

Carnivores

Gestation Period

In the bitch about 63 days (8.5 to 9 weeks). In the queen 56 to 59 days (8 weeks)

Placenta

Classified as being bi- and trilaminar vitelline (initially), choriovitelline (later), chorioallantoic (finally), deciduate, zonary and endothelio-chorial

Carnivores

A primary ovocyte is ovulated.

Ovulation in bitch – 2nd or 3rd day of estrus.

Ovulation is spontaneous. Ovulation in queen – 26 to 30 hours after coitus. Ovulation is induced.

Embryo remains in uterine tube for up to 12 days.

Blastocyst lemon-shaped, then ovoid, then expands laterally (not as dramatically as bovine and pig).

Carnivores

Ovulation from both ovaries. Blastocysts migrate within the uterus for 2 – 3 days.

Implantation occurs at about 2 weeks in dog and cat.

Each uterine horn contains an equal number of evenly-spaced blastocysts.

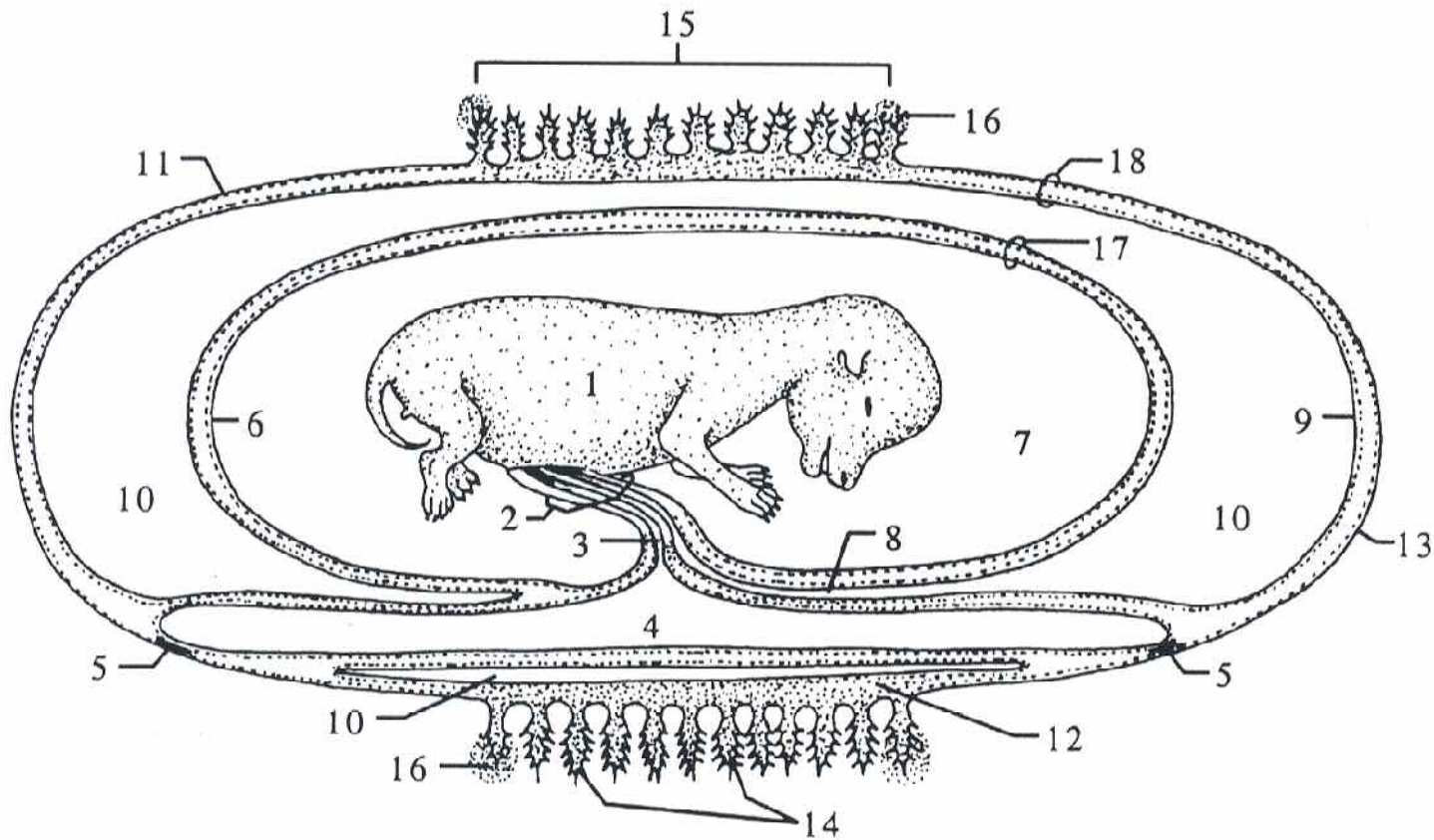
Embryonal disc faces antimesometrial wall. Vegetal pole lies against mesometrial wall. Here attachment takes place via simple trophoblastic villi.

