

Ram Balak Mahto
Guest faculty
Zoology department
V.S.J College Rajnagar Madhubani
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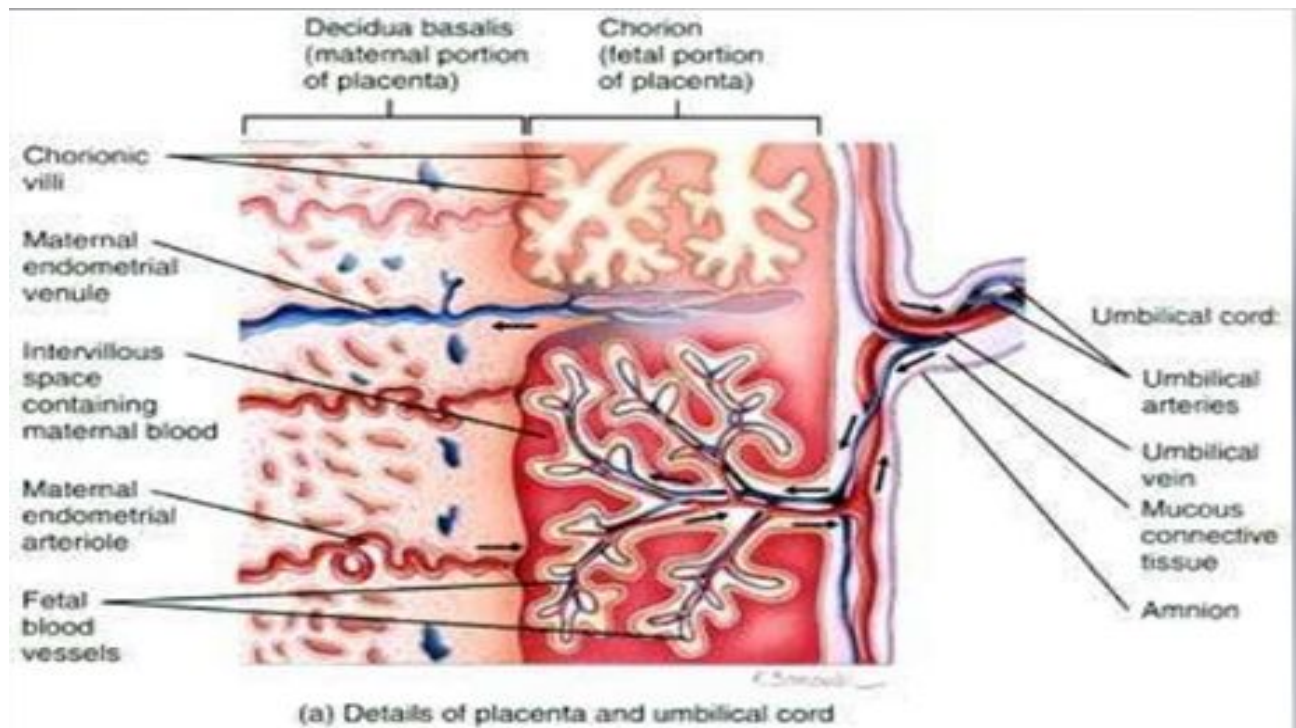
PLACENTAL STRUCTURE AND FUNCTIONS

The term placenta was derived from Greek word it means flat cake. Placenta is not common to all mammals. It is developed well in Eutheria (the embryo develops in the uterus of mother). The term placenta applies to any type of organ developed from the maternal and foetal tissues jointly and which serves for the transport of nutrients from the mother to embryo. Placenta is a special connective tissue, which contains the uterus of mother and foetal membranes of foetus.

Based on the point of origin of placenta, there are two parts: foetal placenta furnished by the extraembryonic membranes and maternal placenta developed from the endometrium.

Fetal membranes

These are the membranes that develop outside the embryo but in close association with it and they carry out certain specific functions. In human beings foetal membranes are amnion, chorion, yolk sac and allantois.



1. Amnion:

This is formed above the embryo. This consists of a cavity (amniotic cavity) and encloses a fluid called amniotic fluid. The embryo is suspended into the amniotic cavity by the umbilical cord. The amniotic fluid provides a shock absorbing effect to the embryo against bumps infections etc. The watery fluid around the embryo helps in maintaining constant temperature and pressure and protects the embryo in case the mother has a fall.

