

Veterinary Anatomy
(Unit – 8)

Topic

EMBRYOLOGICAL DEVELOPMENT OF PLACENTA AND PLACENTAL BARRIERS

by

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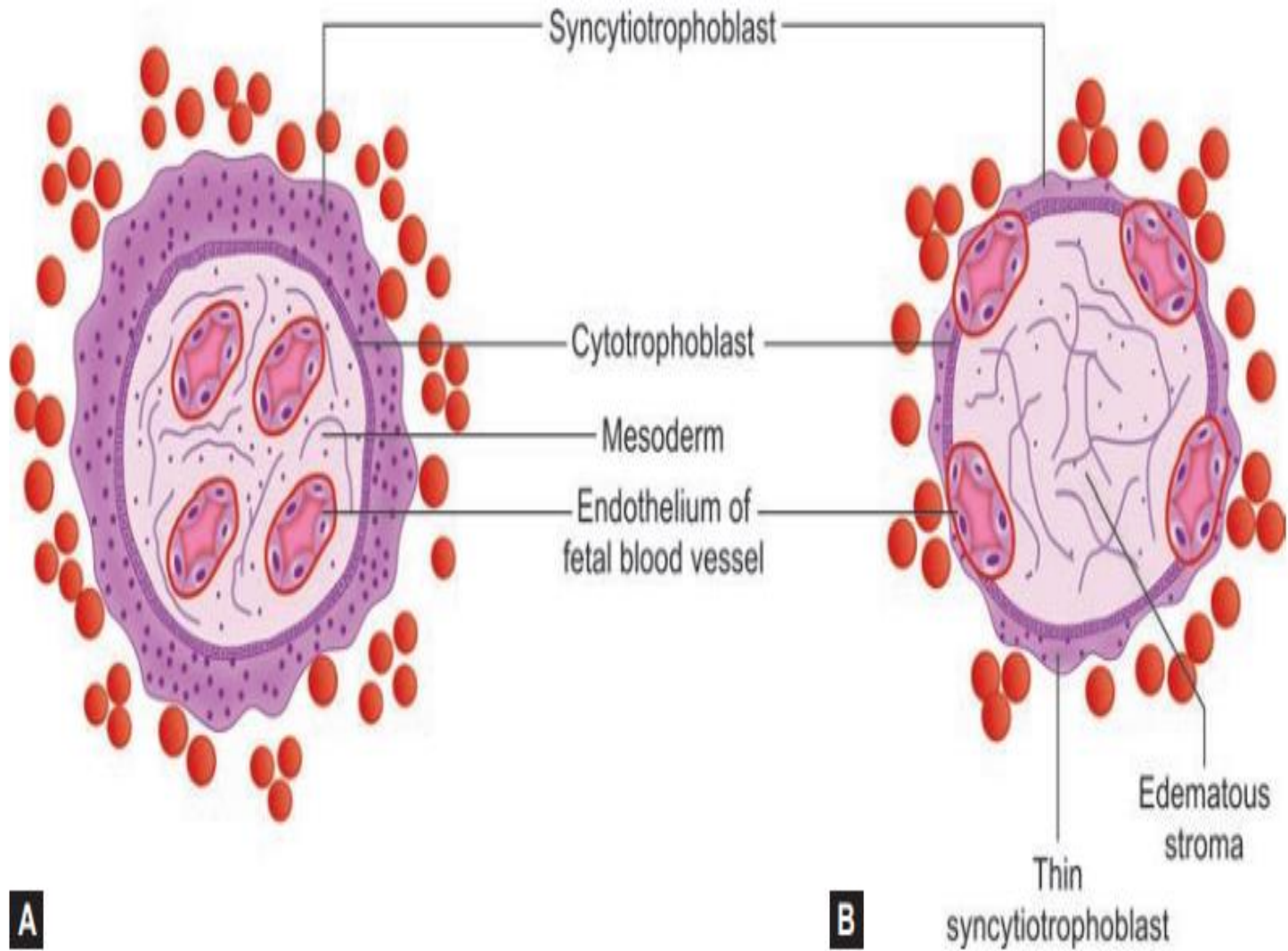
Placental Membrane/Barrier

❑ In the placenta, maternal blood circulates through the intervillous space and fetal blood circulates through blood vessels in the villi. Though the maternal and fetal bloods are flowing side by side and in opposite directions they do not mix with each other. They are separated by a membrane, made up of the layers of the wall of the villus.