Carnivore yolk sac

At implantation ventral part of yolk sac lies against trophoblast (bilaminar vitelline placenta) – changes into a trilaminar vitelline placenta. By day 21 vascularisation by vitelline circulation creates choriovitelline placenta.

Yolk sac loosened from chorion by growth of exocoelom (formation of somatic and splanchnic layers). Final loosening by day 25 when allantois occupies exocoelom.

NB! Most caudal and cranial points of yolk sac are not loosened. Performs a limited role in hematopoiesis and embryonal nutrition (vitelline circulation).



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|--------------------------|------------------------------|--------------------------|
| 1. Fetus | 7. Amniotic cavity | 13. <i>Chorion laeve</i> |
| 2. Umbilical cord | 8. Allantoic duct | 14. Chorionic villi |
| 3. Vitelline duct | 9. Allantois | 15. Zonary placenta |
| 4. Yolk sac | 10. Allantoic cavity | 16. Marginal hematoma |
| 5. Mesodermal attachment | 11. Chorion | 17. Allantoamnion |
| 6. Amnion | 12. <i>Chorion frondosum</i> | 18. Allantochochion |

Fig. 2.36 Canine conceptus: Longitudinal section showing fetal membranes (schematic)

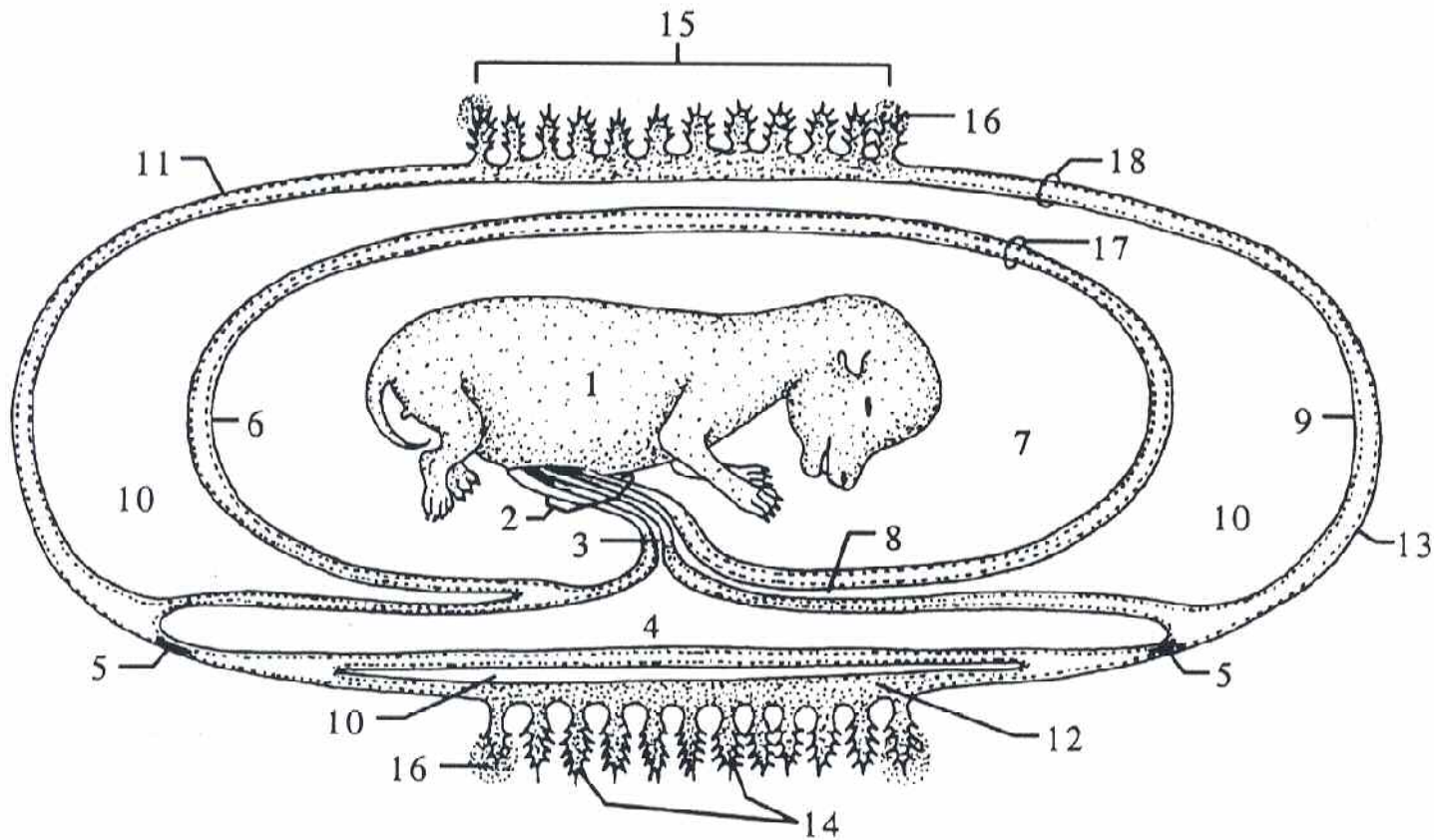
Note that the positions of the vitelline & allantoic ducts are incorrect - the vitelline duct should be shown emerging cranial to the allantoic duct

