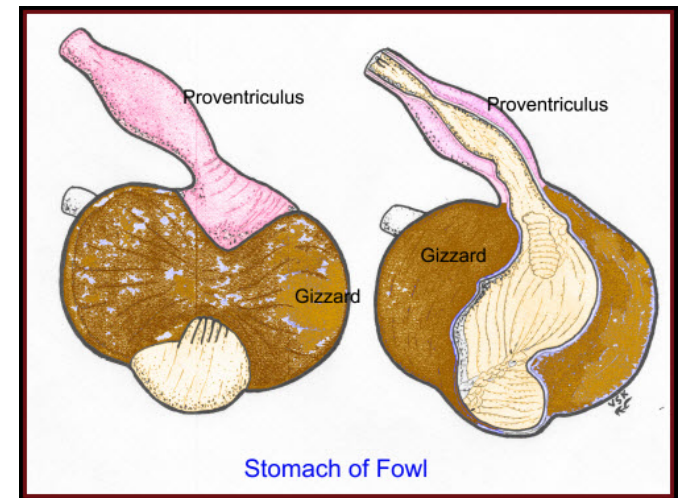
- Capacity is about 3 litres. When full it is pyriform in shape
- It is related to the liver; diaphragm and left ventral and lateral abdominal wall.
- The visceral surface is less extensive and is related to the intestine, pancreas and left kidney



Dog

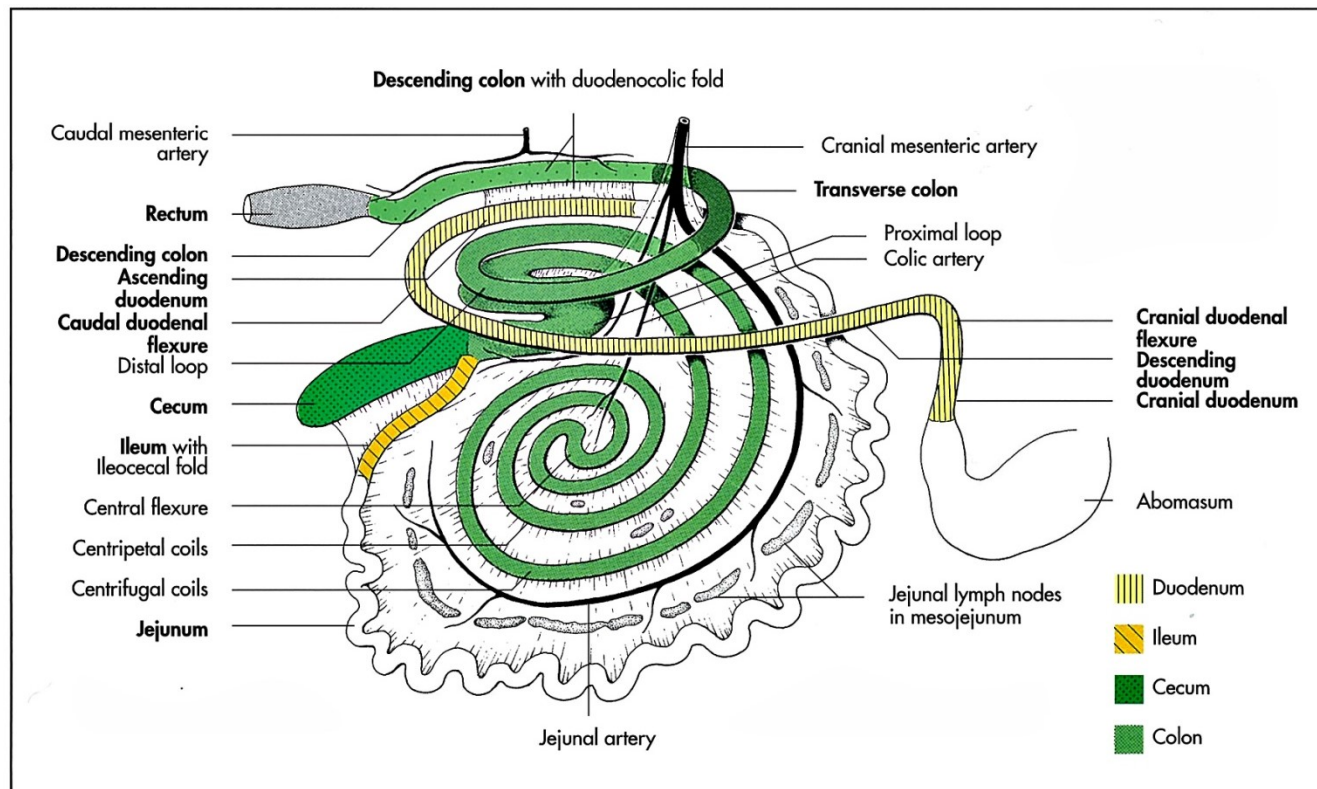
Stomach of Fowl

- It is made up of two parts
 - Proventriculus (*glandular*) and
 - Gizzard (*muscular*)
- The *proventriculus* is an elongated fusiform thin walled tubular organ, related laterally and ventrally to the liver and the spleen at its supero-caudal aspect
- It is connected in front with the oesophagus and behind with the gizzard
- Its mucous membrane is lined by glandular epithelium
- The *gizzard or muscular stomach* is a thick walled muscular disc with two orifices placed close together on the antero-dorsal aspect of its circumference
- It is situated behind and partly between the two lobes of the liver
- The mucous membrane, lining the gizzard is thrown into ridges and is covered by dense horny substance, secreted by the glands lying beneath the epithelium



SMALL INTESTINE

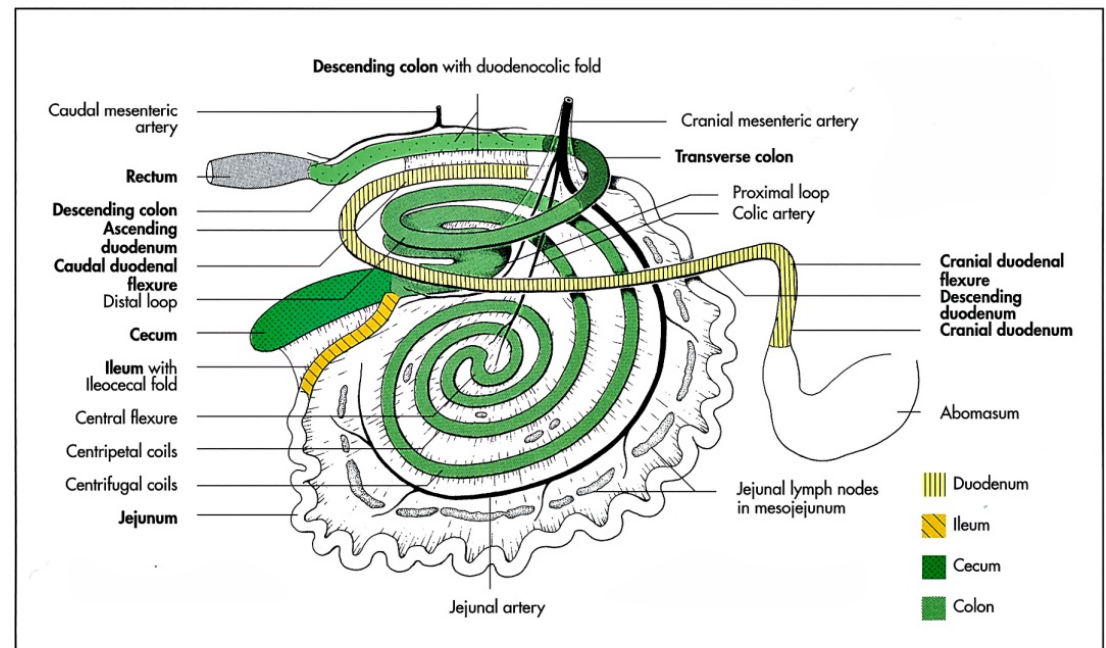
- The small intestine measures about **21.5 m.** in the adult (Indian ox) and has a diameter of about **5 to 6 cm**
- It begins at the pylorus and terminates at the caecum. It is divisible into a *fixed part* and a *mesenteric part*
- ***Fixed Part*** – ***Duodenum***
- ***Mesenteric Part*** – ***Jejunum, Ileum***



Intestinal tract of the ox

Duodenum

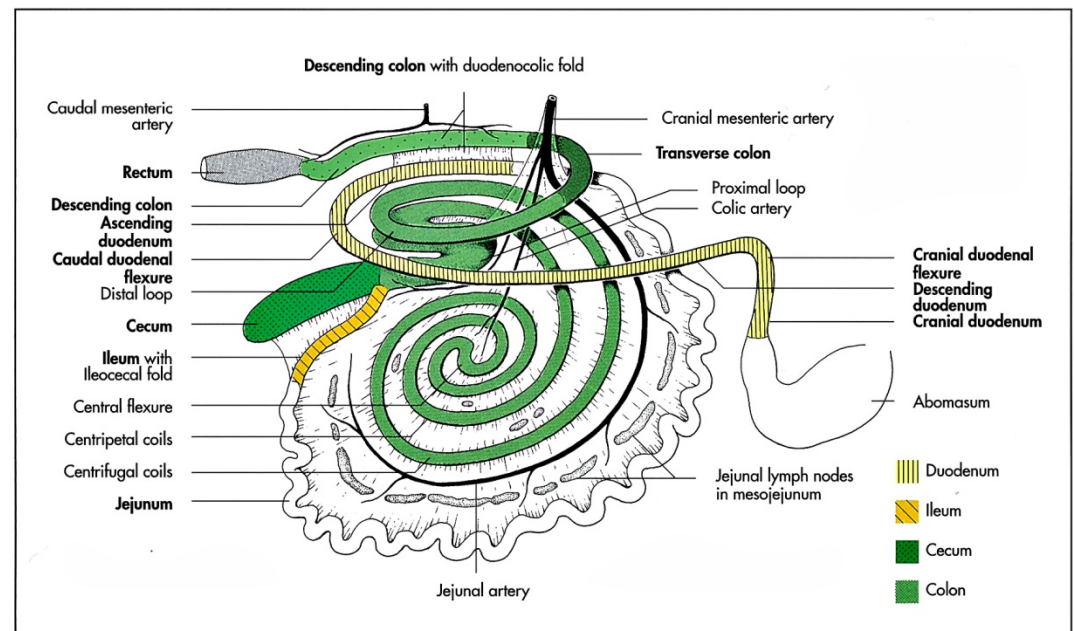
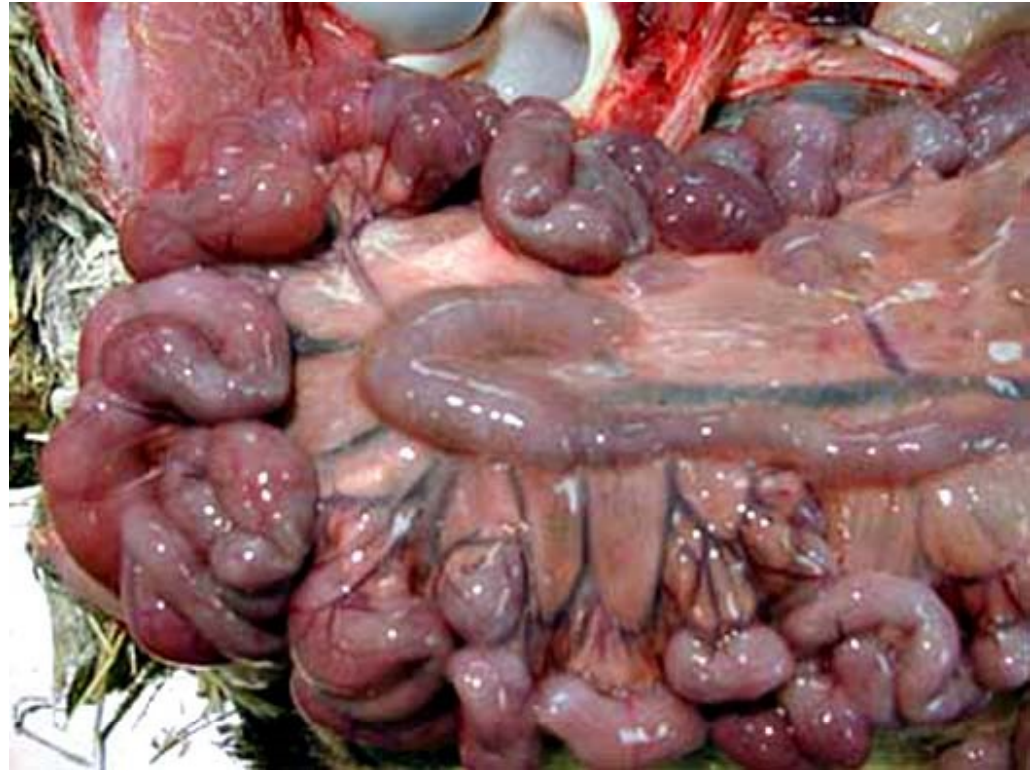
- The duodenum is about **1m long**. It begins at the pylorus at the ventral end of the 10th rib
- **The *first part* passes upwards to the visceral surface of the liver. Here it forms a ‘S’ shaped curve**



