# VASAE

- Vas sanguinus

  * Arteriae – are the vessels that carry blood away from the heart. The wall of the arteries are thicker

  * Venae – are the vessels that carry blood toward the heart. There are number of valves in lumens to prevent backflow.

- Vas lymphaticum

# Circulus Sanguinus

- Circulus sanguinus major

Systemic circulation

- Circulus sanguinus minor

Pulmonary circulation

- Portal circulation
- Fetal circulation

# Systemic circulation

- The systemic circulation is the circulation of the blood to all parts of the body which transports oxygenated blood away from the heart through the aorta from the left ventricle where the blood has been previously deposited from pulmonary circulation, to the rest of the body, and returns oxygen-depleted blood back to the heart.

# Pulmonary circulation

- Pulmonary circulation is the movement of blood from the heart, to the lungs, and back to the heart again. From the right atrium, the blood is pumped through the tricuspid valve (or right atrioventricular valve), into the right ventricle. Deoxygenated blood leaves through the right ventricle through the pulmonary artery and goes to the lung. The oxygenated blood return to the left atrium.

# Fetal blood circulation

- The fetal circulation works differently from that of born animals, mainly because the lungs are not in use. The fetus obtains oxygen and nutrients from the mother through the placenta and the umbilical cord.

# Fetal blood circulation

- The blood from the placenta is carried to the fetus by the umbilical vein.
- Less than a third of this enters the fetal ductus venosus and is carried to the caudal vena cava, while the rest enters the liver from the port of the liver.
- The blood in the liver then moves to the right atrium of the heart via hepatic veins and caudal vena cava.

# Fetal blood circulation

- There is an opening between the right and left atrium (the foramen ovale), and most of the blood (coming from caudal vena cava) flows through this hole directly into the left atrium from the right side because of the blood flow direction. The continuation of this blood flow is into the left ventricle, and from there it is pumped through the aorta into the body.
- Some of the blood (coming from cranial vena cava) entering the right atrium does not pass directly to the left atrium through the foramen ovale, it enters the right ventricle and is pumped into the pulmonary trunk. In the fetus, there is a special connection between the pulmonary trunk and the aorta, called the ductus arteriosus, which directs most of this blood away from the lungs
- Some of the blood moves from the aorta through the internal iliac arteries to the umbilical arteries, and re-enters the placenta, where carbon dioxide and other waste products from the fetus are taken up and enter the maternal circulation

Coto

# Postnatal changings

- At birth, when the infant breathes for the first time, there is a decrease in the resistance in the pulmonary vasculature, which causes the pressure in the left atrium to increase relative to the pressure in the right atrium. This leads to the closure of the foramen ovale, which is then referred to as the fossa ovalis.
- Additionally, the increase in the concentration of oxygen causing closure of the ductus arteriosus.

- V.umblicalis – Lig.teres hepatis
- A.umblicalis - lig.teres vesicae
- Ductus venosus – Lig.venosum
- Foramen ovale – Fossa ovalis
- Ductus arteriosus – Lig.arteriosum

Coto

# ARTERIAE

- Tr.pulmonalis : Carries the deoxygenated blood to the lungs
- Aorta: Carries the oxygenated blood to the body

# AORTA

The aorta is the main artery in the body, originating from the left ventricle of the heart. It distributes oxygenated blood to all parts of the body.

Aorta ascendens

Arcus aortae

Aorta descendens

# Aorta ascendens

- The aorta starts as the ascending aorta. It begins at the opening of the aortic valve in the left ventricle of the heart. The ascending aorta gives the coronary arteries that supply the heart.

# Coronary circulation

- Two major coronary arteries are the first branches off the ascending aorta near the point where the aorta and the left ventricle meet. It follows the sulci of the heart and all parts of the heart receives its own supply of blood from these arteries and its branches.

- A.coronaria dextra

  ramus interventricularis subsinosus

- A.coronaria sinistra

  ramus interventricularis paraconalis

  ramus circumflexus

Coto

# Arcus aortae

- The aortic arch is the connection between the ascending and descending aorta. After the pulmonary trunk twists around aorta, the vessel continues with a loop cranially, dorsally and caudally respectively. The main vessels that carry the blood to the head, neck and forelegs originate from the arch named as brachiocephalic trunk

# Arcus aortae (Eq.,Ru.)

- Tr.brachiocephalicus
  - * A.subclavia sinistra
  - * A.subclavia dextra
  - * Tr.bicaroticus
    - A.carotis communis sinistra
    - A.carotis communis dextra

# Arcus aortae (Su.)

- A.subclavia sinistra
- Tr.brachiocephalicus
    - * A.subclavia dextra
    - * Tr.bicaroticus
        - A.carotis communis sinistra
        - A.carotis communis dextra

# Arcus aortae (Car.)

- A.subclavia sinistra
- Tr.brachiocephalicus
    - * A.carotis communis sinistra
    - * A.anonyma
        - A.subclavia dextra
        - A.carotis communis dextra

# Vascularisation of the head

- The last branches of a.carotis communis

* A.occipitalis

* A.carotis interna

  Circulus arteriosus cerebri

* A.carotis externa

  Tr.linguofacialis

  A.temporalis superficialis

  A.auricularis caudalis

  A.maxillaris

# Vascularisation of the foreleg

- A.subclavia sinistra
  - * Tr.costocervicalis
  - * A.cervicalis profunda
  - * A.vertebralis
  - * A.cervicalis superficialis
  - * A.thoracica interna
- A.axillaris
- A.brachialis
- A.mediana
  - * A.radialis

Coto

# Aorta descendens

- After the arch, the aorta directs caudally. The descending aorta starts from the level of 7th thoracal vertebrae. It is divided into two parts by diaphragma as aorta thoracica and aorta abdominalis.