Carnivore amnion

Completely formed by week 3

Initially small amount of amniotic fluid which gradually increases in volume to 50 – 70 ml in dog (less in the cat) at parturition.

No amniotic plaques are formed in either species.



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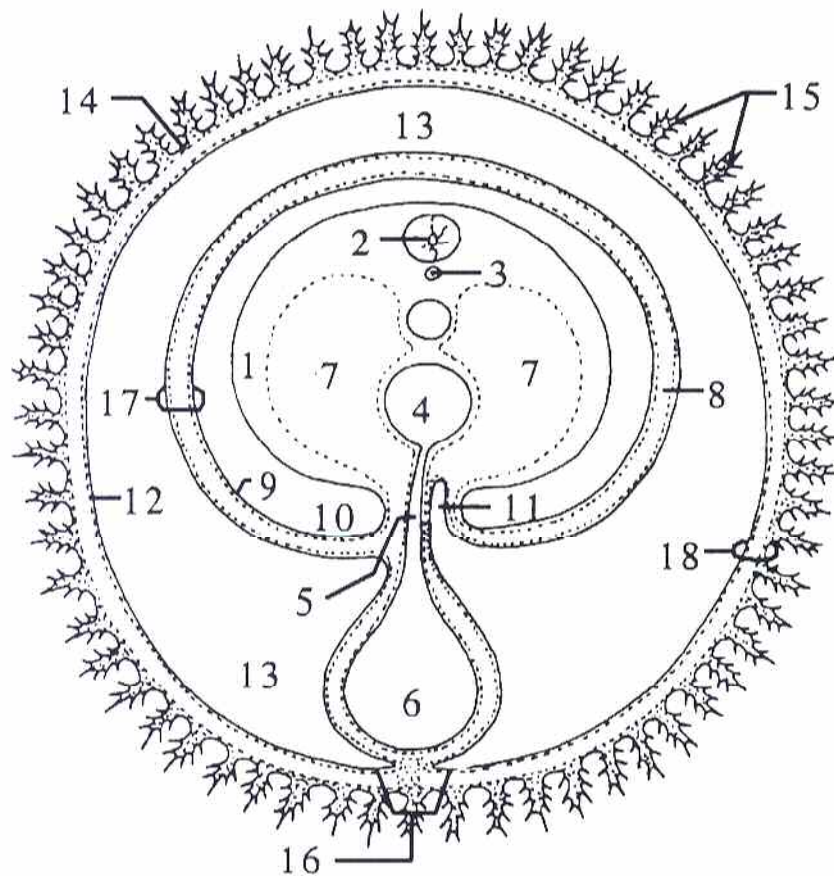
Carnivore allantois