Intestinal tract of the ox

Jejunum

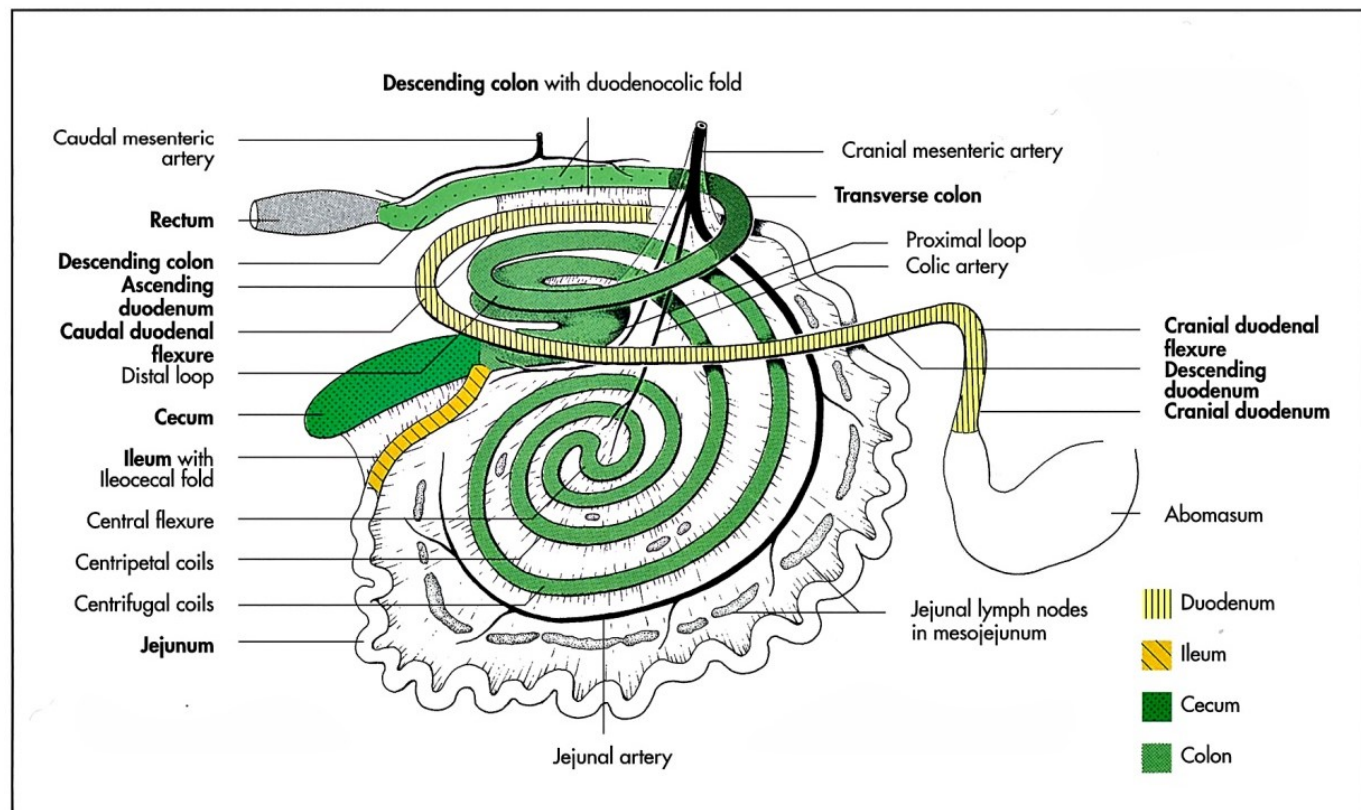
- The second part of the small intestine.
- it is arranged in numerous very close coils, which form a **festoon** at the edge of the mesentery



Intestinal tract of the ox

Ileum

- The last **120 cm** constitutes the *ileum*
- In the interior, lymphoid tissue occurs in the form of distinct nodules, which are either scattered - *Solitary glands* or in groups - *Payer's patches*
- The **Payer's patches** are large and are about **18 to 40** in number; in calves **35 to 50**.



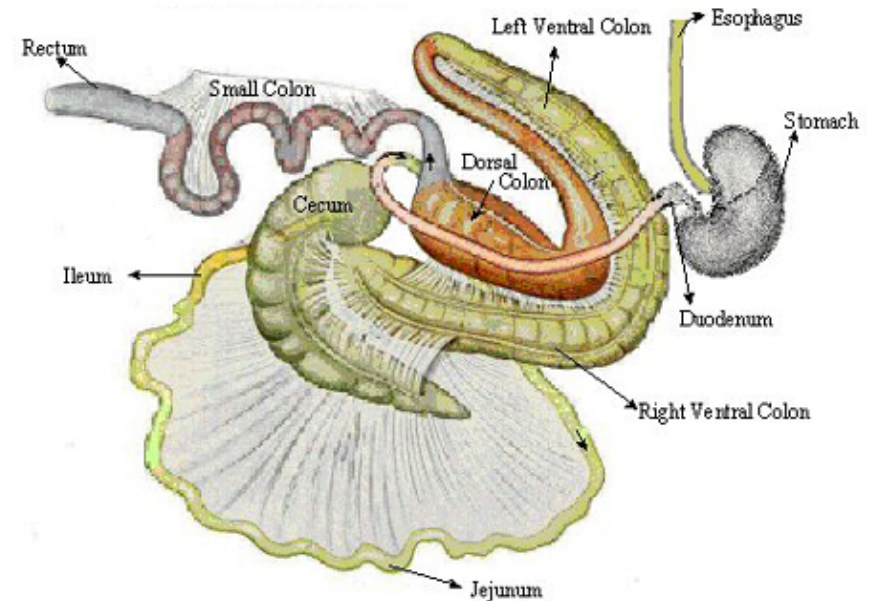
Intestinal tract of the ox

Sheep And Goat

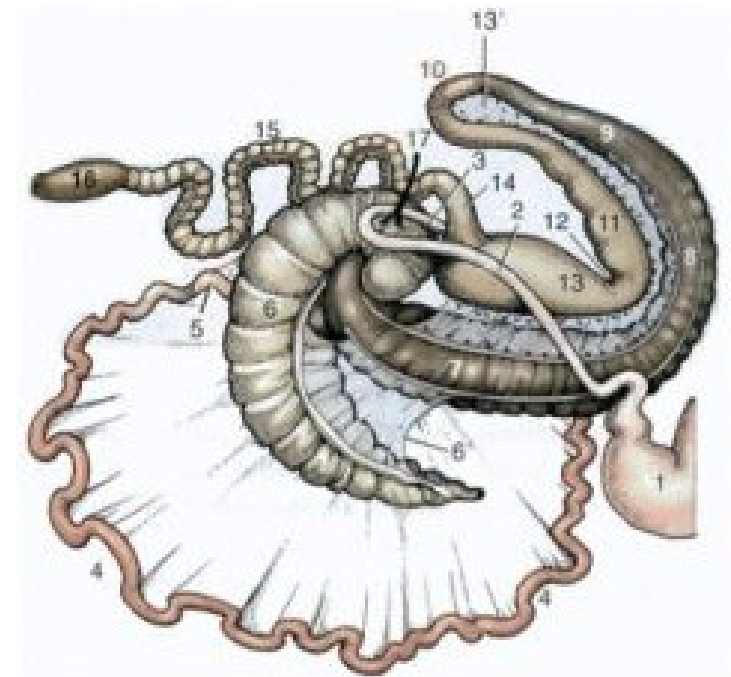
- The general structure resembles that of Ox
- The small intestine is about **80 feet** long with an inch average diameter
- The caliber is increasing in its terminal part, where a **very extensive payer's patches are found**

Horse

- Length is about 22 m. and diameter 7.5 to 10 cm
- The duodenum is somewhat like a horseshoe.

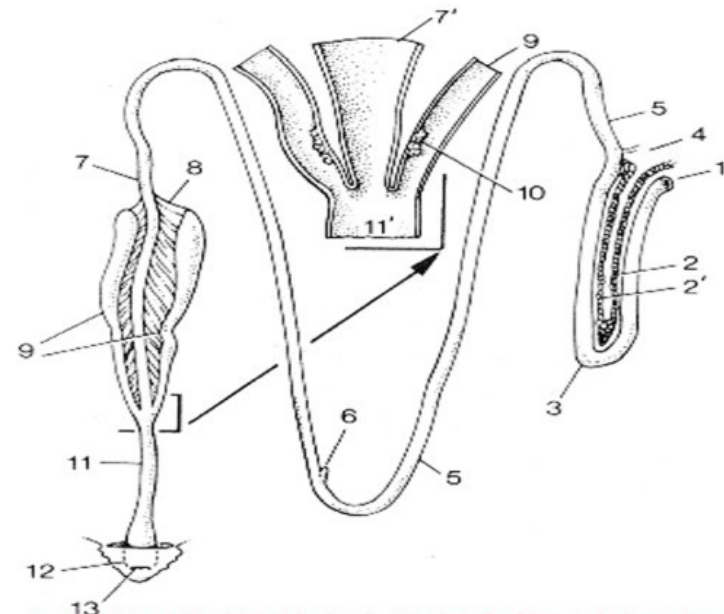


Equine Digestive Tract



Fowl

- The small intestine is made up of **duodenum, jejunum and ileum**
- The duodenum leaves the gizzard passes backwards to the right and forms a loop, the flexure being at the caudal part of the abdominal cavity
- It continues forward past its origin to be continued as jejuno-ileum coiled between the abdominal air sacs
- The two bile ducts and two pancreatic ducts empty near each other at the termination of the duodenum



Isolated intestinal tract in fowl with detail of ileocolic junction

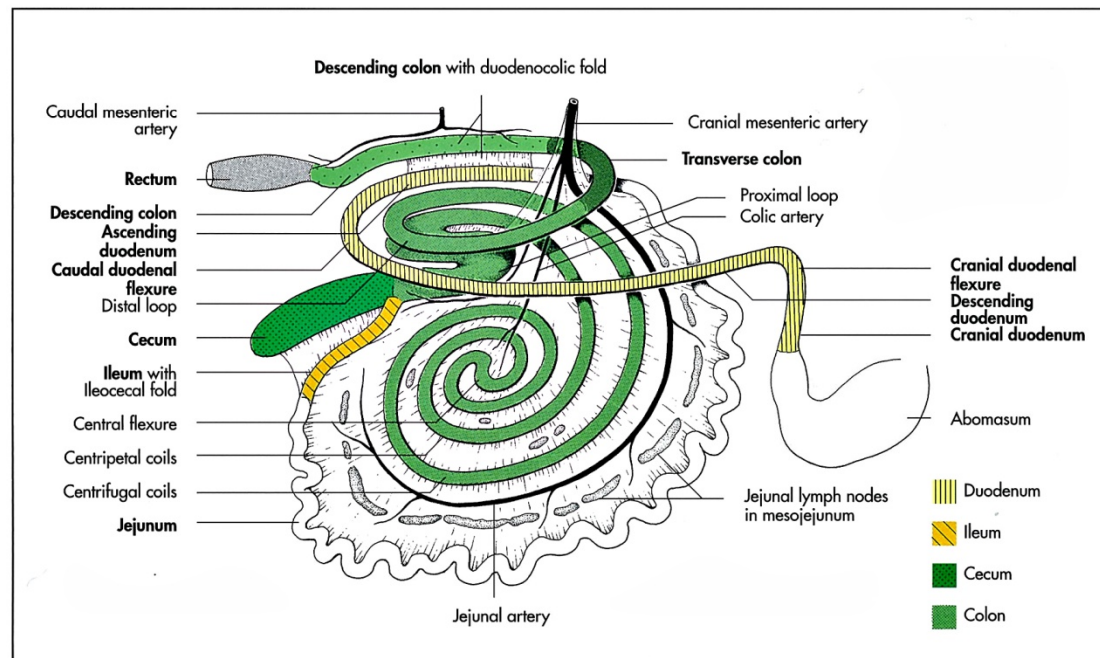
1. Pylorus 2, 2'. Dorsal and ventral lobes of pancreas
3. Duodenal loop 4. Bile and pancreatic ducts entering duodenum
5. Jejunum 6. Meckels diverticulum 7. Ileum 7'. Ileum opened
8. Ileocaecal fold 9. Caeca 9'. Caeca opened 10. Caecal tonsil
11. Colon 11'. Colon opened 12. Cloaca 13. Vent

