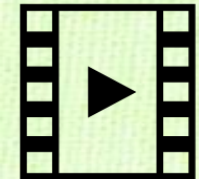




Fetal circulation



Fetal circulation
before birth



Fetal circulation
after birth



Fetal circulation



Correction file



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LECTURE OBJECTIVES :

Were not given



Fetal Cardiovascular system is designed:

before birth in
intrauterine life

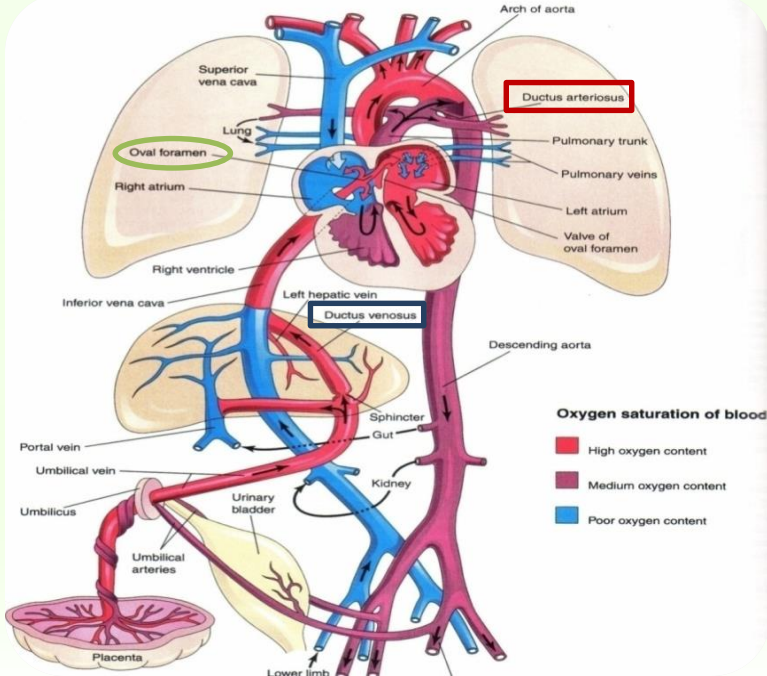
1- To serve prenatal needs

at birth

2- To permit modifications at birth, which
establish the neonatal circulation

Important

Good respiration in
the newborn infant
is dependent upon
normal circulatory
changes at birth
(well functioning
CVS)



Three structures are very important in
the transitional circulation:

- 1- Ductus venosus.
- 2- Ductus arteriosus.
- 3- Foramen ovale.



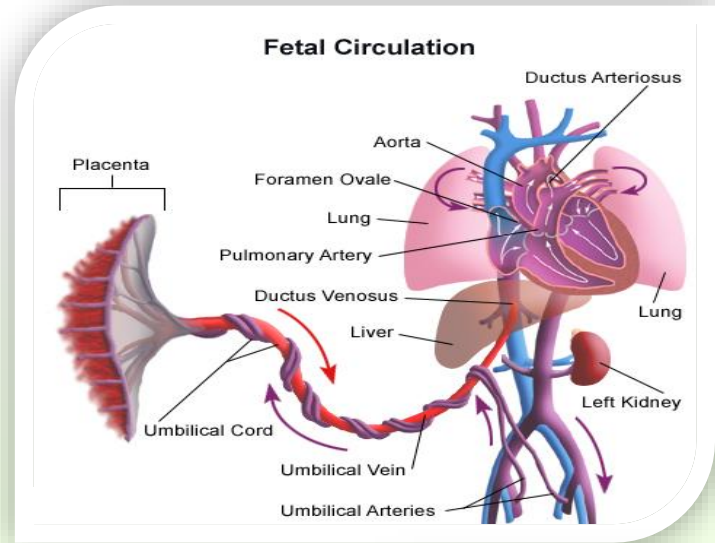
Blood can reach & leave the fetus through the **umbilical cord** that contains:

two umbilical
arteries

Carries deoxygenated
blood from the fetus to
the placenta

one umbilical
vein

Carries oxygenated
blood from the placenta to the fetus



So ,How It Works ?