Develops from about week 3 as evagination of hindgut. Initially restricted to centre of chorionic sac. Pushes dorsally between amnion and chorion on right side of embryo. After extending over amniotic sac, it continues ventrally on left side and pushes between amnion and detached yolk sac. Grows into cranial and caudal ends of chorionic sac.

Allantois fuses with chorion and amnion to form allantochorion and allantoamnion vascularised by umbilical circulation.

Allantoic fluid: No hippomanes.

Volume at parturition is 30 – 120 ml in dog; only 3 ml in cat.

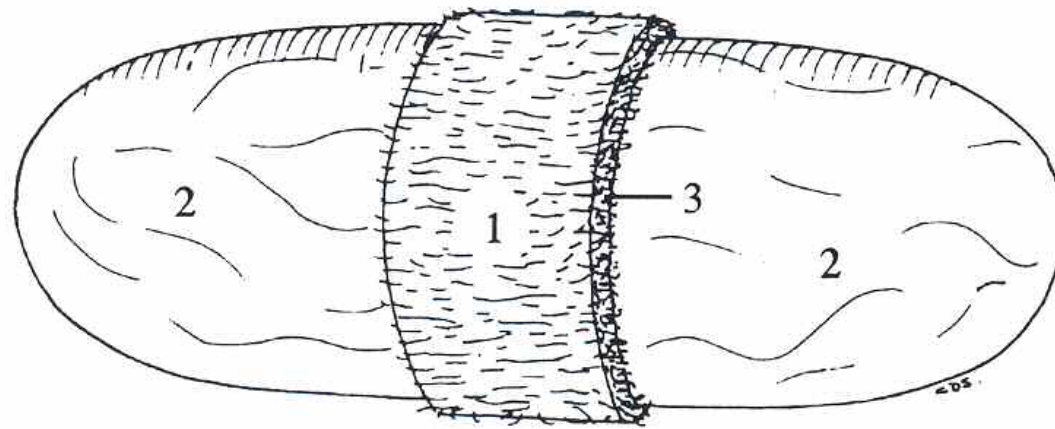


1. Fetus
2. Neural tube
3. Notochord
4. Mesenteron
5. Vitelline duct
6. Yolk sac
7. Endocoelom
8. Exocoelom
9. Amnion
10. Amniotic cavity
11. Allantoic duct
12. Allantois
13. Allantoic cavity
14. Chorion
15. Chorionic villi
16. Choriovitelline placenta
17. Allantoamnion
18. Allantochorion

Fig. 2.35 Canine conceptus: Transverse section showing fetal membranes (schematic)

Carnivore chorion

- 1. Simple trophoblastic villi anchor blastocyst to uterus at early stage (day 17) – histotrophic nutrition.**
- 2. After formation of chorion and amnion and elongation of chorionic sac (day 21), simple villi form over central third of chorionic sac – chorion frondosum.**
- 3. Cranial and caudal thirds of chorionic sac remain free of villi – chorion laeve.**
- 4. Villi of chorion frondosum vascularised by umbilical arteries. These villi branch profusely and either erode uterine epithelium or project towards uterine gland openings.**



1. *Chorion frondosum*
2. *Chorion laeve*
3. Marginal hematoma

Fig. 2.38 Canine *Placenta zonaria* (schematic)