Large Intestine

- Large intestine in domestic animals consists of **caecum, colon and rectum**

OX

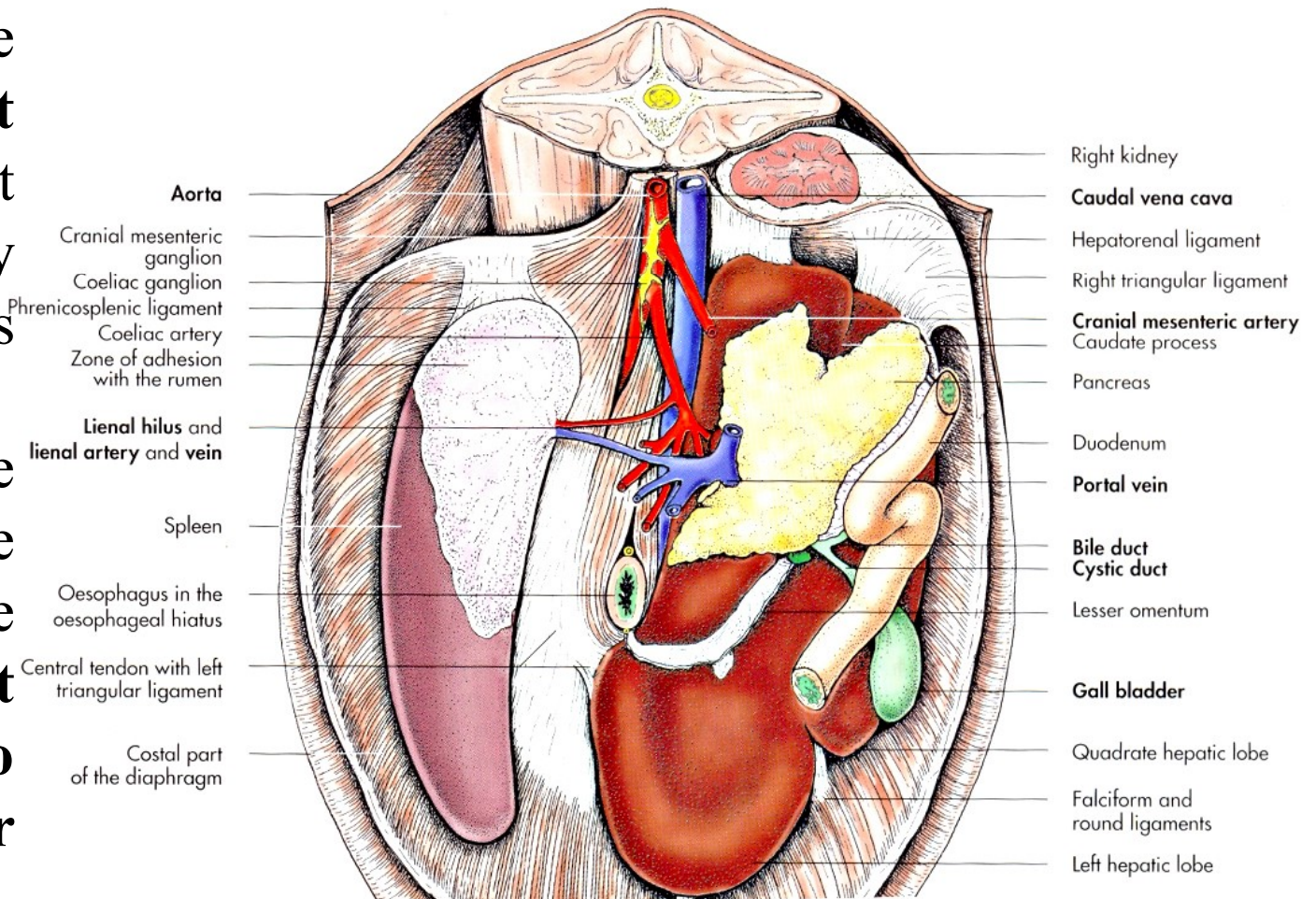
- The large intestine extends from **the termination of the ileum to the anus and measures 10 to 11.4 m**
- It is situated between right and left layers of the mesentery in the right dorsal part of the abdominal cavity related on its left to the rumen
- It is divided into 3 parts - caecum, colon and rectum



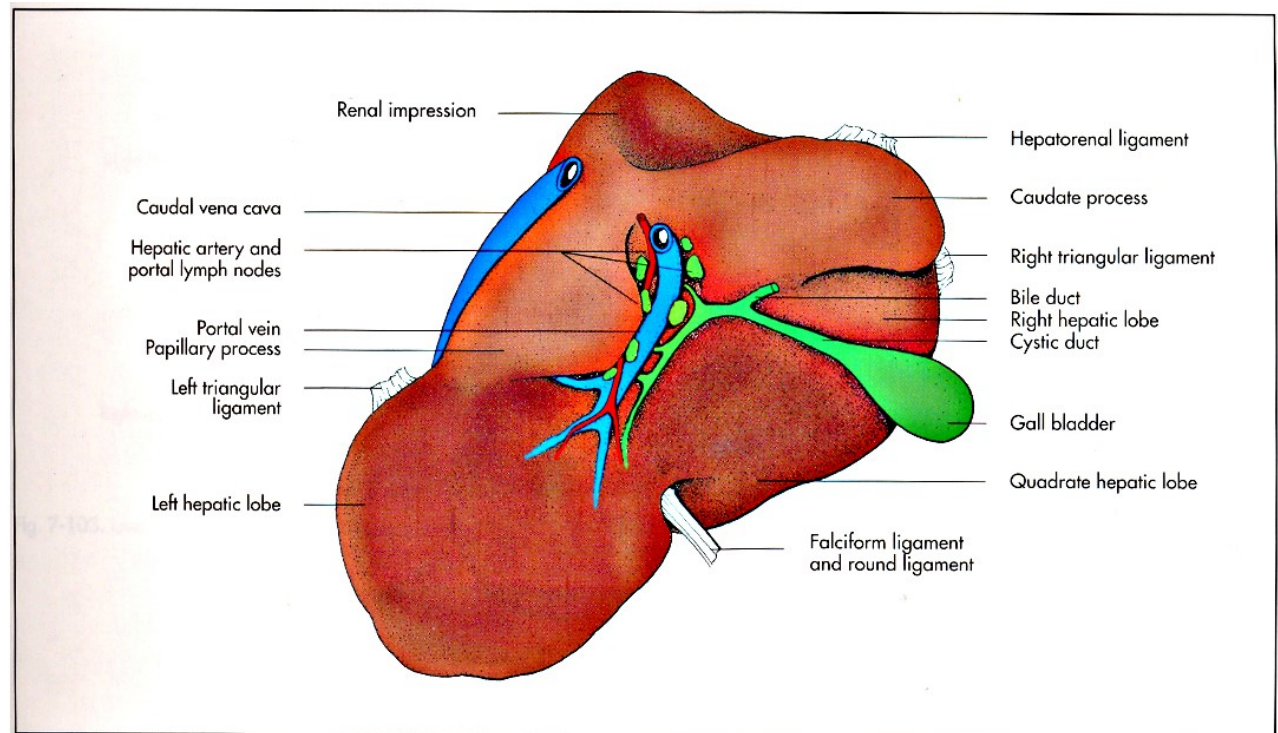
Intestinal tract of the ox

LIVER

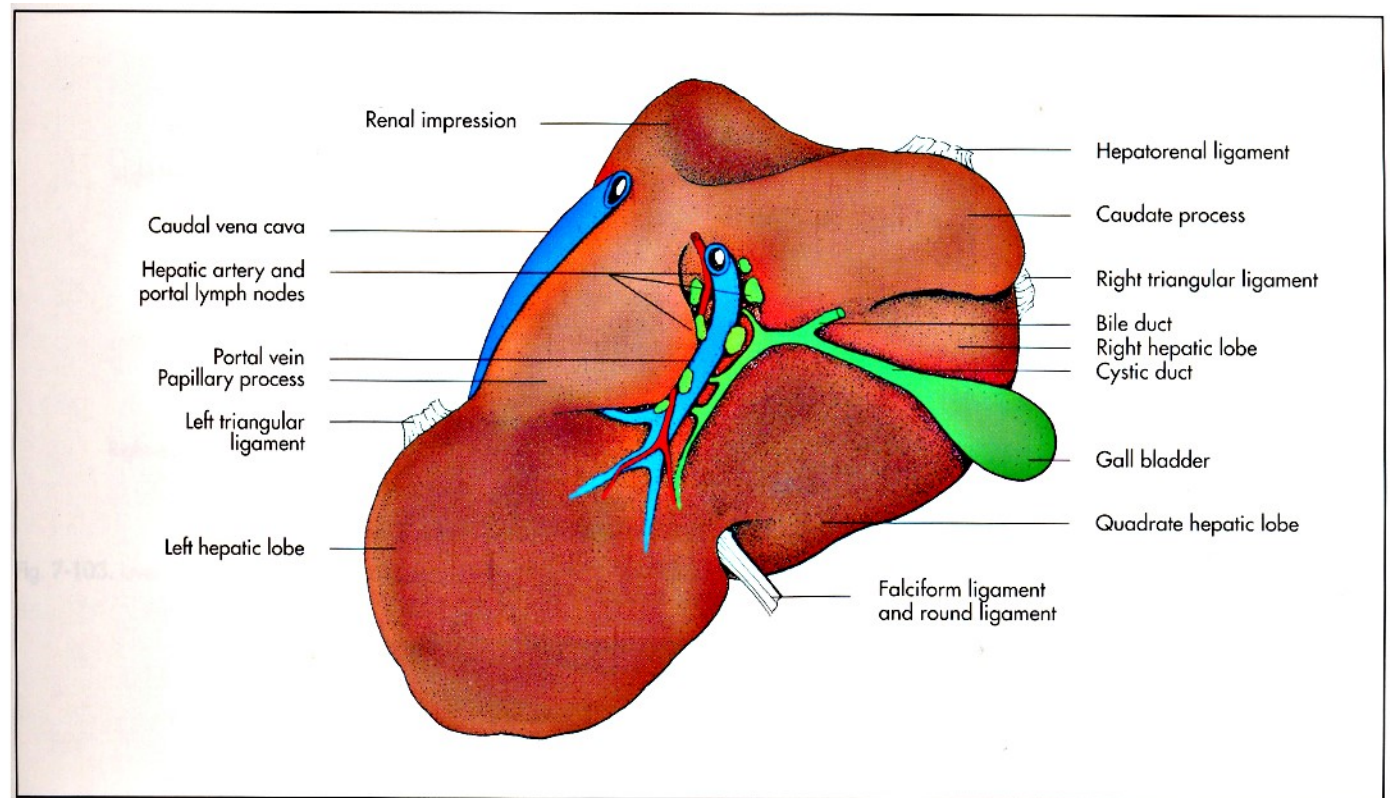
- The liver is the **largest gland in the body**
- It lies in the abdominal cavity almost entirely to the right of the median plane and extends obliquely downward and forward from the lumbo-costal angle to the level of **8 th rib**. It is **red brown** in color
- Its average weight is about **4.5 to 5.5 kg**. It is strongly curved and is accurately adapted to the abdominal face of the diaphragm. **It presents two faces and four borders**



- The *dorsal border* is short and thick. It presents the large, thick quadrilateral caudate lobe and a deep depression, renal impression of the right kidney and adrenal
- The *ventral border* is short and thin
- The *right border* is marked by the umbilical fissure in which the round ligament is attached
- The *left border* presents the oesophageal notch below its middle.