Highly oxygenated blood passes from the placenta through the **umbilical vein**.



1/2

Half go through **ductus venosus**
to reach **directly** the

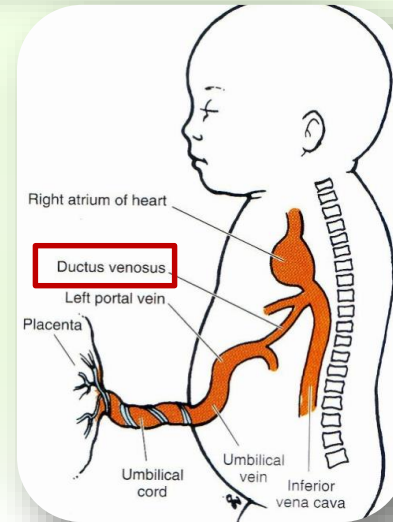


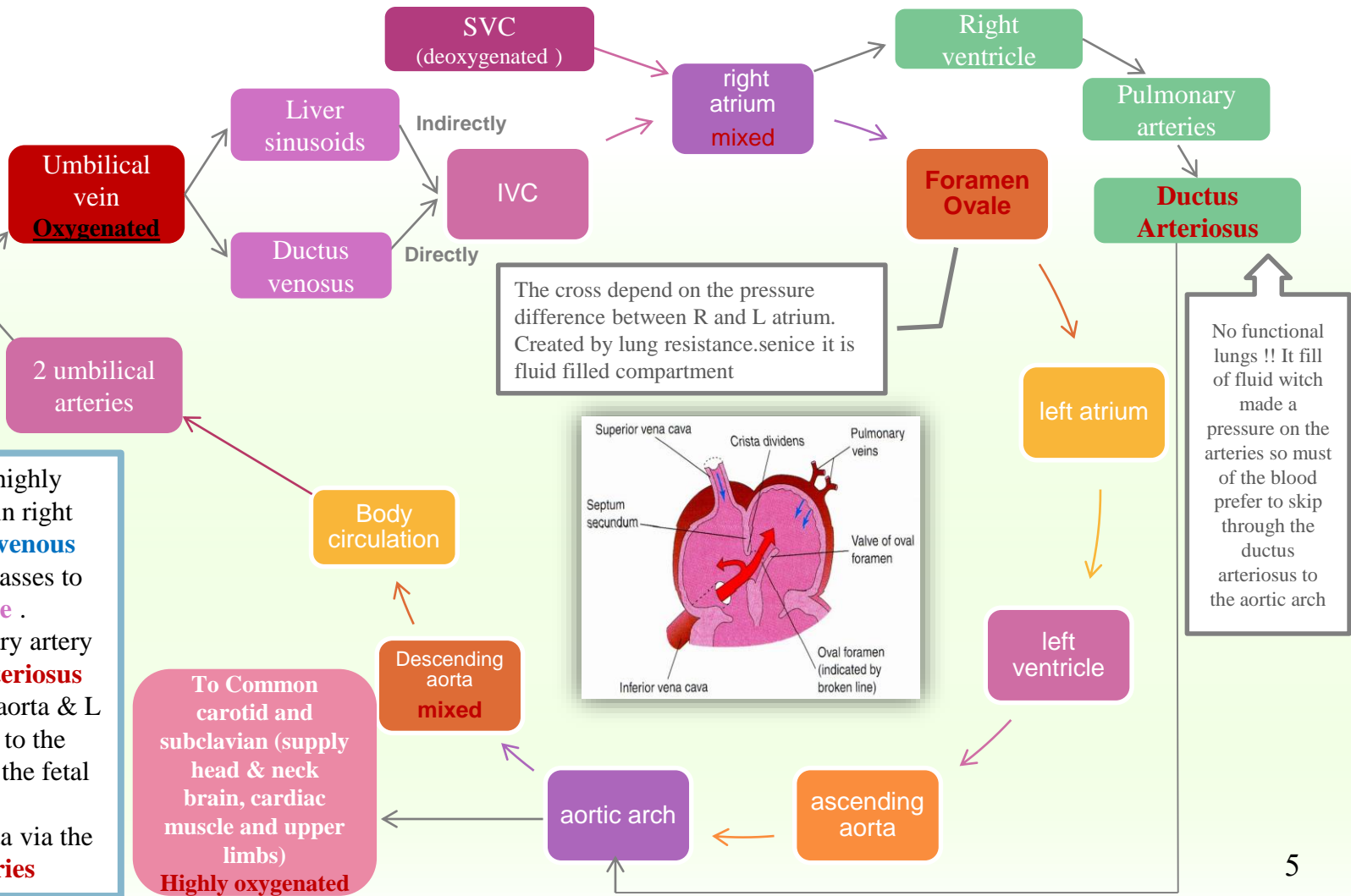
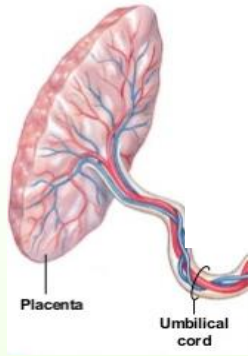
IVC



