

Fetal membranes

Placentae may be classified according to the way the **villi** are distributed on the fetal chorion. Thus, where they are uniformly dispersed, as in the mare and sow, the placenta is said to be *diffuse*. Where they are grouped into multiple circumscribed areas, as in the ruminant, the placental arrangement is called *cotyledonary*, while in the bitch and cat the villi are disposed in the form of a broad encircling belt forming a *zonary* placenta, *discoid* in man.

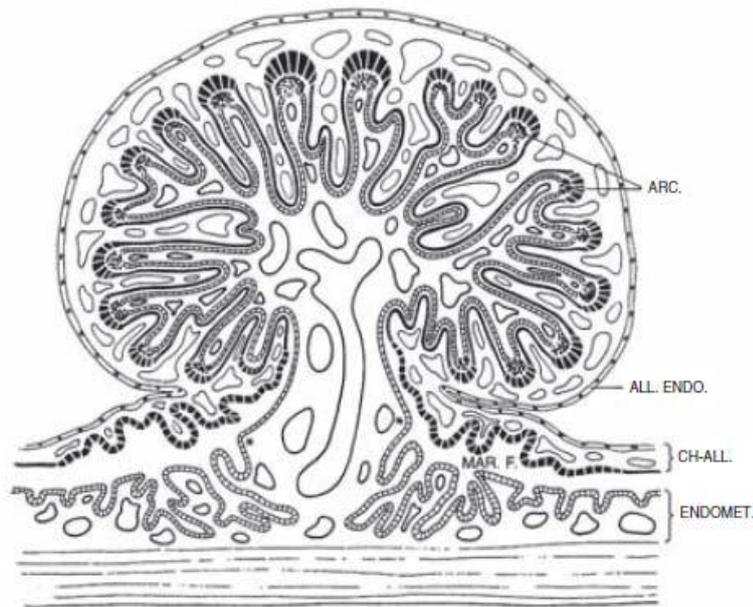
Classification Based on:

1- Placental Shape:

Diffuse Placenta: attachment is continuous throughout the entire surface of the endometrium. Examples of the diffuse placenta can be observed in the pig and horse in swine, the placenta is completely non-invasive. The chorionic villi are not localized to a particular region but are instead distributed nearly over the entire surface of the uterine luminal epithelium. The closely packed and convoluted chorionic villi yield an extensive surface area to facilitate movement of diffusible molecules between the maternal and fetal circulations and participate in the uptake of nutritional secretions from uterine glands. The equine placenta, while still considered diffuse, is distinct from the sow placenta in that it possesses localized regions of contact known as *microcotyledons* and an invasive trophoblast population known as chorionic girdle cells that, upon migration into the uterine endometrium, can form transitory structures known as *endometrial cups*.

Cotyledonary Placenta: attach at mushroom-like structure throughout the endometrium. Fetal side is called cotyledons - maternal side is called caruncle. Ruminant ungulates possess a cotyledonary placenta. The cotyledons are

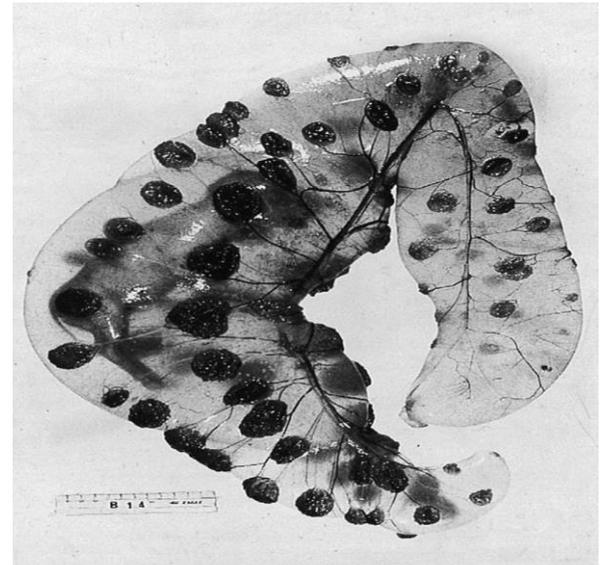
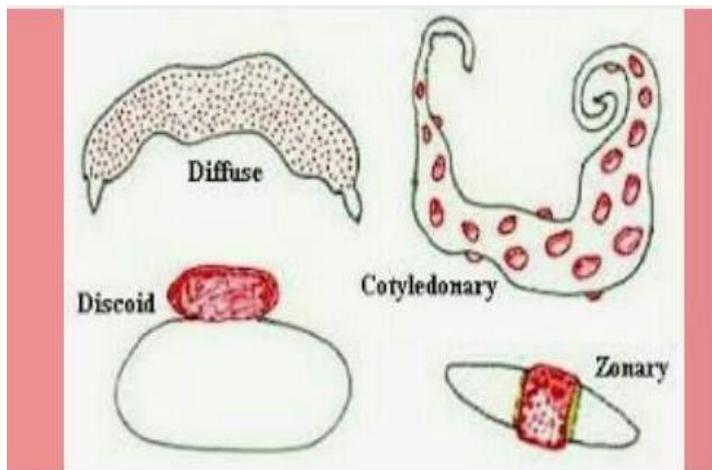
vascularized villous trophoblasts that intercalate into a glandular structure in the uterine endometrium known as caruncles. The fetal cotyledons begin to associate with maternal caruncles early in gestation and interdigitation of these tissues is well underway by day 35 in ewes and day 45 in cattle. Together, the combined unit of cotyledons and caruncles is referred to as a *placentome*.