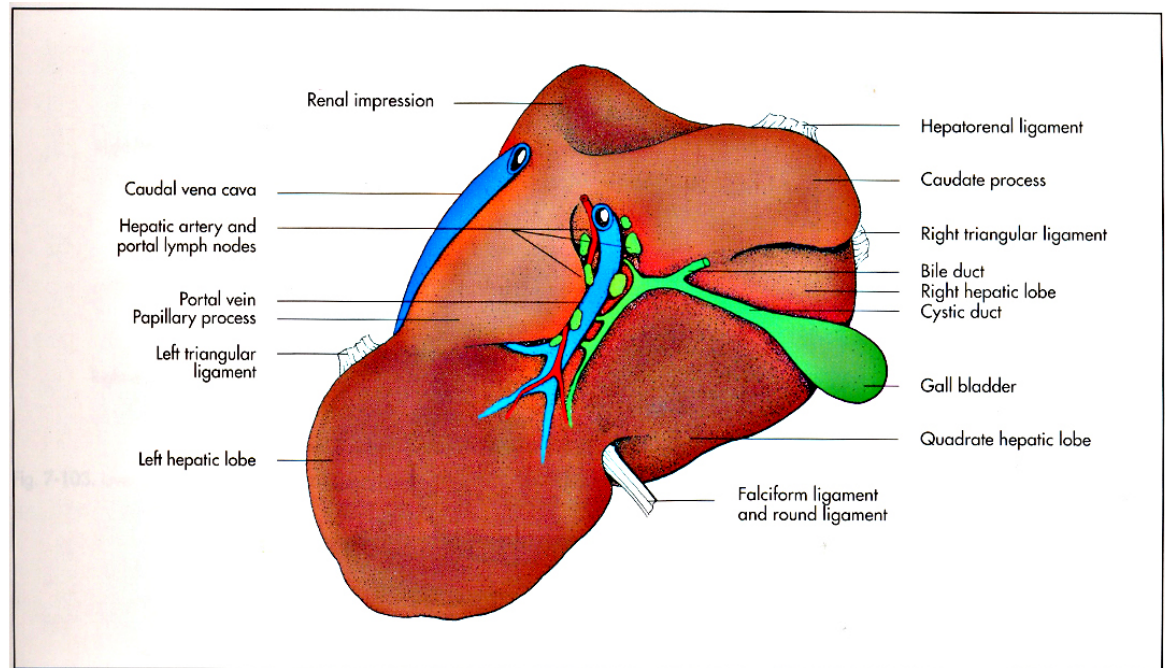


- The *visceral surface* is concave and very irregular. It presents impression of the organs with which it is in contact
 - **Omasal impression**
 - **Reticular impression**
 - **Cystic impression**
 - The portal fissure is a well-defined depression situated dorsal to the omasal impression



LIGAMENTS OF LIVER

- ***Right lateral ligament*** attaches the dorsal border to the sublumbar region
- ***Caudate ligament*** attaches the caudate lobe to the ventral face of the right kidney
- ***Falciform Ligament*** which attaches the sternal part of the diaphragm to the parietal surface of the liver
- ***Round Ligament***, which is in the free border of the falciform ligament, extends from the umbilical fissure to the umbilicus
- ***Left lateral ligament***

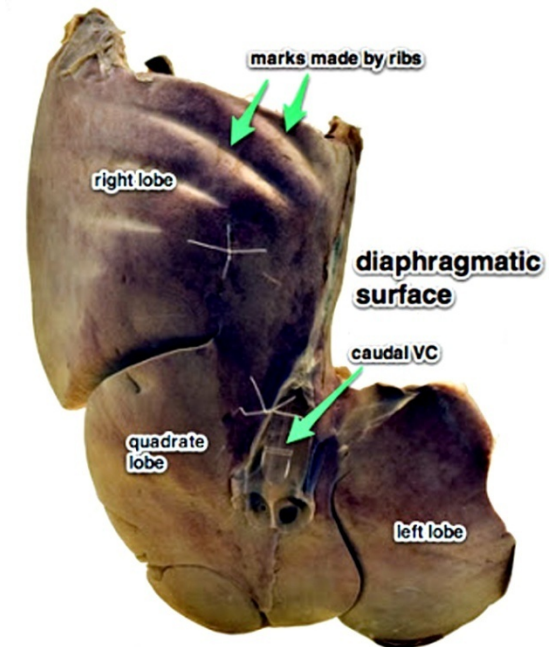
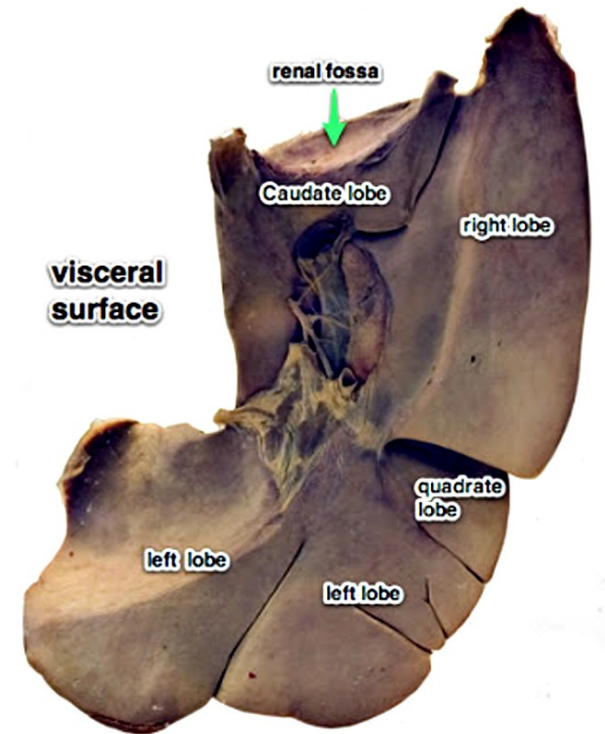


SHEEP AND GOAT

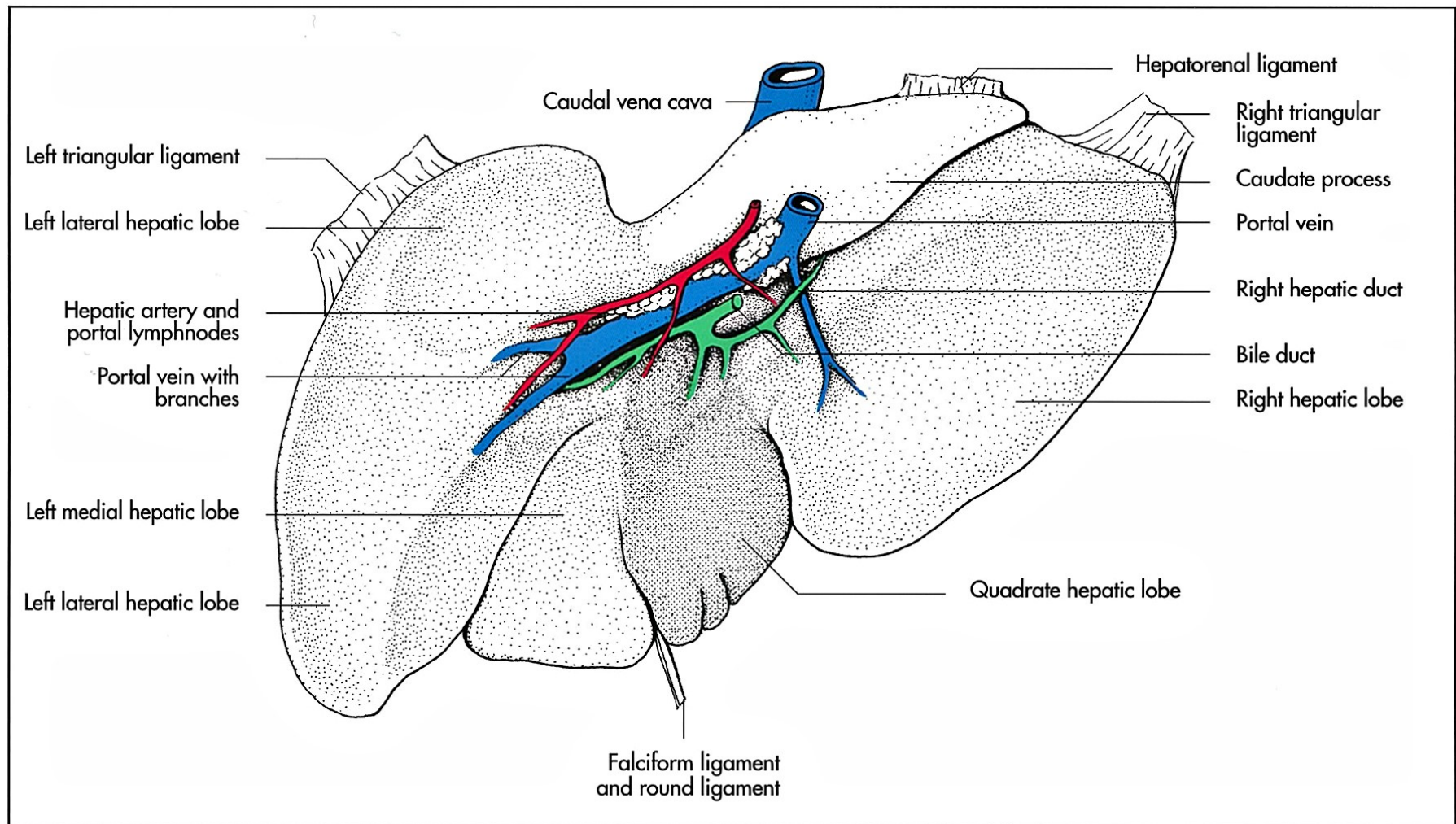
- The liver weighs **550-700 gm**
- The umbilical fissure is deep and partially divides the gland into **two chief lobes, dorsal and ventral**

HORSE

- It is more extensive but thinner.
- Its average weight is about **5 kg**. It has **three lobes, right; middle or central and a left lobe**, separated by inter lobar fissures ventrally
- The right lobe is larger and presents at its upper part the caudate lobe and caudate process. The middle lobe is smaller than the right in the young



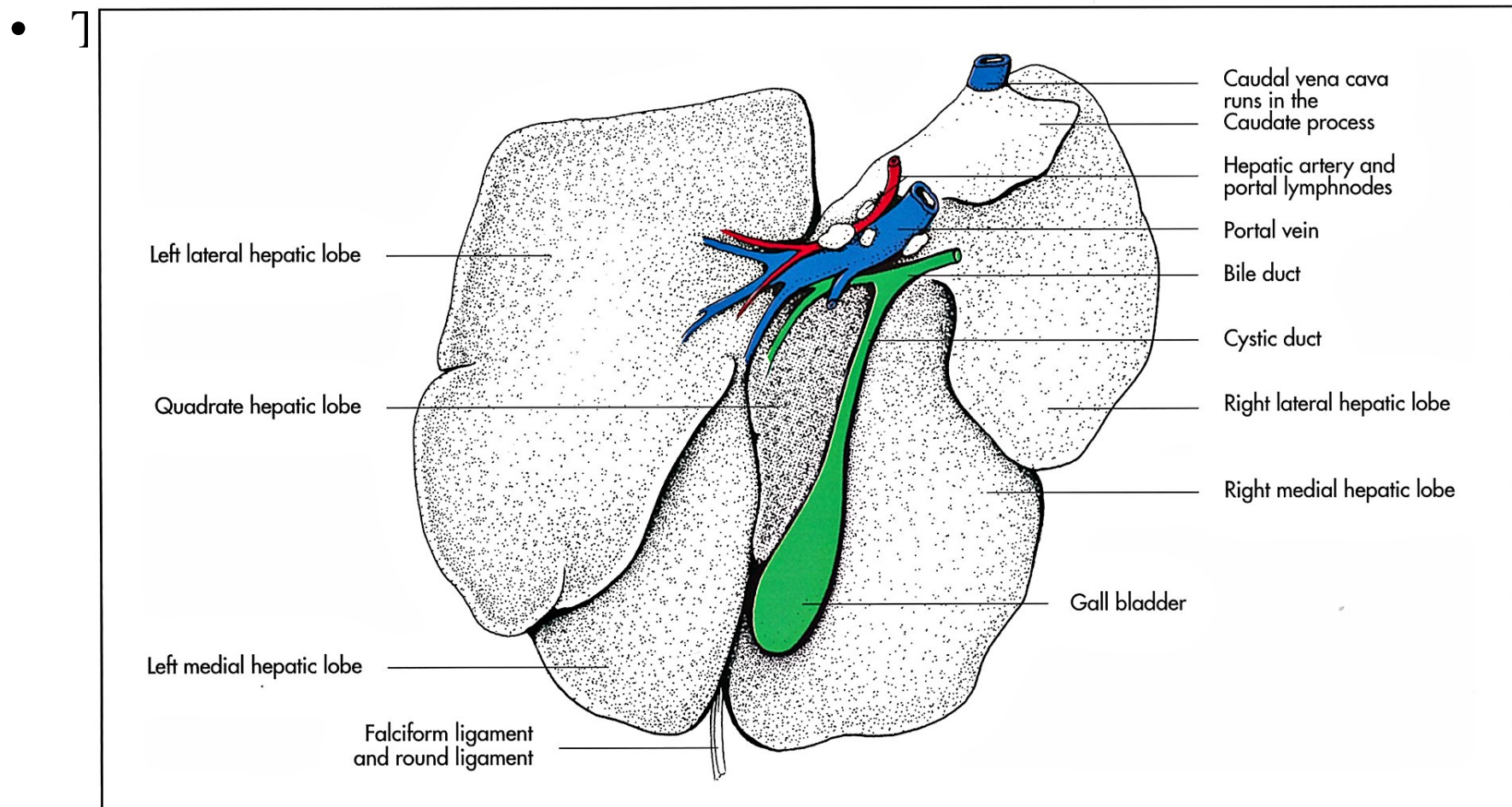
- The liver has *no gall bladder*



Liver of the horse, schematic, visceral surface.

