

PLACENTA IN MAMMALS

The word placenta has been derived from ~~from~~ a greek word which means flat cake. It is formed by the union of maternal and foetal tissue to serve the function of transport of nutrient and gases between the embryo and endometrium of mother (Massman 1937, Thompson 1944 and Nelson 1952).

Development of Placenta :

The placenta developed from the extra embryonic membranes (chorion, allantois and yolk sac) plays an important role in the development of placenta. The placenta formed as a result of combination of chorion and allantois is called allantoic placenta. In some mammals (marsupials) the placenta is developed by the combination of chorion and yolk sac and is known as yolk sac placenta.

Yolk Sac Placenta :

In most of the marsupials - Diadelphys, Macropus, the blastocyst develops as an allantois and a large yolk sac with a vascular network. The yolk sac is so large that it make contact with the chorion. The chorion forms small folds on its outer surface where it comes in contact with the uterine wall. These wrinkle folds to hold the blastocyst to the uterine wall and they prevent the premature exit of the blastocyst. This form a placenta called yolk sac or chorionic or chorion-vitelline placenta.

Allantoic placenta :

The placenta starts its development with the formation of primary trophoblastic villi, composed of extra embryonic ectoderm. These are functionally replaced by secondary or chorionic villi, which develop from the somatopleure in the trophoblastic ectoderm and somatic mesoderm. The trophoblast of chorion in contact with the uterine wall becomes thick and a syncytiotrophoblast is formed. This tissue actively grows into countless finger-like projection the villi which penetrate the uterine wall into the corresponding crypte

The deeper layer of trophoblast retain cell boundaries and are called cytotrophoblast.

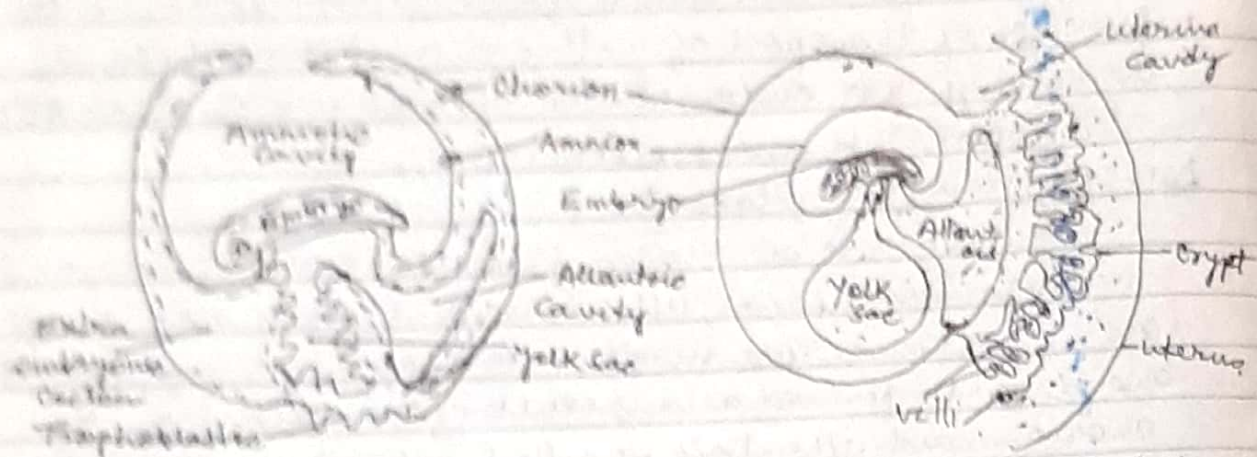


Fig. Formation of yolk sac placenta

Fig. Formation of Allanto-chorion placenta

Meanwhile some part of allantois intimately unites with the chorion to form a allanto chorion placenta and sends out its tissue into chorionic villi so as to form placenta. This is called allantoic, or chorio-allantoic placenta.

CLASSIFICATION OF PLACENTA :-

The allantoic placenta has been classified variously depending on various basis.

(I) Classification of placenta based on distribution of villi:

It may be of three types (1) Deciduate (2) Non-deciduate (3) Contra deciduate.

(1) Deciduate: In this type of placenta the union between uterine and foetal membranes is very intimate. The result of this intimacy is that at the time of birth much of the superficial layer is eliminated and hence there is a definite loss of maternal tissue.

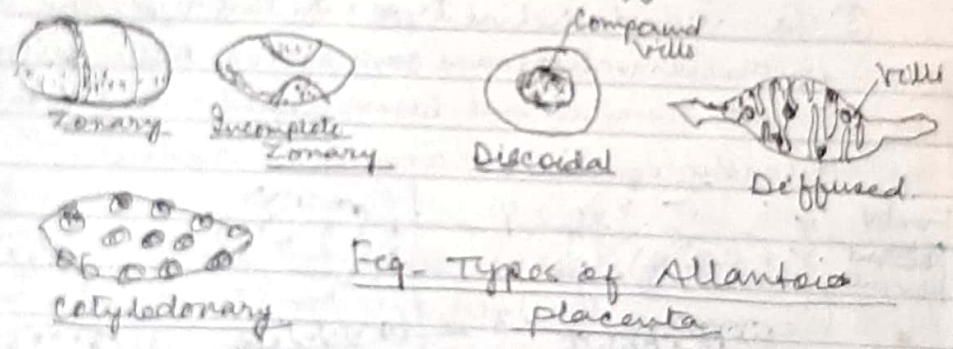
This type of placenta is of three types -

- (i) Zonary: Here the blastocyst are elongated and the villi are arranged to an annular zone on the chorion. Ex - Lion, cat, Elephant.
- (ii) Discoidal placenta: when the placenta is restricted to a discoidal area. Ex - Bat, Rabbit, Apes, man.