Zonary Placenta: Numerous species, including carnivores, possess a zonary placenta. Girdle-like band, this type consists of a band of chorion surrounding the middle of the fetus. This zone of chorion forming the most intimate contact with the maternal uterus is the basis for the name of this placenta type.

Discoid Placenta: disk-shaped area, higher primates and rodents possess a placenta that is characterized by one or more distinct discs comprised of localized regions of fetal chorion that interface with uterine tissues, thus the descriptive name “discoid”.

2-Formerly, the placentae were differentiated according to whether or not maternal tissue separated off with the fetal tissue at birth. Thus, of the domestic mammals, **non-deciduate** the placentae of the woman, bitch and cat were said to be **deciduate**.



Summary of Species Differences in Placental Architecture

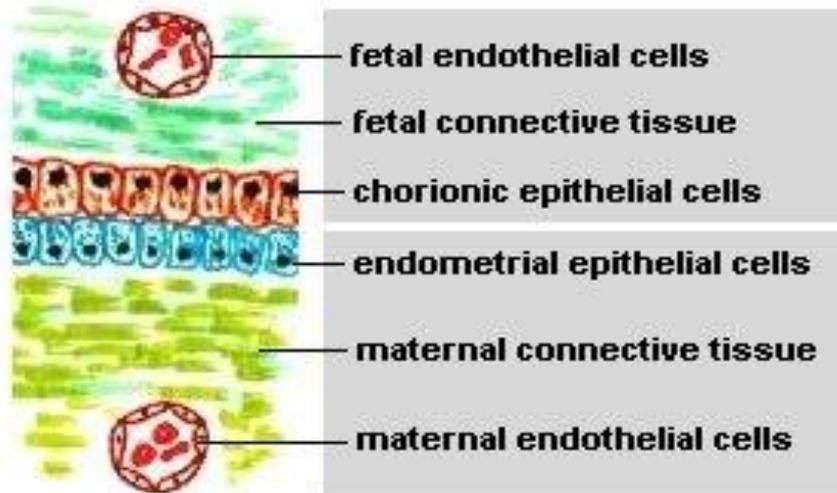
3- Classification Based on Layers between Fetal and Maternal Blood (histology):

Just prior to formation of the placenta, there are a total of six layers of tissue separating maternal and fetal blood. There are three layers of fetal extra embryonic membranes in the chorioallantoic placenta of all mammals, all of which are components of the mature placenta:

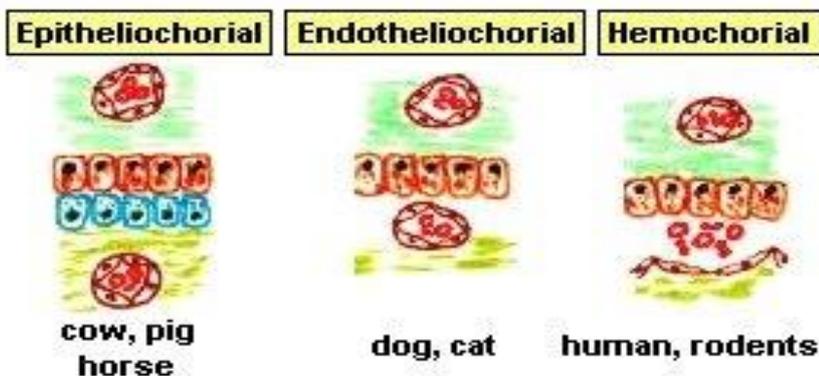
1. Endothelium lining allantoic capillaries
2. Connective tissue in the form of chorioallantoic mesoderm
3. Chorionic epithelium, the outermost layer of fetal membranes derived from trophoblast

There are also three layers on the maternal side, but the number of these layers which are retained - that is, not destroyed in the process of placentation - varies greatly among species. The three potential maternal layers in a placenta are:

1. Endothelium lining endometrial blood vessels
2. Connective tissue of the endometrium
3. Endometrial epithelial cells



| Type of Placenta | Maternal Layers Retained | | | Examples |
|-------------------|--------------------------|-------------------|---------------------|--|
| | Endometrial Epithelium | Connective Tissue | Uterine Endothelium | |
| Epitheliochorial | + | + | + | Horses, swine, ruminants |
| Endotheliochorial | - | - | + | Dogs, cats |
| Hemochorial | - | - | - | Humans, rodents |



| Type of Placenta | Common Examples |
|--------------------------------|--|
| Diffuse, epitheliochorial | Horses and pigs |
| Cotyledonary, epitheliochorial | Ruminants (cattle, sheep, goats, deer) |
| Zonary, endotheliochorial | Carnivores (dog, cat, ferret) |
| Discoid, hemochorial | Humans, apes, monkeys and rodents |