PIG

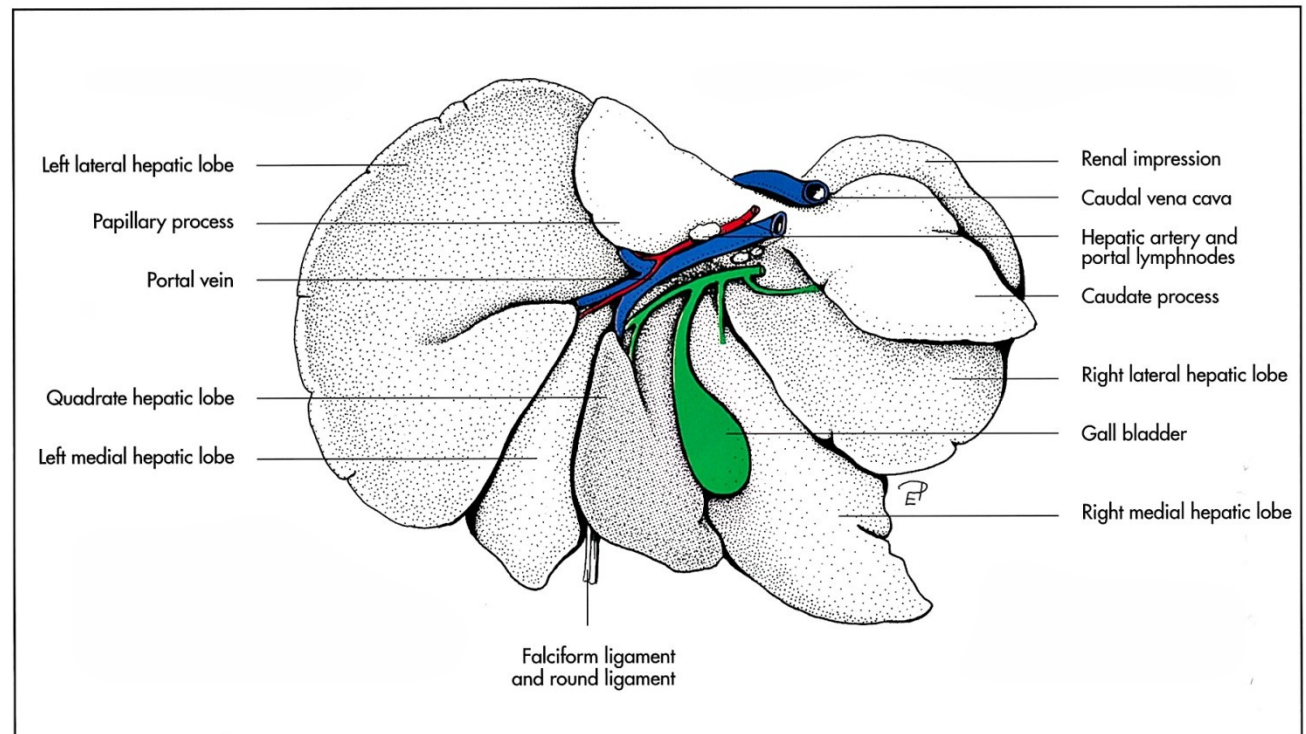
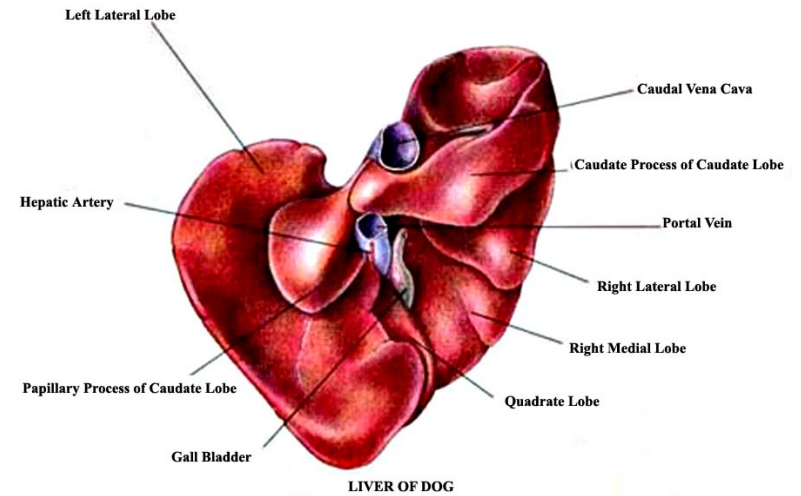
- Relatively large
- It is divided into **five lobes**, viz., **right lateral, right central, left central and left lateral**, which is the largest lobe and a small caudate lobe



Liver of the pig, schematic, visceral surface.

Dog

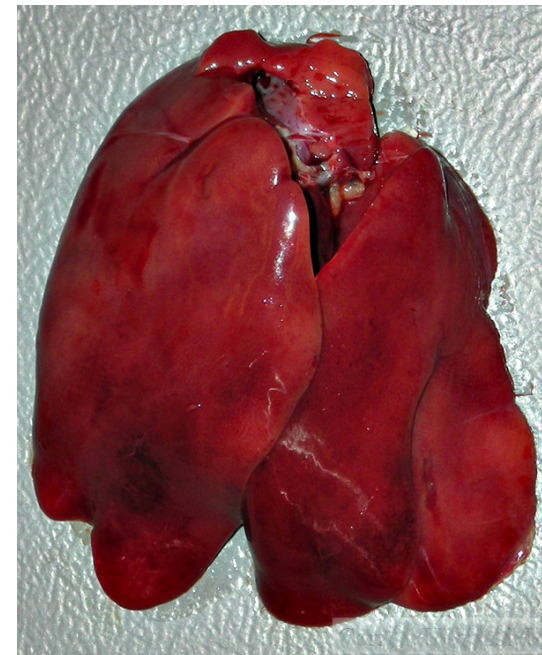
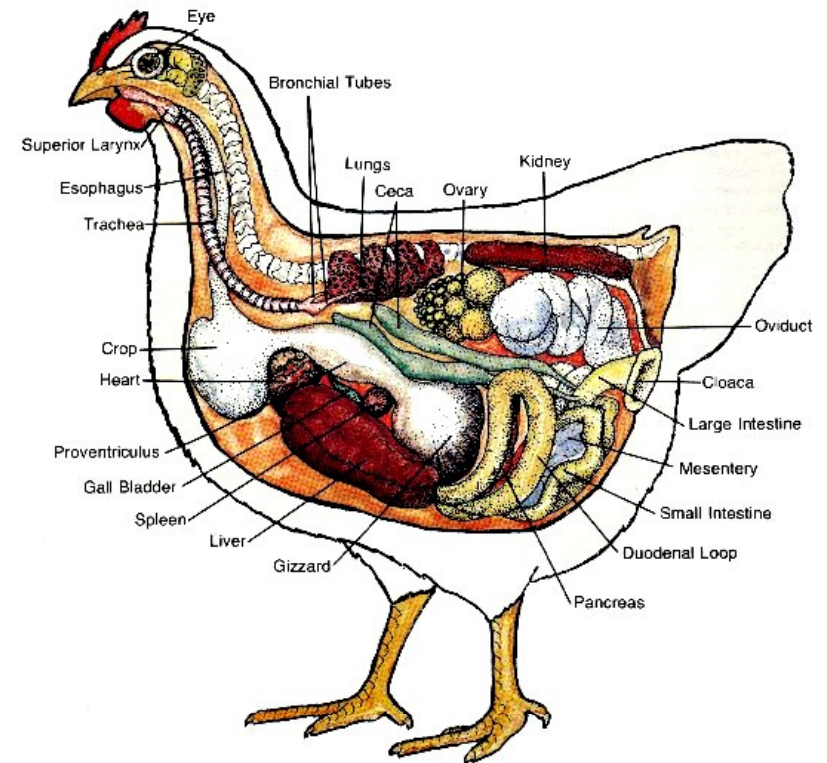
- It weighs about **3%** of the body weight
- It consists of **five lobes** -Rt. Lateral, Central, Caudate, Lt-central and Lt-lateral divided by fissures, which converge towards the portal fissure
 - **The left lateral lobe is largest and is oval**



Liver of the dog, schematic, visceral surface.

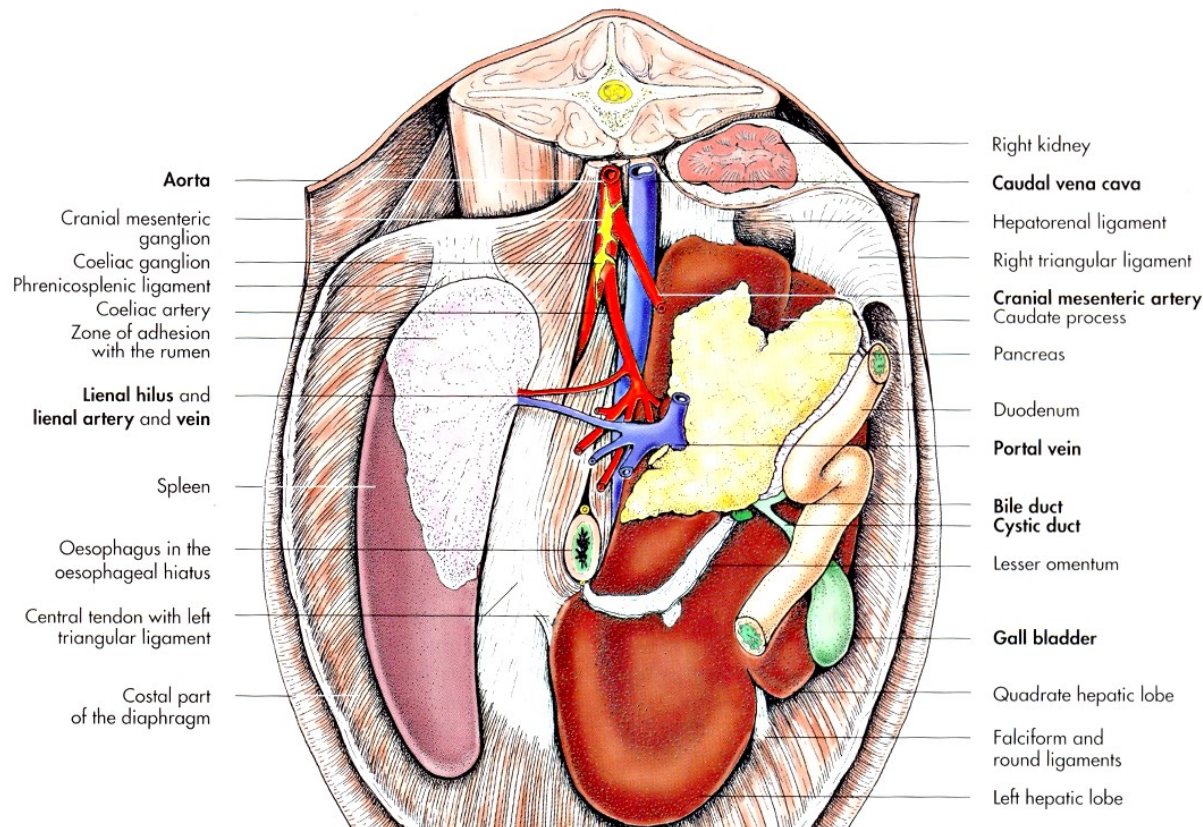
Fowl

- The liver lies in the **ventral part** of the body cavity
- Its parietal surface is convex and is related to the ventral and lateral walls of abdomen
- It presents a deep cardiac impression in front for the pericardium and heart
- The visceral surface is irregular and concave. It presents impression left by the proventriculus and gizzard while on the right is impressions from the spleen and small intestine
- The gall bladder is situated on the right caudal part of this face
- **The gland consists of 2 lobes, of which the right is larger**