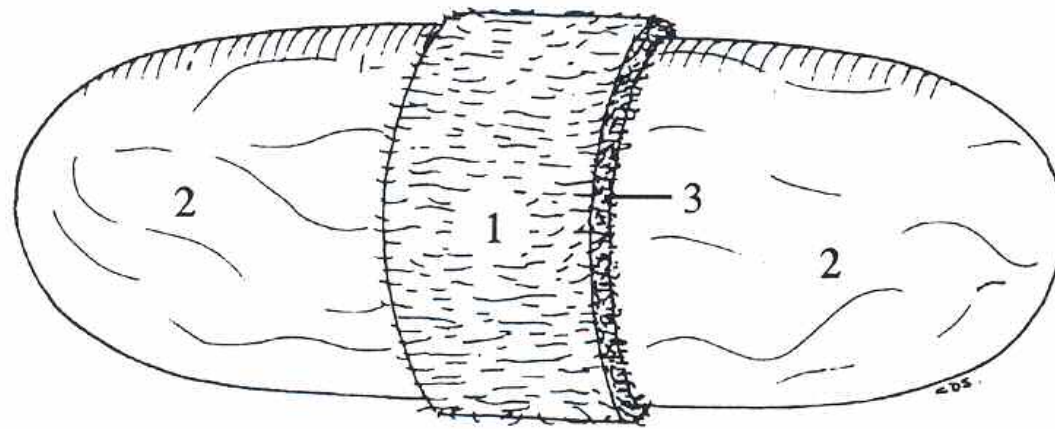
Carnivore chorion

Erosion of uterine epithelium (histotrophic nutrition)

Cells at tips of chorionic villi cause:

- **Maternal cells to become polyploid and desquamate.**
- **Damage to maternal capillaries – resulting hemorrhage adds blood cells to mass of cellular debris. Most blood, however, forms marginal hematomas at border of chorion frondosum. Marginal hematomas (greenish in dog, brownish in cat) absorbed by chorion laeve as histotroph.**

Cells at tips of chorionic villi utilise the mass of cellular debris, together with uterine gland secretions, as histotroph.



1. *Chorion frondosum*
2. *Chorion laeve*
3. Marginal hematoma

Fig. 2.38 Canine *Placenta zonaria* (schematic)



Figure 3.10. Photograph of a midterm canine fetus in utero. The chorion has been torn while opening the uterus.

Carnivore chorion

Blockage of uterine gland openings (histotrophic nutrition)

Blocked uterine gland openings (ducts) swell up with contents and form so-called gland rooms (see histology of placenta). The obstructing chorionic villi absorb the accumulated secretions as histotroph.

The uterine glands associated with the ducts also enlarge in the placental zone, but are separated from the gland rooms by a layer of condensed connective tissue, the glandular covering layer.