# Aorta descendens

- **Aorta thoracica**

*** A.bronchoesophagea**

**Supplying the lungs and esophagus**

*** A.intercostales dorsales**

**The first 3 branches originate from costocervical trunk and the rest of them leave from aorta**

# Aorta descendens

- **Aorta abdominalis**
  - * A.abdominalis cranialis (car, su)
  - * Aa.lumbales
  - * A.celiaca

-a.lienalis,

-a.hepatica,

-a.gastrica sinistra

  - * A.mesenterica cranialis
  - * A.renalis
  - * A.mesenterica caudalis
  - * A.testicularis-A.ovarica
  - * A.circumflexa ilium profunda (car)
  - * A.ilica externa
  - * A.iliaca interna
  - * A.sacralis mediana

Coto

# Vascularisation of the hindlimb

- A.iliaca externa
  - A.profunda femoris
  * A.femoralis
    - Tr.pudentoepigastricus
    - A.saphena
  * A.poplitea
  * A.tibialis cranialis
  * A.tibialis caudalis

# Vascularisation of the pelvic region

- A.iliaca interna

* A.glutea cranialis
* A.glutea caudalis
* A.iliolumbalis
* A.obturatoria

* A.umblicalis
* A.vaginalis –A.prostatica
* A.penis – A.clitoridis
* A.perinealis ventralis

# Vascularisation of the heart

- Horse and pig :

- LCA : * PIA
  * CA
- RCA : * CA
  * SIA

- Ruminant and dog:

- LCA : * PIA
  * CA
  * SIA
- RCA : small

Coto

# Vascularisation of the brain

Horse and Dog ;

- Internal carotid artery

- caroticobasilar artery
- Caudal intercarotid artery
- Cranial intercarotid artery
- Medial cerebral artery
- Caudal comminicans artery
- Cranial comminicans artery

- Vertebral artery

- Basilar artery

Coto

# Vascularisation of the brain

Ruminant and Pig ;

- Rete mirabile epidurale
  - Maxillar artery
  - Vertebral artery
  - Medial meningeal artery
  - Condylar artery
- Vertebral artery
  - Basilar artery

# Vascularisation of the eyeball

- Common carotid artery
- External carotid artery
- Maxillary artery
- External ophthalmic artery

# Vascularisation of the mamma

- Internal iliac artery
  - *Internal pudental artery
    - Caudal mammary artery
- External iliac artery
  - *External pudental artery
- Internal thoracic artery
  - *Cranial mammary artery

Coto

# Vascularisation of the uterus

- Uterine artery ; originates from
  - Vaginal artery (car)
  - External iliac artery (horse)
  - Internal iliac artery
    - Umbilical artery (ruminant)

Coto

# VENAE

- Vv.pulmonales:

Carry the oxygenated blood to the heart

- Vv.cordis:

The veins of the heart

- V.cava cranialis et caudalis:

The main veins transport the deoxygenated blood toward the heart.

# Venae cordis

- V.cordis magna
- V.cordis media
- V.cordis dextra (parvae)
- V.cordis minimae

*** Sinus coronarius ***

# V.cava cranialis

- Tr.bijugularis ; Formed by merging the two of v.jugularis externa.

  * V.jugularis externa ; V.maxillaris and v.linguofacialis combine

    V.cervicalis superficialis

    V.cephalica***

    V.jugularis interna (absent in horse)

- V.subclavia

The vessels open the v.cava cranialis;

V.thoracica interna, V.cervicalis profunda,

V.costocervicalis, V.vertebralis,

V.azygos dextra (eq., car.)

# V.cava caudalis

- V.iliaca communis dextra et sinistra

  * V.iliaca externa

    V.saphena lateralis (parva)

    V.saphena medialis (magna)

  * V.iliaca interna

The vessels open v.cava caudalis;

V.testicularis – V.ovarica

V.adrenalis, V.renalis,

Vv.hepaticae, Vv.lumbales,

V.phrenica caudalis

# Portal circulation

- One of the functions of the liver is regulation of the blood components according to body needs. It works like a strainer.
- So the venous blood of the un-paired organs in the abdominal cavity those are functionally related with the liver are unit by portal vein and enters the liver.
- The final common pathway for transport of venous blood from spleen, pancreas, gallbladder and the abdominal portion of the gastrointestinal tract is through the hepatic portal vein.
- After the blood components are regulated by liver, it opens to caudal v.cava via hepatic veins.

# Anastomoses ?

- An anastomosis (plural anastomoses) is a connection between normally divergent blood vessels.
- Between vertebral arteries
- Between cranial and caudal epigastric arteries
- Forming the Circle of Willis etc...

**ARTERIOVENOUS ANASTOMOSES?**

- Direct connections between small arteries and veins exist in many parts of the body where they are used to short-circuit the capillary bed. They are concerned with temperature regulation. To this end, they are plentiful in the exposed appendages of the body: the digits, external ears, and nose.

Coto

# Baroreceptors ?

- Baroreceptors are sensors located in the blood vessels. They sense the blood pressure and relay the information to the brain, so that a proper blood pressure can be maintained. The baroreceptors can identify the changes in the average blood pressure

- They are located in the carotid sinus (at the bifurcation of external and internal carotids) and in the aortic arch.

# Collateral branches of the heart ?

- The Heart has the ability to create Collateral Circulation, or new vessels that help to nourish the myocardium of the heart when a blockage, and/or a heart attack creates inadequate blood flow. It takes time for this Collateral Circulation to form, and it may or may not fully meet the needs of the myocardium for oxygen. This Collateral Circulation can usually be seen in the film taken of the Coronary Arteries during Coronary Angiography.