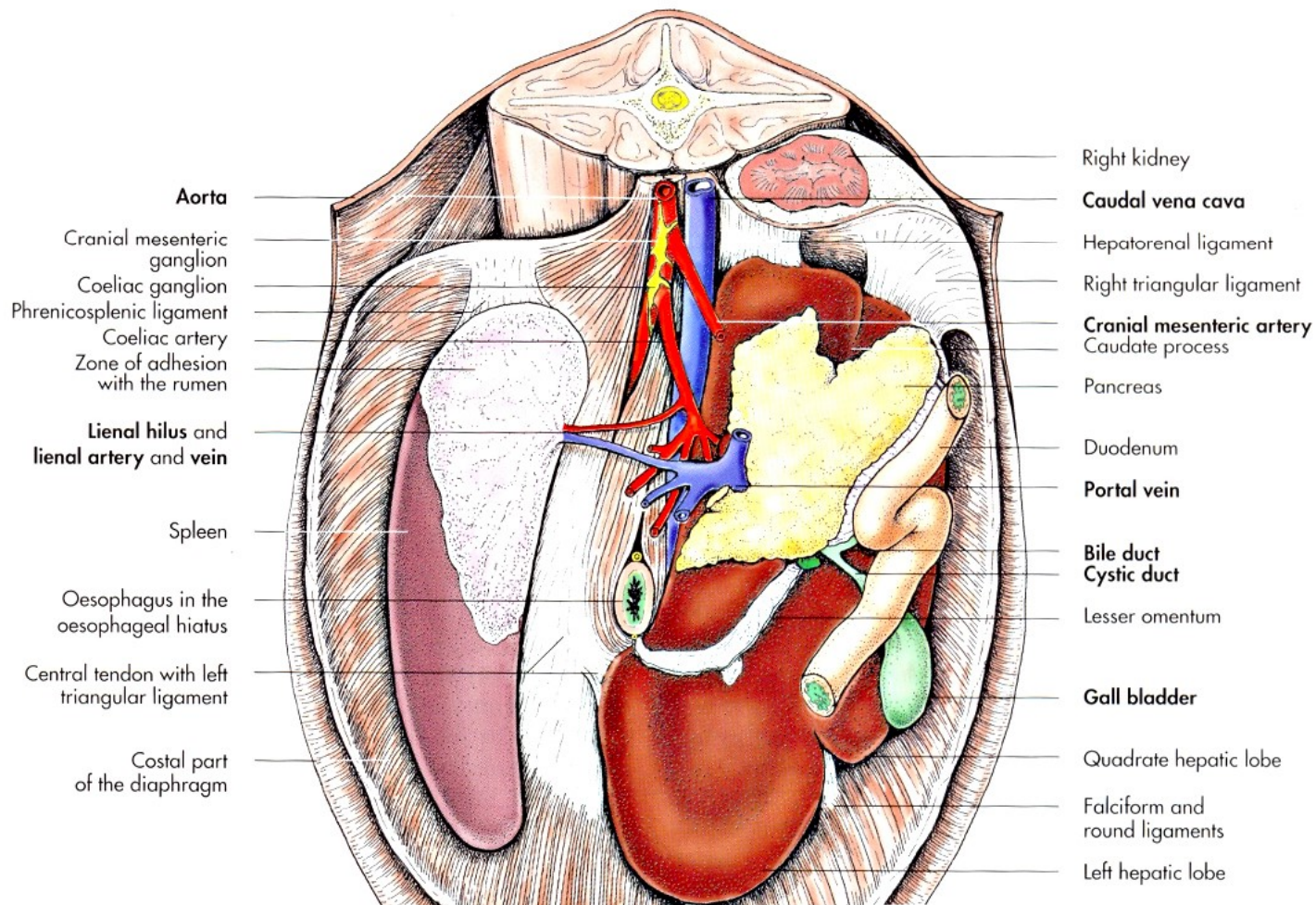


PANCREAS OF OX

- It is commonly known as **sweetbread** or abdominal salivary gland
- The pancreas is a racemose gland mostly at the right of the median plane and it is attached to the visceral surface of the liver by the mesentery
- When fresh it is **reddish cream** in colour. It weighs about **350 gm.** and is irregularly quadrilateral in outline

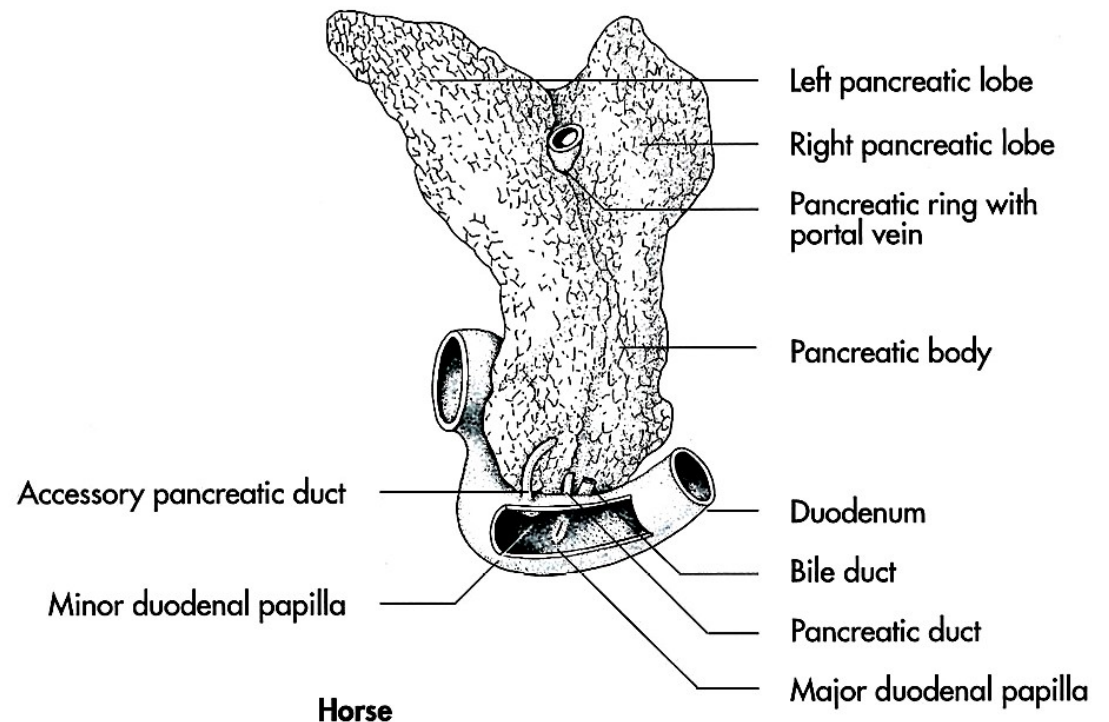


- It presents two surfaces, four borders and four angles.
- The dorsal surface is related to the liver, ventral face of right kidney and right adrenal, coeliac, cranial mesenteric artery
- The ventral surface faces downward and is normally in contact with the dorsal curvature of rumen and the intestine.



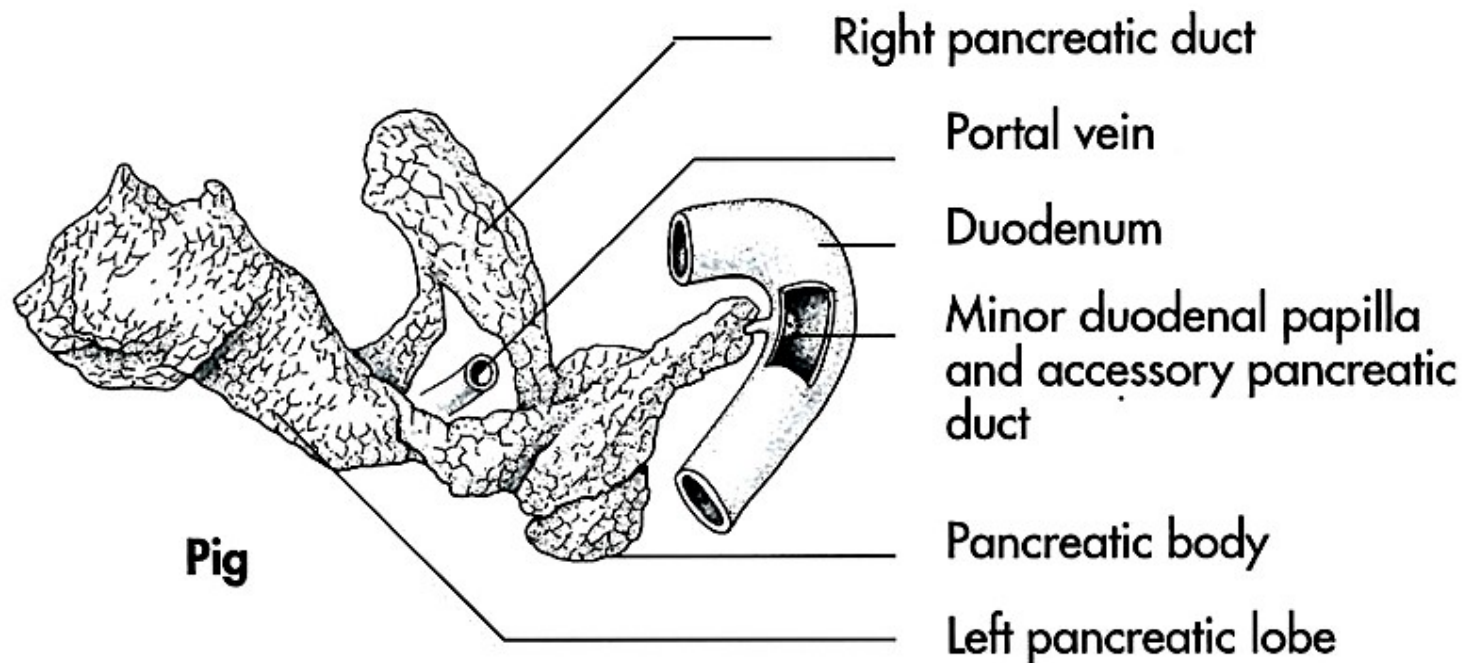
PANCREAS (HORSE)

- The gland is **triangular** in outline with the apex cranial
- It weighs about **350 gm**
- The **dorsal surface** is related to the liver, right kidney, caudal vena cava and portal vein
- The **ventral face** is related to the caecum, great colon and small colon.