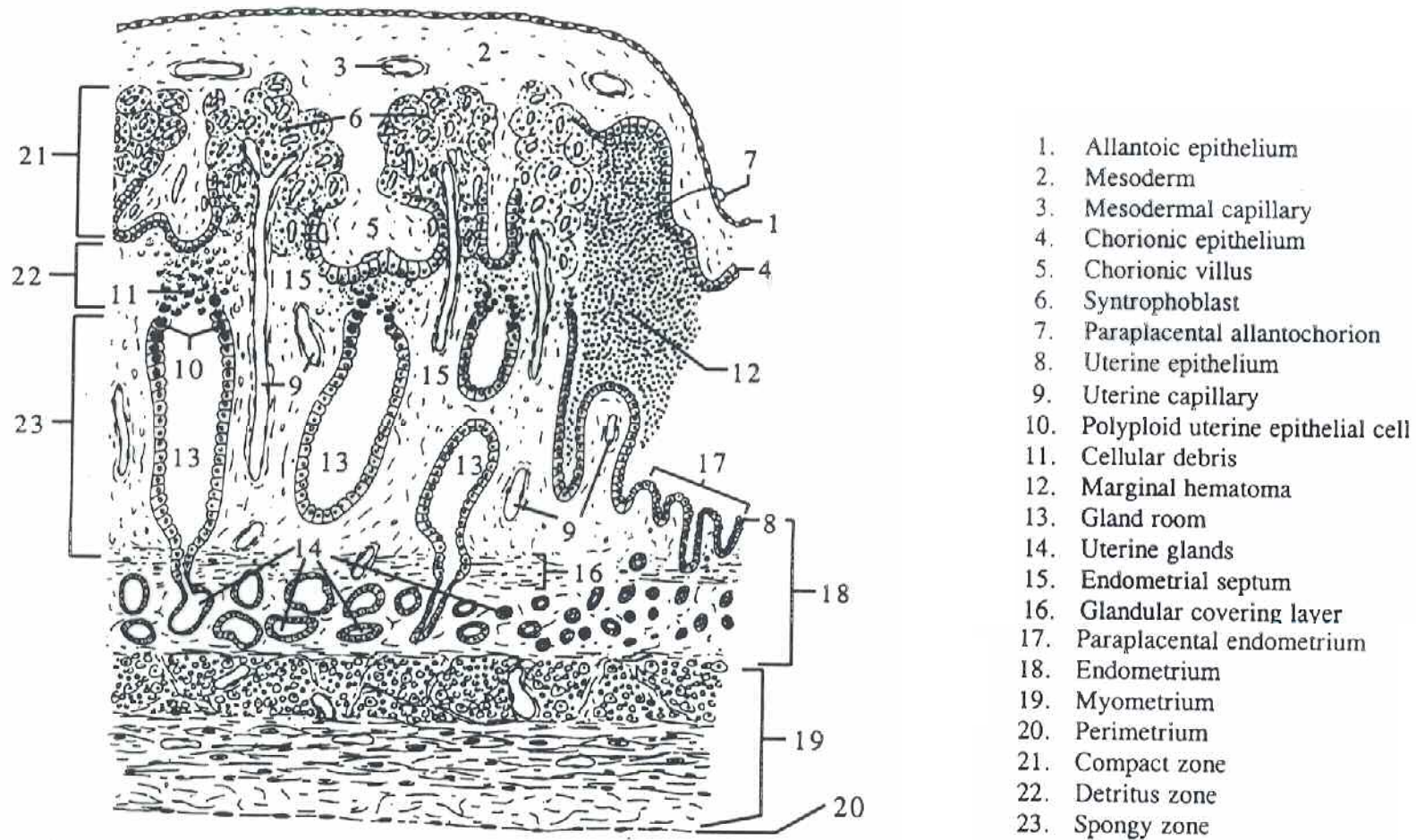


Fig. 2.38 Canine placenta (histological section)

Carnivore chorion

Formation of syntrophoblast (hemotrophic nutrition)

Exposed maternal capillaries remain undamaged and form network between chorionic villi. Become surrounded by modified chorionic cells from the base of the villi in the form of a syncitial mass, the syntrophoblast.

Maternal capillary endothelium separated from syntrophoblast by interstitial membrane. Decidua cells (maternal fibroblasts) can occur - small in dog, large and contain glycogen in cat. Isolated, clear cells lie at periphery of syntrophoblast – the cytotrophoblast which are considered to be reserve cells.