1/2

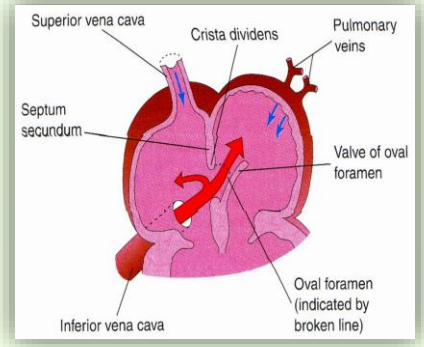
Half passes to **liver sinusoids**
then **indirectly** reach the





Small amount of highly oxygenated blood in right atrium mixes with **venous blood** of the **SVC** passes to **right ventricle**. Then to the pulmonary artery then to **Ductus Arteriosus** (between the arch of aorta & L pulmonary artery) to the descending aorta, to the fetal body. Then back to placenta via the **umbilical arteries**

The cross depend on the pressure difference between R and L atrium. Created by lung resistance. since it is fluid filled compartment



No functional lungs !! It fill of fluid witch made a pressure on the arteries so must of the blood prefer to skip through the ductus arteriosus to the aortic arch



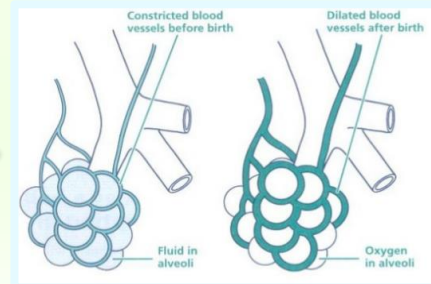
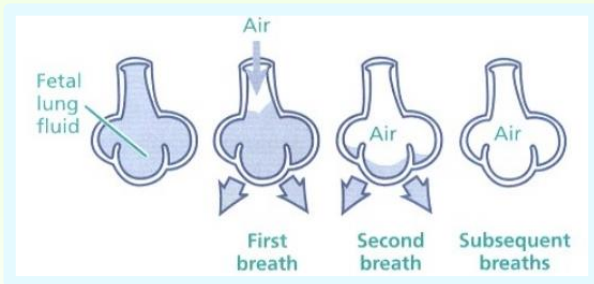
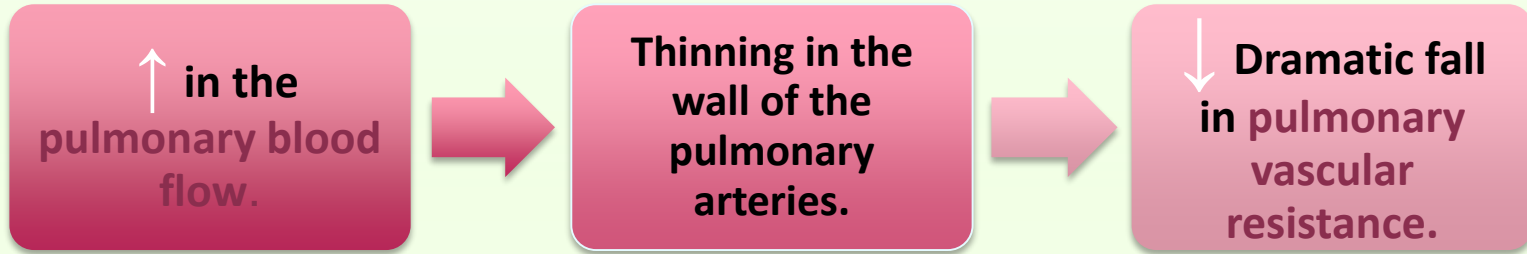
After Ligation of the umbilical cord