2. Chorion:

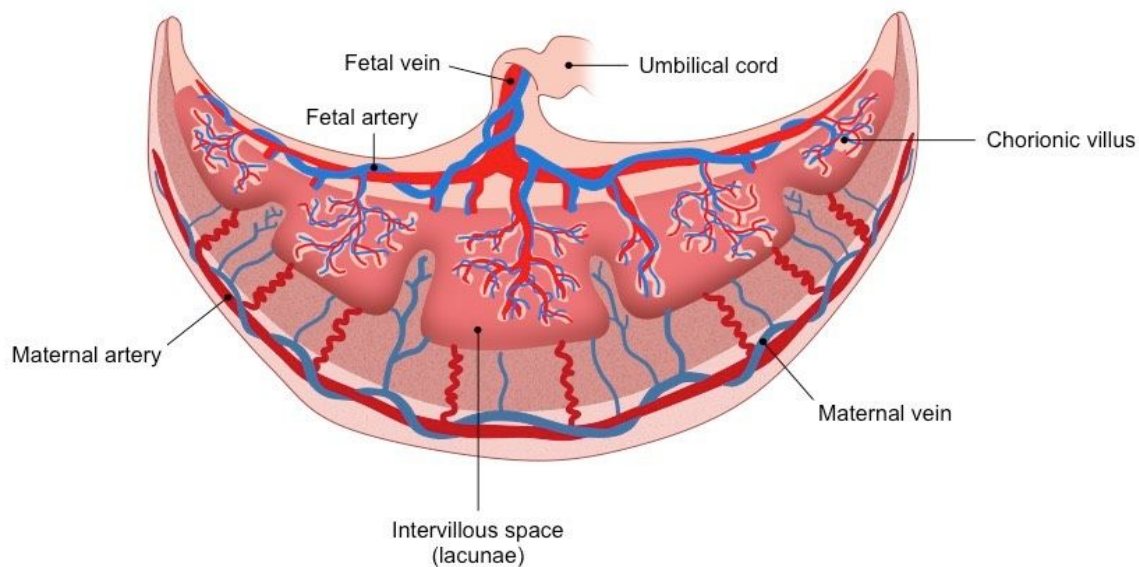
The chorion completely surrounds the embryo and has small projections all around it during early stages of development. The chorion is composed of trophoblast on the outside and mesoderm on the inside. Chorion protects the embryo and forms placenta for metabolic exchange between the mother and the foetus.

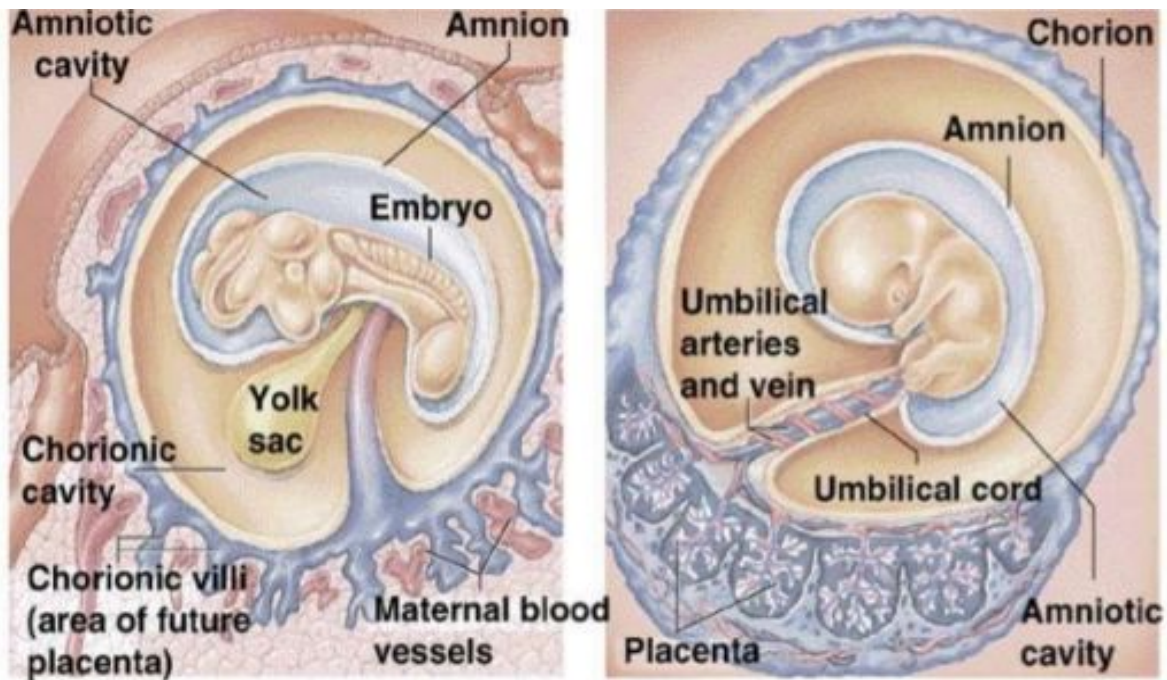
3. Yolk sac:

This is formed below the embryo. In human beings this contains a fluid but no yolk. It is vestigial organ. Its wall is made up of trophoblast and endoderm. The yolk sac functions as the region of formation of blood cells upto about 6th week of development when the liver of the foetus takes up this function.

4. Allantois:

This is a small bag like structure that develops from the gut of the embryo and near the yolk sac. This membrane develops around the third week of development. Gradually the allantois shrinks in size and gets enclosed in the umbilical cord. Allantois helps in the formation of umbilical arteries and veins. The allantois also forms blood cells.





Functions of placenta:

- Transfer of nutrient and waste product
- Enzymatic function
- Barrier function
- Immunological function
- Storage
- Endocrine function

- Transfer of nutrient and waste product;

Transfer of nutrients and waste products between mother and fetus. It works as an excretory organ of foetus. It releases the nitrogenous waste materials into mother blood. Placenta allows the diffusion of monosaccharides, amino acids, hormones, vitamins, oxygen, carbon dioxide, water and other waste materials, because of this it supplies food, oxygen to foetus. The mechanisms involved in the transfer of substances across the placenta are:

- **Simple diffusion**
- **Facilitated diffusion (Carrier mediated)**
- **Active transport (Against concentration gradient)**
- **Endocytosis**
- **Exocytosis**
- **Leakage**

➤ **Enzymatic function:**

Diamine oxidase which inactivates the circulatory amines.

Oxytocinase which neutralizes the oxytocin.

Phospholipase A₂ which synthesizes arachidonic acid etc.

➤ **Barrier function**

Fetal membrane has long been considered as a protective barrier to the fetus against noxious agents circulating in the maternal blood.

In general, substances of higher molecular weight than 500 daltons can not cross it, but there are some exceptions, Antibodies and antigen can cross the placental barrier in both directions by process of endo and exo cytotaxis. **Only IgG (Not IgA & IgM)** antibodies and antigen can cross the placental barrier. Large size drug like insulin, heparin are transferred minimally. It is facilitated by pinocytosis. The rate of drug transfer in late pregnancy is increased. Maternal viral, bacterial/protozoa infections can reach to fetus by crossing placenta barrier. Similar any drug taken by women during pregnancy can cross the placenta barrier in variable concentration and may have deleterious effect on fetus.

➤ **Immunological function**

The placenta is an imperfect immune barrier between mother and fetus. The placenta performs an important function by transferring **maternal IgG to fetus** and filter out potentially harmful cytotoxic antibodies. However, autoantibodies may, in rare circumstances, cause passively acquired fetal autoimmune disease.

➤ **Storage**

The placenta store glycogen, fat etc

➤ **Endocrine function**

The placenta is a hugely important endocrine organ, producing many hormones which affect the status of pregnancy and the maternal physiology. Produced towards the end of pregnancy in increasing amounts to allow for parturition. Causes luteolysis and promote uterine contractions

Placental hormone;

Human chorionic gonadotropin (hCG): Maintain CL of pregnancy. Stimulates secretion of testosterone by developing testes in XY embryo.

Estrogen: stimulate growth of myometrium, increasing uterine strength for parturition. Helps prepare mammary glands for lactation.

Progesterone: Suppress uterine contraction to provide a quiet environment for fetus. Promote formation of cervical mucus plug to prevent uterine contraction. Helps prepare mammary glands for lactation.

Placenta in Eutheria:

In Eutherian mammals true allantoic placenta is seen. Allantoic becomes big and comes in contact with chorion. This part will show close association with uterine wall. This connection is called placental connection. The structure of placenta⁴ will vary in different orders of Eutheria.