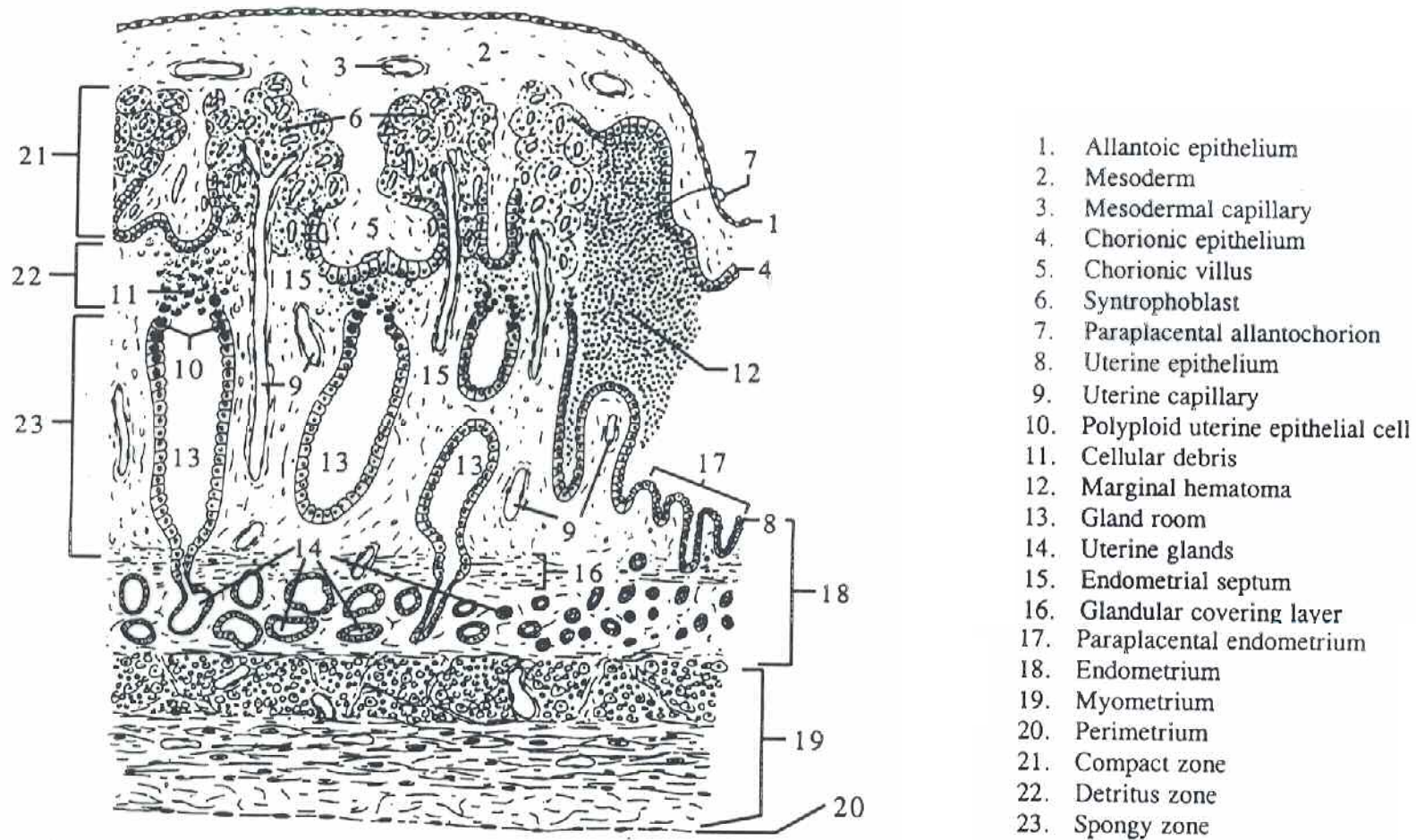
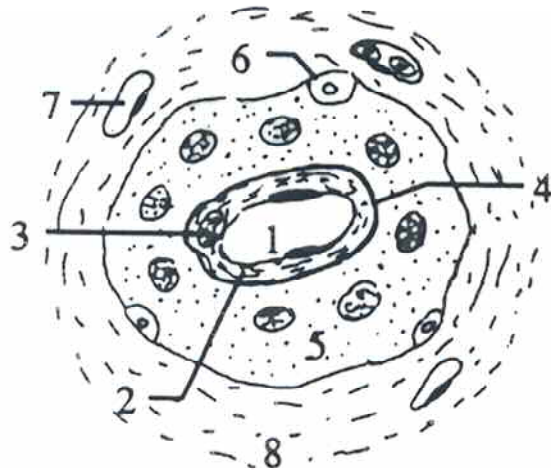


Fig. 2.38 Canine placenta (histological section)



1. Uterine capillary
2. Endothelium of 1
3. Decidua cell
4. Interstitial membrane
5. Syntrophoblast
6. Cytotrophoblast
7. Fetal capillary
8. Mesoderm

Fig. 2.39 Canine placenta (histological section showing detail of syntrophoblast)

Carnivore chorion

Histological organisation of carnivore placenta

Can be divided into 3 zones:

- **Compact zone – maternal capillaries, syntrophoblast, cytotrophoblast.**
- **Detritus zone – tips of chorionic villi surrounded by cellular debris.**
- **Spongy zone – gland rooms and endometrial septa.**

At parturition *pars uterina* of placenta desquamates above glandular covering layer and is removed with fetal membranes. Uterine epithelium regenerates to replace lost tissue.