Sudden fall of blood pressure in the **IVC** and the **right Atrium**.

→ **The valve of the ductus venosus constricts.**



After Aeration of the lungs at birth





Changes After Birth

MINUTES

Closure of
**foramen
ovale**

Physiological
closure

Anatomical
closure.

DAYS

Constriction
of **ductus
arteriosus**

20% of the lumen
of the ductus is
closed → By the
end of the **first 24
hours**

82% of the duct is
closed → By the
end of **48 hours**

100% is closed →
By **96 hours**



substance released from fetal lungs during their initial inflation.



it has a **contractile** effect on smooth muscles of the ductus arteriosus.



but its action is dependant on the high **Oxygen** saturation of the aortic blood.



Bradykinin

So **hypoxia** and other ill-defined factors keep the ductus arteriosus patent.

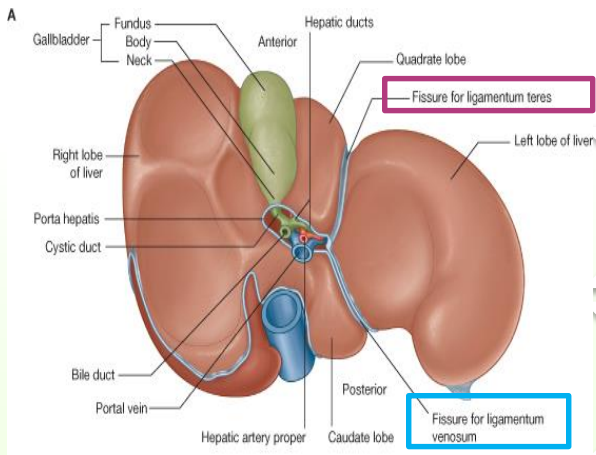
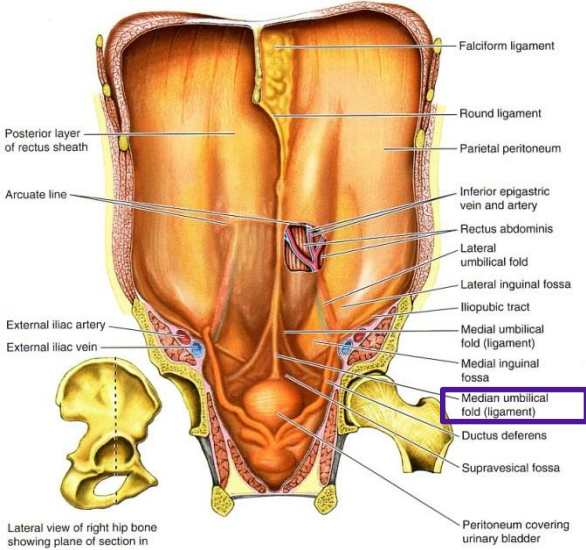


During intrauterine fetal life the patency of ductus arteriosus is controlled by the **low** contents of oxygen in the blood passing through it.



When oxygen tension reaches **50** mmHg in the ductus arteriosus > it causes constriction of its smooth muscles.