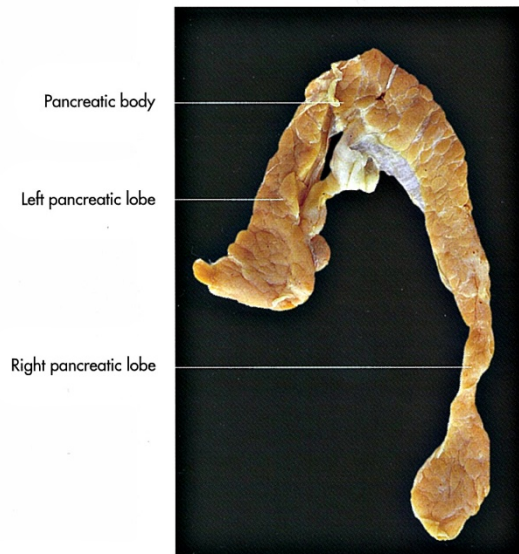
PIG

- It is **triangular** in outline
- The **left lobe** is related to stomach and the **right lobe** is attached to the duodenum
- The parenchyma contains large quantity of fat

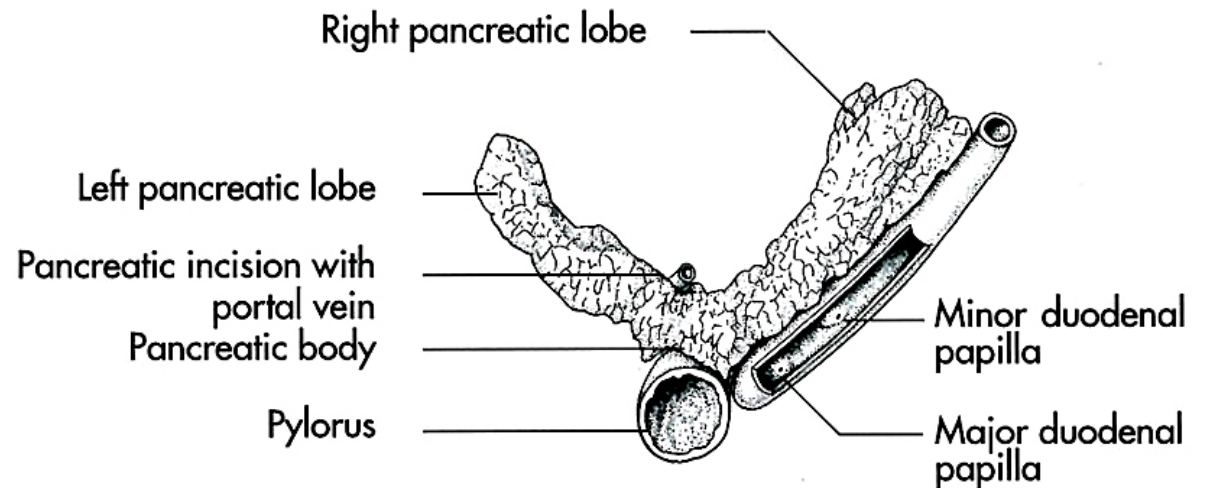


DOG

- The pancreas is V shaped consisting of two branches - *right and left*, meeting at an acute angle behind pylorus
- The *right branch* extends backwards above the first part of the duodenum and ends a short distance behind the right kidney
- The *left branch* passes to the left and backwards between the stomach and transverse colon and ends at the cranial pole of the left kidney



Pancreas of a dog, dorsal aspect.



Dog

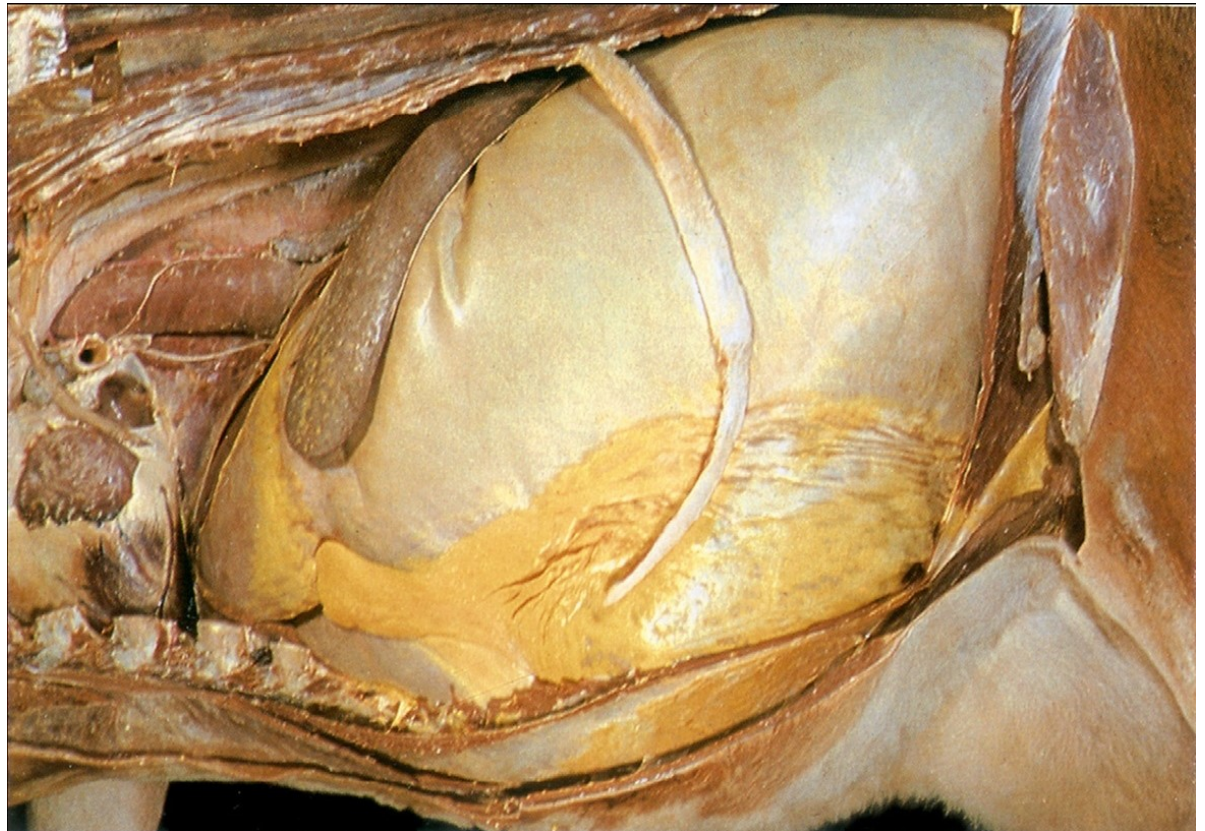
Fowl

- The pancreas is long narrow lobulated **yellowish red gland**, which is situated in the loop formed between the two parts of duodenum
- Two or three ducts open into the duodenum close to the opening of the bile ducts

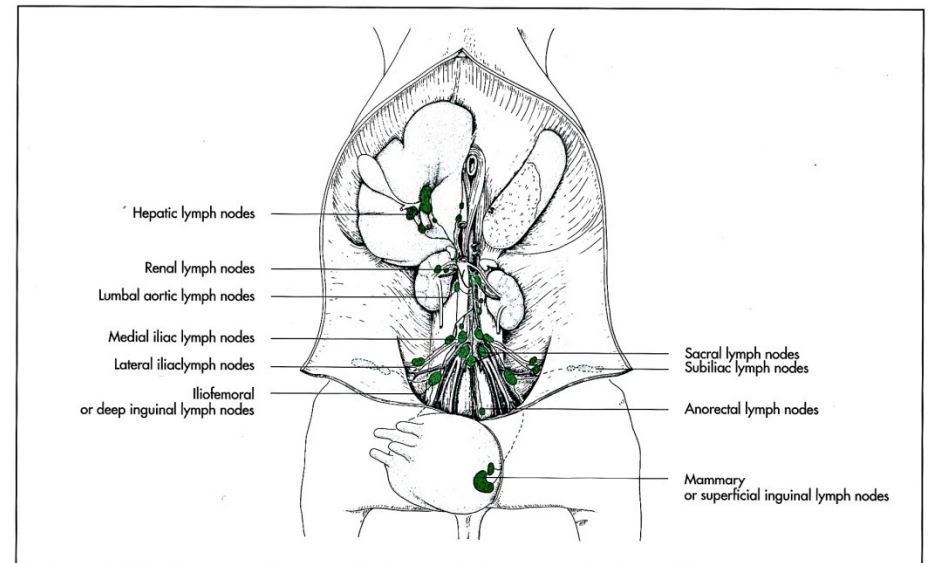
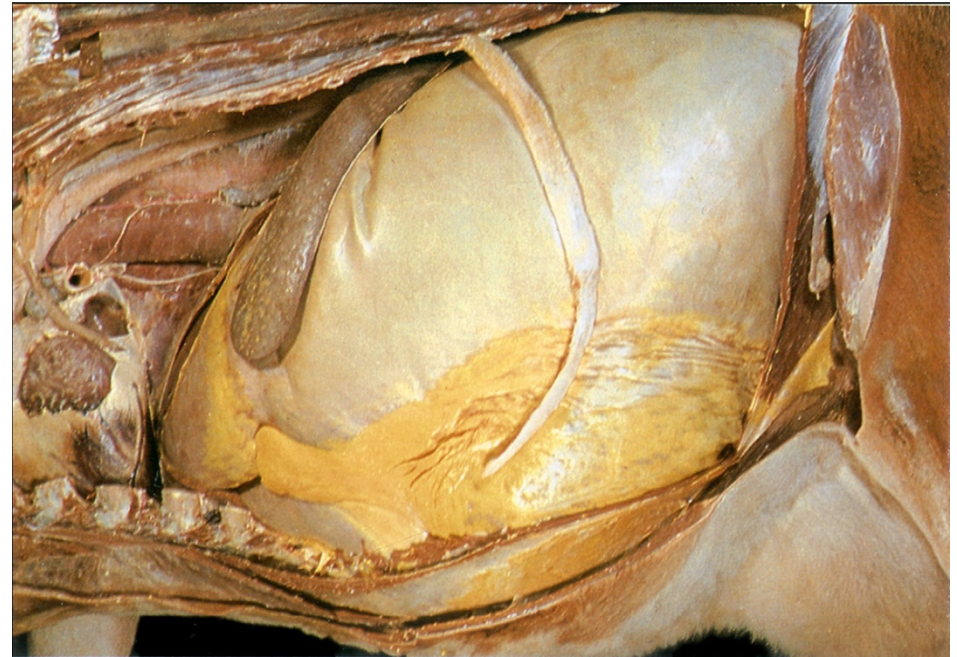


SPLEEN - OX

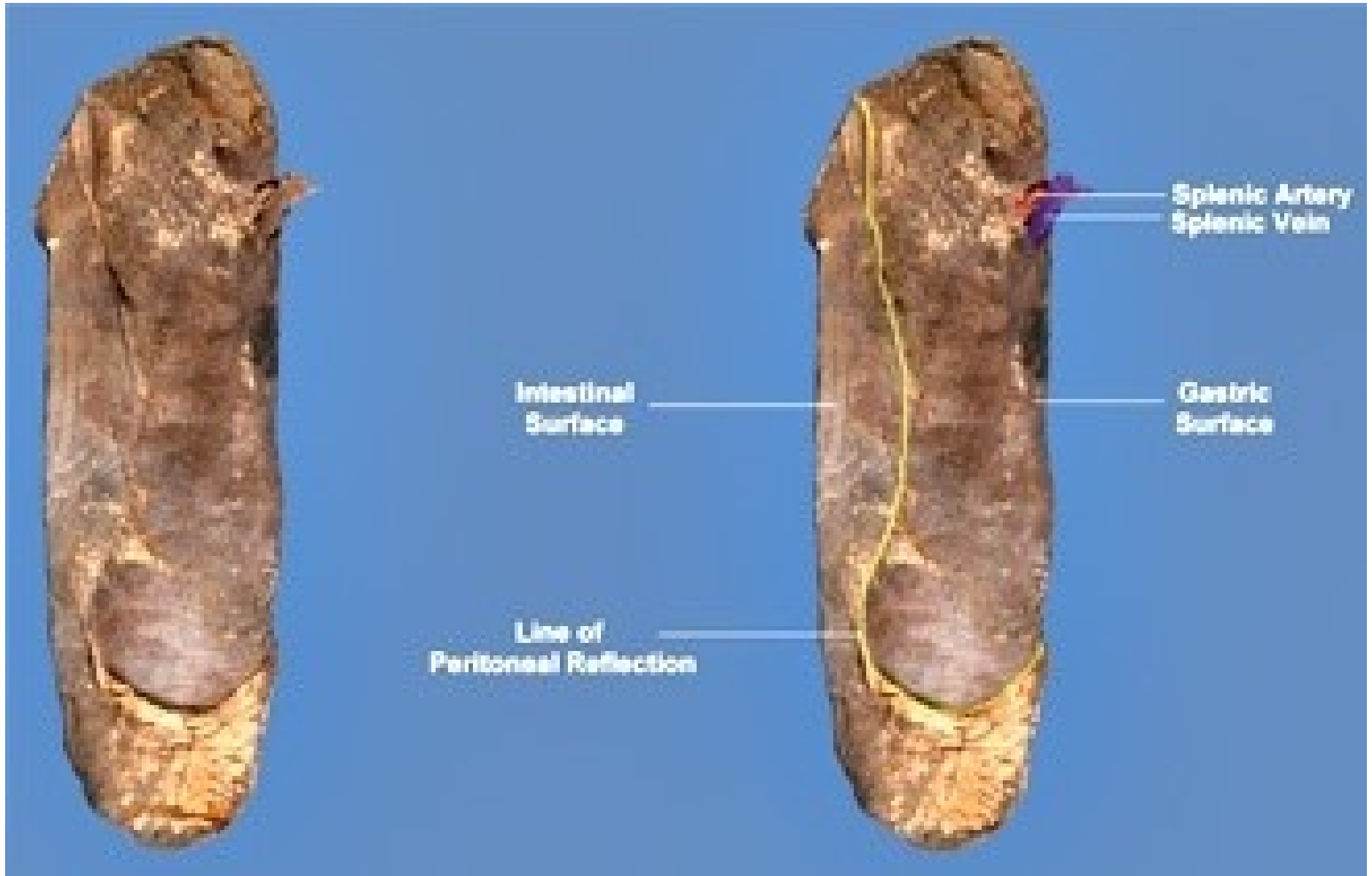
- The spleen is **the largest of the lymphoid organs, situated on the left face of the rumen and elliptical in outline**
- It is **bluish-red or purple in colour** and measures about **50 cm** long and **15 cm** broad and weighs about **900 gms**
- It presents **two surfaces, two borders and two extremities**
- **The parietal surface** is convex and is applied against the **diaphragm**



- **The visceral surface** is concave and is related chiefly to left side of **the rumen** and a narrow adjacent area of **the reticulum**.