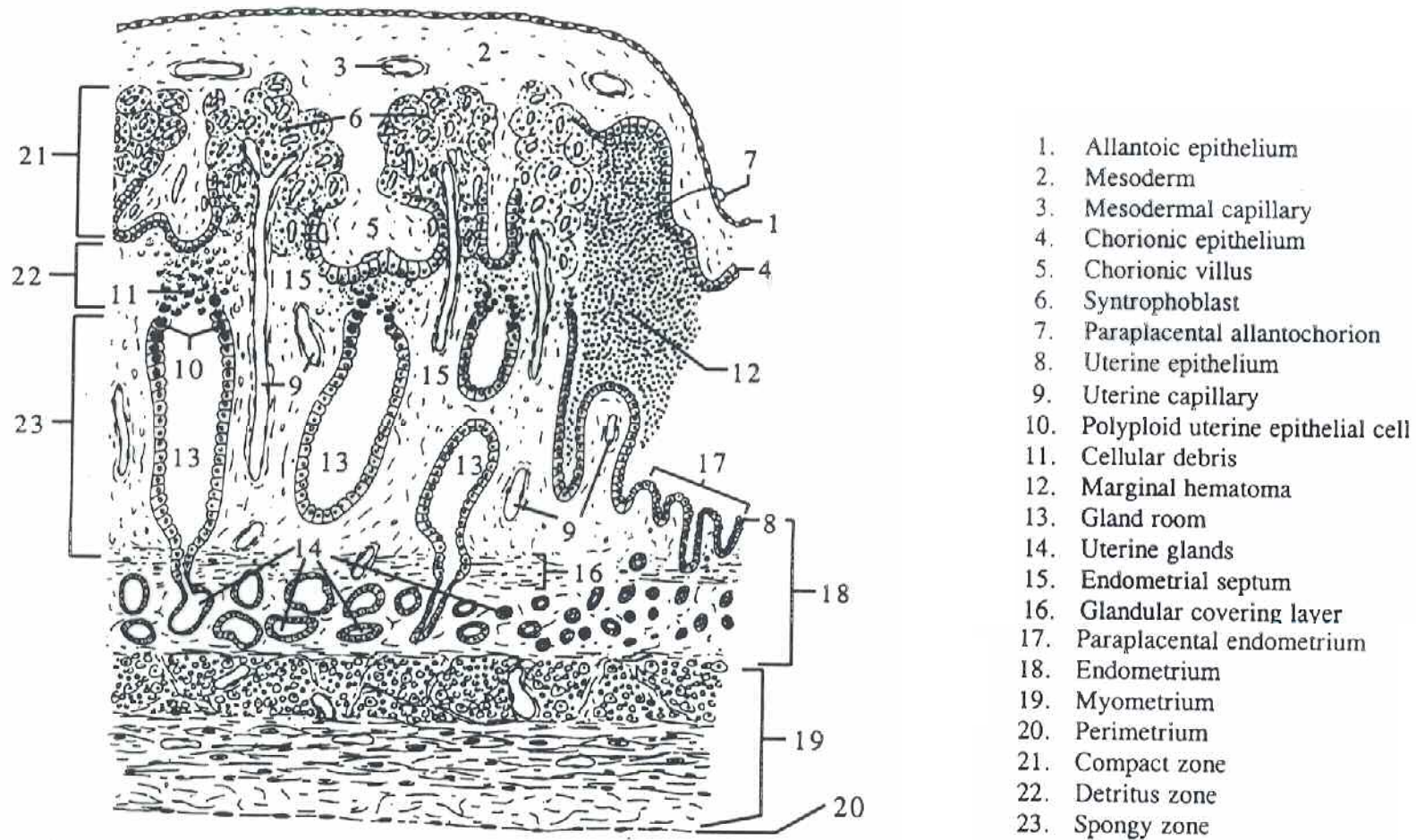


Fig. 2.38 Canine placenta (histological section)

Carnivore umbilical cord

Relatively short – one half fetal body length in dog and one third in cat.

Covered only by simple squamous amniotic epithelium. Same components as other species studied. No amniotic plaques.

Umbilical cord has no natural point of rupture – must be bitten through by mother.