Adult derivatives of fetal vascular structures



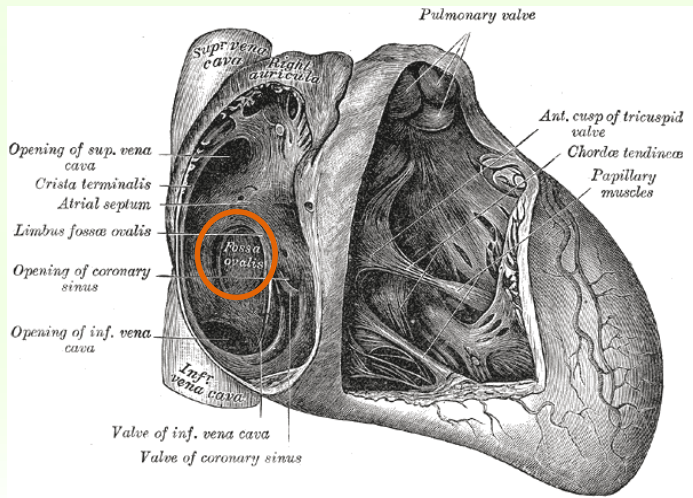
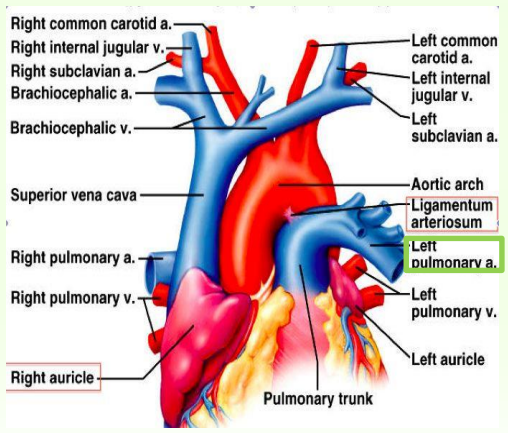
Umbilical vein → **Ligamentum teres.**

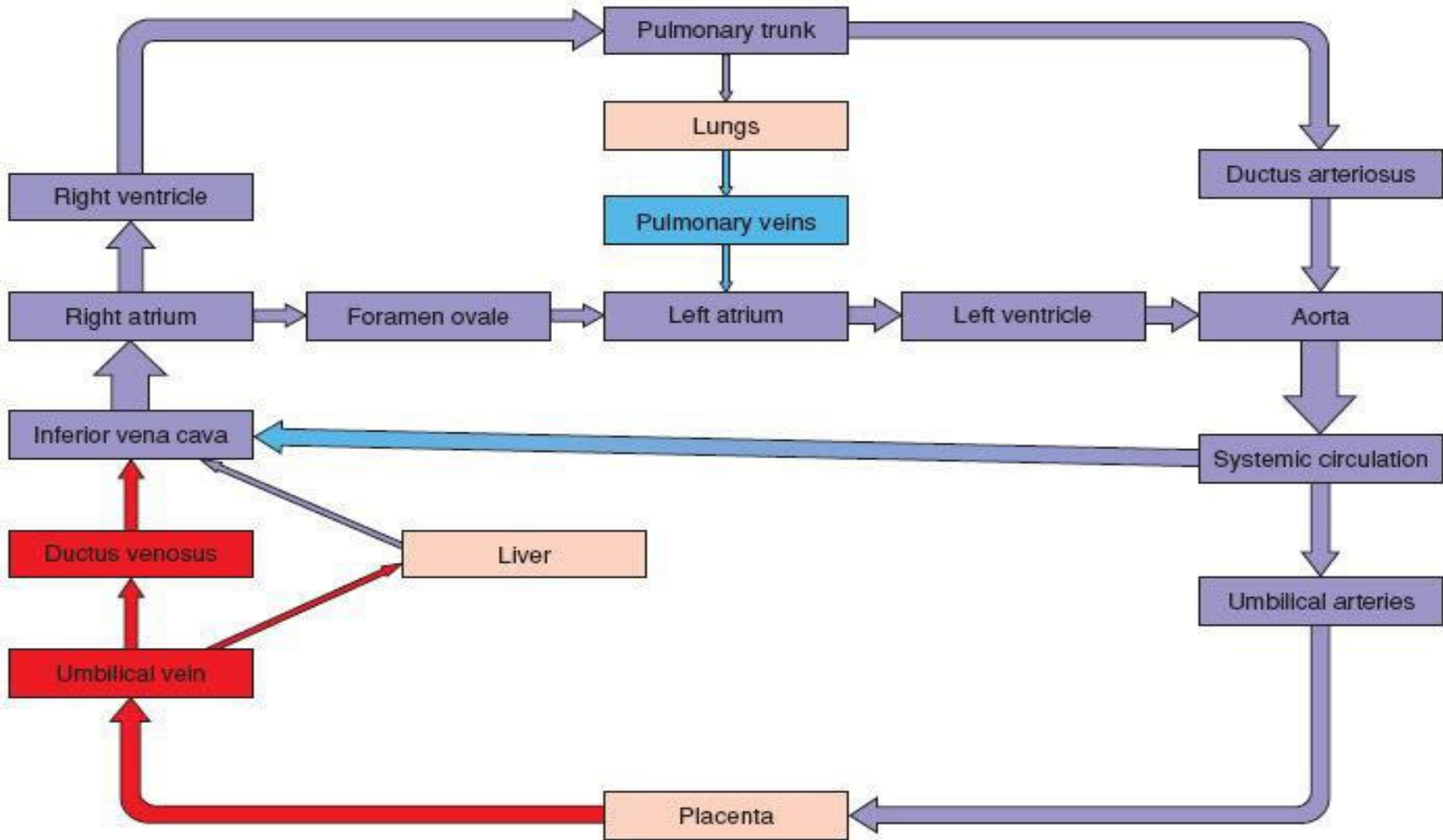
Umbilical arteries → **Medial umbilical ligaments.**