- (2) Metadiscoidal - The chorionic villi are restricted to a circular disk on the ventral surface of foetus Ex Man, Pig.
- (3) Non-deciduate -

There is very intimate connection between the allantois and maternal or uterine tissue. Also it is also of three types:

- (a) Diffuse: In this type, the chorionic villi are uniformly distributed all over the surface except at the extreme end of blastocyst Ex Horse, Pig, Camel etc.
- (b) Cotyledonary: Here the villi occurs over the elongated blastocyst in tufts or branches, hence called cotyledonary eg. Cow, sheep.
- (c) Intermediate type: In this type the cotyledonary type of placenta are present and between them occurs the villi. It is very rare type, eg Giraffe.



- (3) Contra-deciduate: In this type of placenta there is no loss of maternal tissue but the foetal placenta with the distal portions of allantois remains in uterus Ex Talpa, Bandicoot.

II) Histological Classification of placenta:

Otto Grosser (1909) gave the classification of placenta which is based on the number of layer intervening the maternal and foetal blood. It is

In most primitive form there are 6 layers to check the flow of nutritive material. Out of six layers three are foetal and remaining three are maternal. All the six layers are as follows -

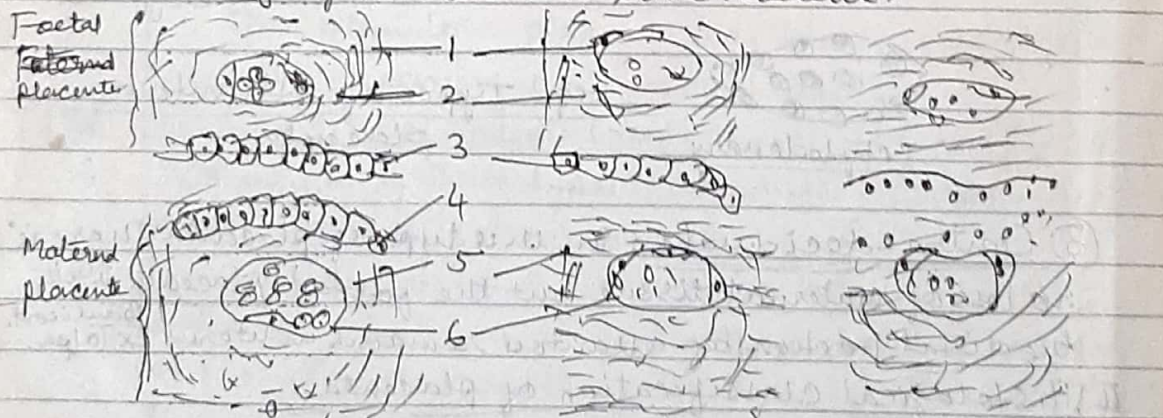
- 1) Foetal membrane - i) Chorion epithelium (ii) Chorion connective tissue (iii) Chorion blood capillaries

Maternal membrane: i) uterine epithelium

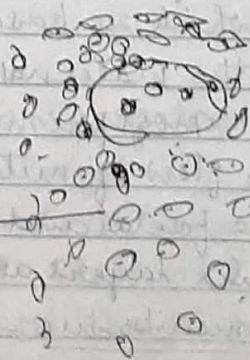
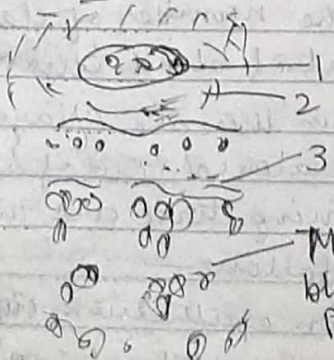
ii) uterine connective iii) uterine blood vessels

On the basis of histology placenta are recognized of following types:

- 1) Epithelio-chorial type: In this type, when the epithelium of uterus is in apposition with the chorion. Ex: Pig.
- 2) Syndesmochorial type: when the epithelium of the uterus disappears and the chorion establishes a direct contact with the endometrium. eg. Sheep
- 3) Endothelio-chorial type: when the chorion come in direct contact with the blood capillaries of ^{the} endometrium. Ex: Dog
- 4) Haemo-chorial type: when the epithelium, endometrium and the endothelial wall of the capillaries disappear and the ^{villi} ~~ant~~ is directly bathed in the maternal blood. Ex: Man and primates
- 5) Haemoendothelial type: In this type, the chorion epithelium, chorionic connective tissue being eroded so that the maternal blood bathed into fetal capillaries directly. eg. Rabbit and some rodent.



(A) Epitheliochorial (B) Syndesmochorial (C) Endotheliochorion



1. epithelium of blood vessel
2. chorion connective tissue
3. chorion epithelium
4. uterine epithelium
5. Endometrial connective tissue
6. Endothelium of maternal blood vessel

(D) Haemochorial

(E) Haemoendothelial

Fig - Different types of placenta