Lymph nodes and lymph collecting ducts of the abdominal cavity of the ox, ventral aspect



Intestinal Surface

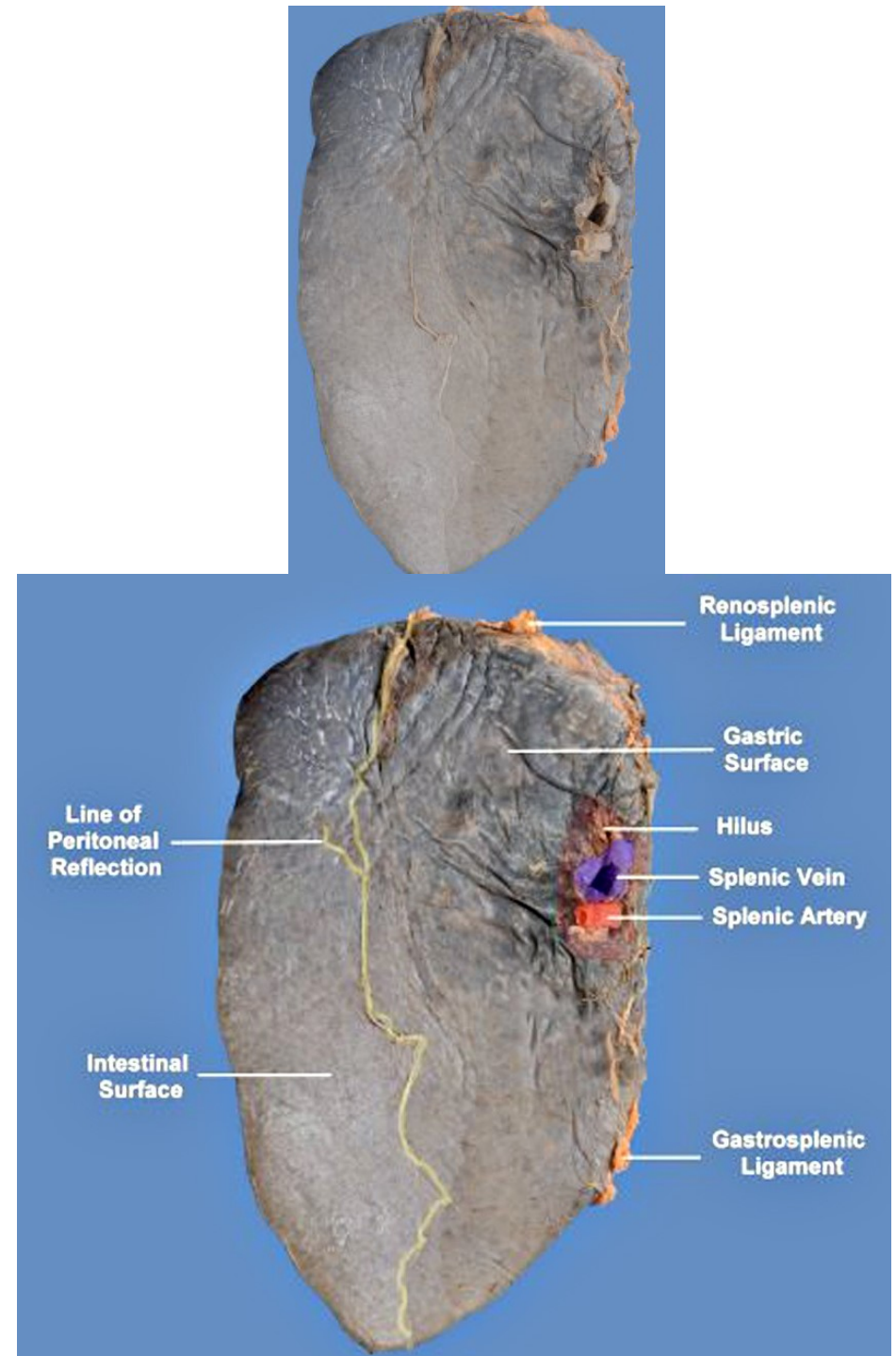
Splenic Artery
Splenic Vein

Gastric Surface

Line of Peritoneal Reflection

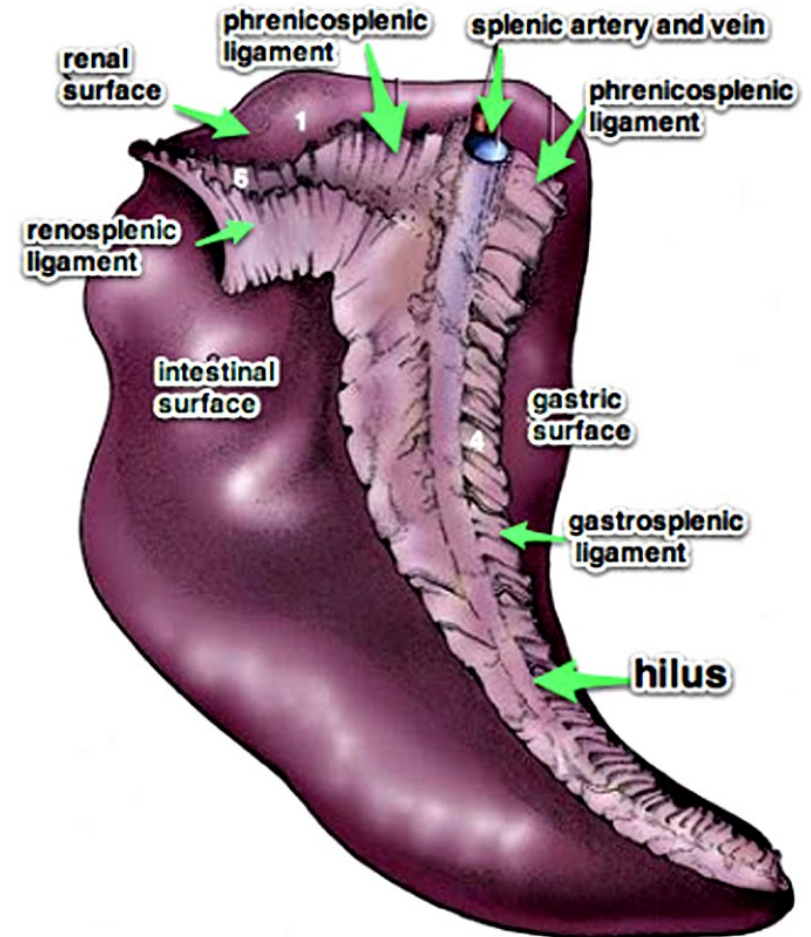
SPLEEN (SHEEP AND GOAT)

- Spleen is **oyster shell-shaped** or triangular approximately
- The wider end or base is dorsal. Long axis is oblique and corresponds to a line drawn from the vertebral end of the last rib to about the 10th intercostal space
- The dorsal end is attached to the diaphragm under last two ribs
- **The hilus** is on the visceral surface as a round depression



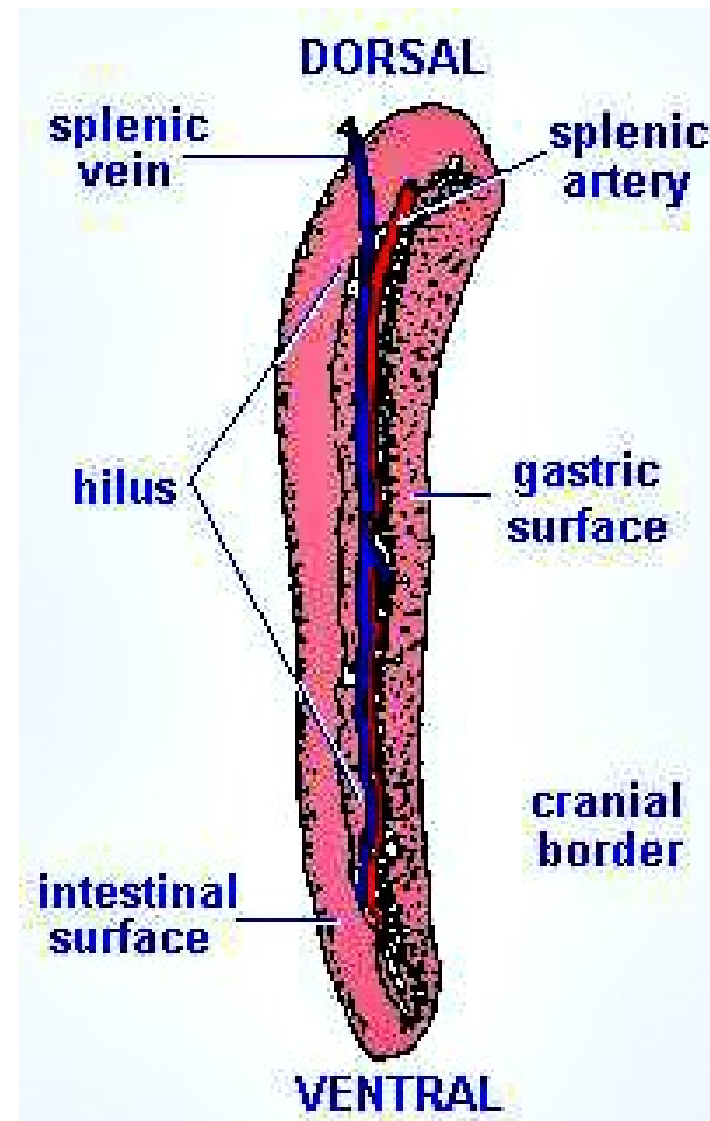
SPLEEN (HORSE)

- It is situated in the left parachondriac region **on the left part of the greater curvature of the stomach**
- It is **scythe shaped**
- It weighs about **1 kg**
- The parietal surface is convex and is related to diaphragm
- The visceral surface is concave and presents a ridge, which divides this face into unequal areas
- The hilus is on a groove situated on the ridge



SPLEEN (PIG)

- Long and narrow extends dorso-ventrally along the left part of the greater curvature of the stomach
- The dorsal end is smooth and convex and lies under the vertebral ends of the last three ribs
- The parietal surface is smooth and convex
- The visceral surface is concave and presents a longitudinal ridge on which the hilus is situated



Dog

- The spleen is **bright red in colour** and **weighs 50 gm**
- It is falciform, long and narrow. It is roughly human- **foot print shaped structure**
- Its dorsal end is narrower and is ventral to the vertebral end of the last rib and first lumbar transverse process
- The ventral end is wider and is variable in position

FOWL

- The spleen is a **reddish brown**, rounded body situated dorsally and to the right of the junction of the proventriculus and gizzard
- Accessory spleens are also noticed



Spleen of Dog