Ductus venosus → **Ligamentum venosum**

Ductus arteriosus → **Ligamentum arteriosum**

Foramen ovale → **fossa ovalis**





(c) Scheme of fetal circulation

Fetal circulation

Summary

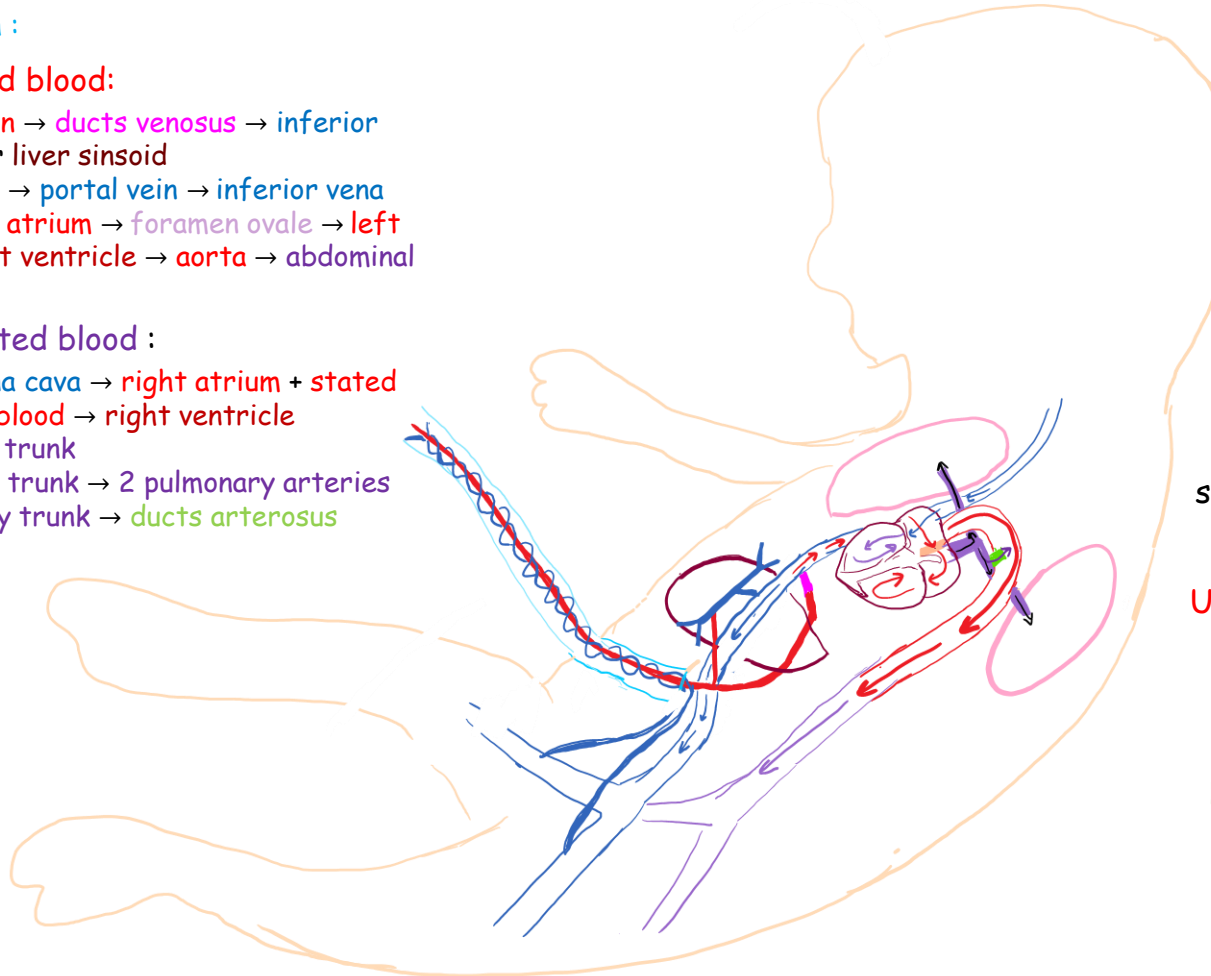
Before birth :