❑ Tissues intervening between fetal blood in chorionic villi and maternal blood in intervillous space constitute the placental membrane or barrier. All interchanges of oxygen, nutrition and waste products take place through this membrane.

The constituent structures forming the placental barrier or maternal fetal barrier extending from the maternal erythrocyte to fetal erythrocyte are as follows:

- In the early part of pregnancy, the barrier presents the following layers**
- Endothelium of fetal blood vessels, and its basement membrane**
- Surrounding mesoderm Cytotrophoblast and its basmembrane and Syncytiotrophoblast.**



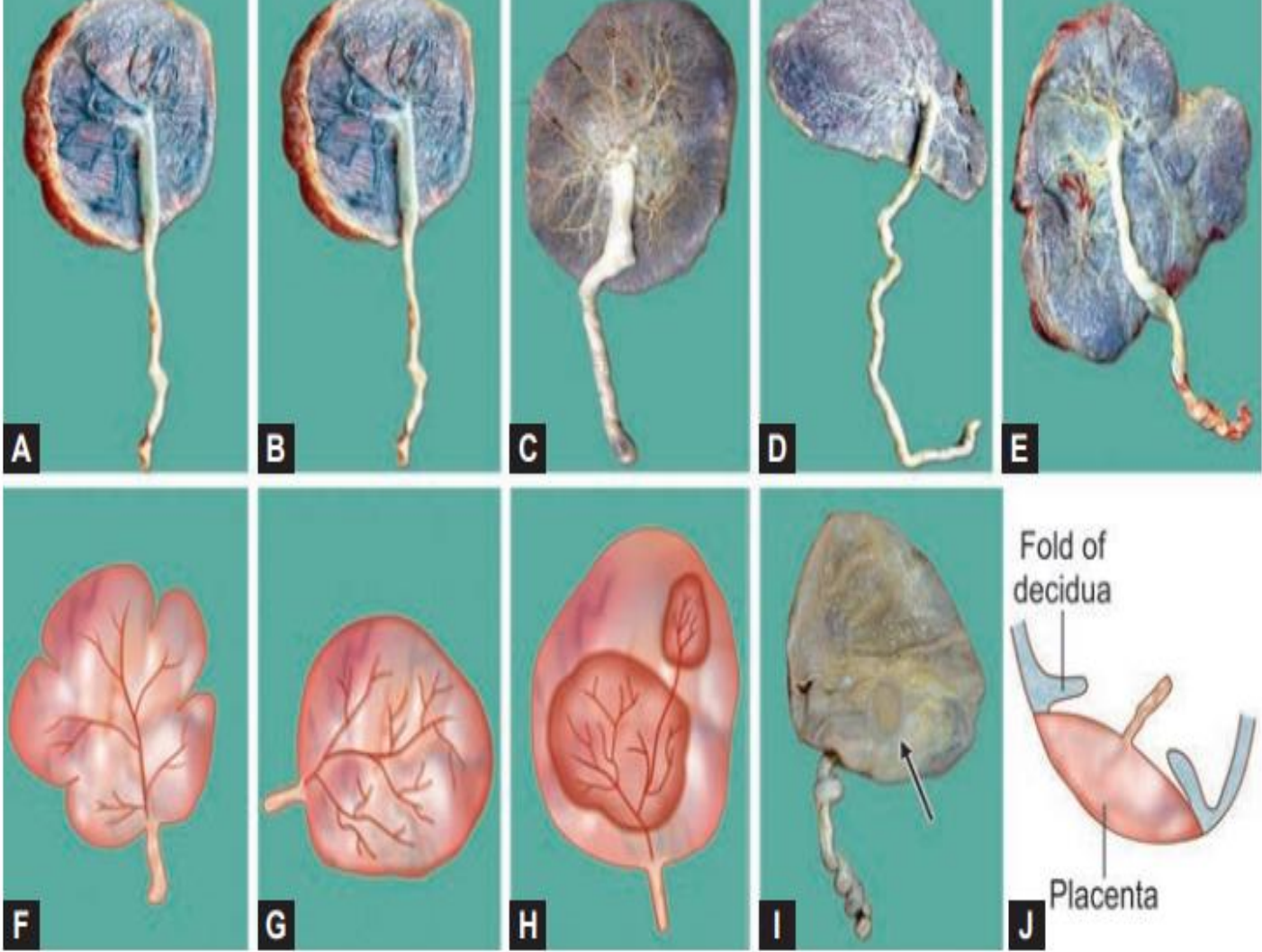
Classification of Placenta

1. Based on shape

- Discoid**—round or disc like
- Bidiscoidal**—it consists of two discs
- Triangular**
- Lobed**—it divides into lobes
- Diffuse/placenta membranacea** — chorionic villi persists all-round the blastocyst
- Placenta succenturiata** —a small part of the placenta is separated from the rest of it
- Fenestrated** —presence of hole or opening in the placenta
- Circumvallate** —when peripheral edge of placenta is covered by a circular fold of decidua, it is called circumvallate.

2. According to attachment of umbilical cord

- Normal**—Central insertion
- Paracentral insertion of umbilical cord** – **Marginal or battledore placenta** —Cord is attached to the margin of placenta
- Velamentous** —Umbilical cord is attached to the fetal membrane close to the peripheral margin of placenta.





FETAL/EXTRAEMBRYONIC MEMBRANES

Definition: Tissues or structures that develop from the zygote but do not form part of embryo proper.

Structures that constitute the fetal membranes are:

- Trophoblast and chorion forming placenta
- Amnion or ectodermal vesicle covering the embryo or fetus and filled with amniotic fluid
- Yolk sac—Primary, secondary, tertiary
- Allantois or allantoenteric diverticulum
- Connecting or body stalk and umbilical cord

Functions:

- Protection—Amniotic membrane and fluid
- Respiration—Placenta
- Excretion
- Nutrition—Amniotic fluid, placenta, umbilical cord
- Clinical importance:** They are essential for performing prenatal diagnostic procedures like chorionic villus biopsy and amniocentesis.