Oxygenated blood:

Umbilical vein → ducts venosus → inferior vena cava or liver sinusoid
liver sinusoid → portal vein → inferior vena cava → right atrium → foramen ovale → left atrium → left ventricle → aorta → abdominal aorta.

Deoxygenated blood :

Superior vena cava → right atrium + stated oxygenated blood → right ventricle
→ pulmonary trunk
1- pulmonary trunk → 2 pulmonary arteries
2- pulmonary trunk → ducts arteriosus
→ aorta .



After birth:

Decrease blood in umbilical vein
→ 1st breath → increase blood pressure above 50 mmHg → lung secrete bradykinin → constriction of the ducts

Umbilical vein → Ligamentum teres.

Umbilical arteries → Medial umbilical ligaments.

Ductus venosus → Ligamentum venosum.

Ductus arteriosus → Ligamentum arteriosum

Foramen ovale → fossa ovalis.



1\ Blood reaches & leaves the fetus through the?

- A\ umbilical cord
- B\ Foramen Ovale
- C\ pulmonary arteries

2\ The umbilical cord Contains?

- A\ two arteries and two veins
- B\ one artery and two veins
- C\ two arteries and one vein

3\ Highly oxygenated blood passes from the placenta to the fetus through the?

- A\ umbilical artery
- B\ umbilical vein
- C\ Ductus Arteriosus

4\ Which one of the following is a substance that is released from fetal lungs during their initial inflation and has a contractile effect on smooth muscles of the ductus arteriosus?

- A\ prostacyclin
- B\ Bradykinin
- C\ none of them

5\ Adult derivative of Umbilical vein is?

- A\ Medial umbilical ligaments
- B\ Ductus venosus
- C\ Ligamentum teres.

6\ When oxygen tension reaches in the ductus arteriosus it causes constriction of its smooth muscles

- A\ 50 mmHg
- B\ 150 mmHg
- C\ 70 mmHg

- 1\ A
- 2\ C
- 3\ B
- 4\ B
- 5\ C
- 6\ A



Done by:

- Amal Aseeri
- Rana Al junaidl
- Futoon ALMutairi
- Hadeel Alsulami



Thank you for checking our team
For any questions or suggestions please email us:
embryology434@gmail.com