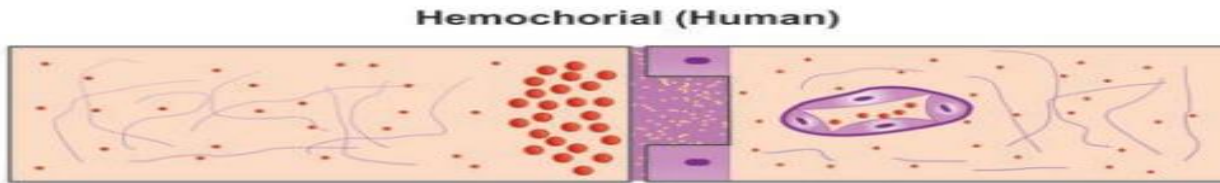
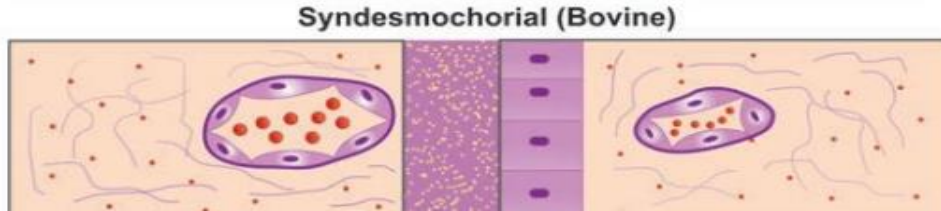
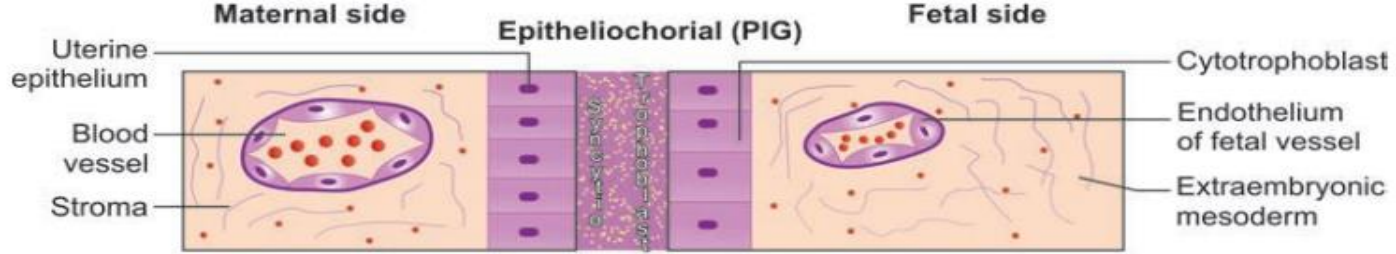


TABLE 6.2: Types of placenta based on tissues contributing for placental barrier

| <i>Type</i> | <i>Maternal component</i> | <i>Fetal component</i> | <i>Example</i> |
|-------------------|---------------------------------------|------------------------------------|----------------|
| Epitheliochorial | Endometrial epithelium | Chorion | Pig |
| Syndesmochorial | Endometrial stroma | Chorion | Bovine |
| Endotheliochorial | Endothelium of maternal blood vessels | Chorion | Dog |
| Hemochorial | Maternal blood in intervillous space | Chorion | Human |
| Hemoendothelial | Maternal blood in intervillous space | Endothelium of fetal blood vessels | Rabbit |

MULTIPLE BIRTHS AND TWINNING

Multiple births: If more than one fetus is carried to term in a single pregnancy. When a mother gives birth to two infants at the same time, they are called twins. Three (triplets), four (quadruplets) or even more infants are sometimes born simultaneously.

Types of twinning: Twins can be produced in two ways

□ **Dizygotic twins:** Two ova may be shed simultaneously from the ovary. Each of them may be fertilized and may develop in the usual manner. This results in twins that are called dizygotic or fraternal twins. As each of them develops from a separate ovum, they have independent genetic constitutions. These twins, therefore, need not be of the same sex, nor do they resemble each other any more than children of the same parents that are born separately. Each fetus has its own chorionic and amniotic sacs (bichorial, diamniotic). Dizygotic twinning is more common in human beings than monozygotic twinning

□ **Monozygotic twins:** Twins can also arise from a single fertilized ovum. These are called monozygotic or maternal twins. The genetic constitution of the two twins is exactly the same. Hence they are of the same sex. They are also exactly alike in appearance.

| <i>Feature</i> | <i>Monozygotic twins</i> | <i>Dizygotic twins</i> |
|----------------------------------|--|-------------------------------------|
| No. of ova fertilized | Fertilization of a single ovum | Fertilization of two separate ova |
| Incidence | More common | Less common |
| Sex of embryos/fetuses | Similar sex | Same or different sexes |
| Appearance | Identical in every way including the HLA genes | Unlike/fraternal twins |
| Genetic constitution | Identical genetic constitution | Genetically dissimilar |
| No. of amnion, chorion, placenta | Majority diamniotic, monochorionic | Two amnions, chorions and placentae |

THANKS