

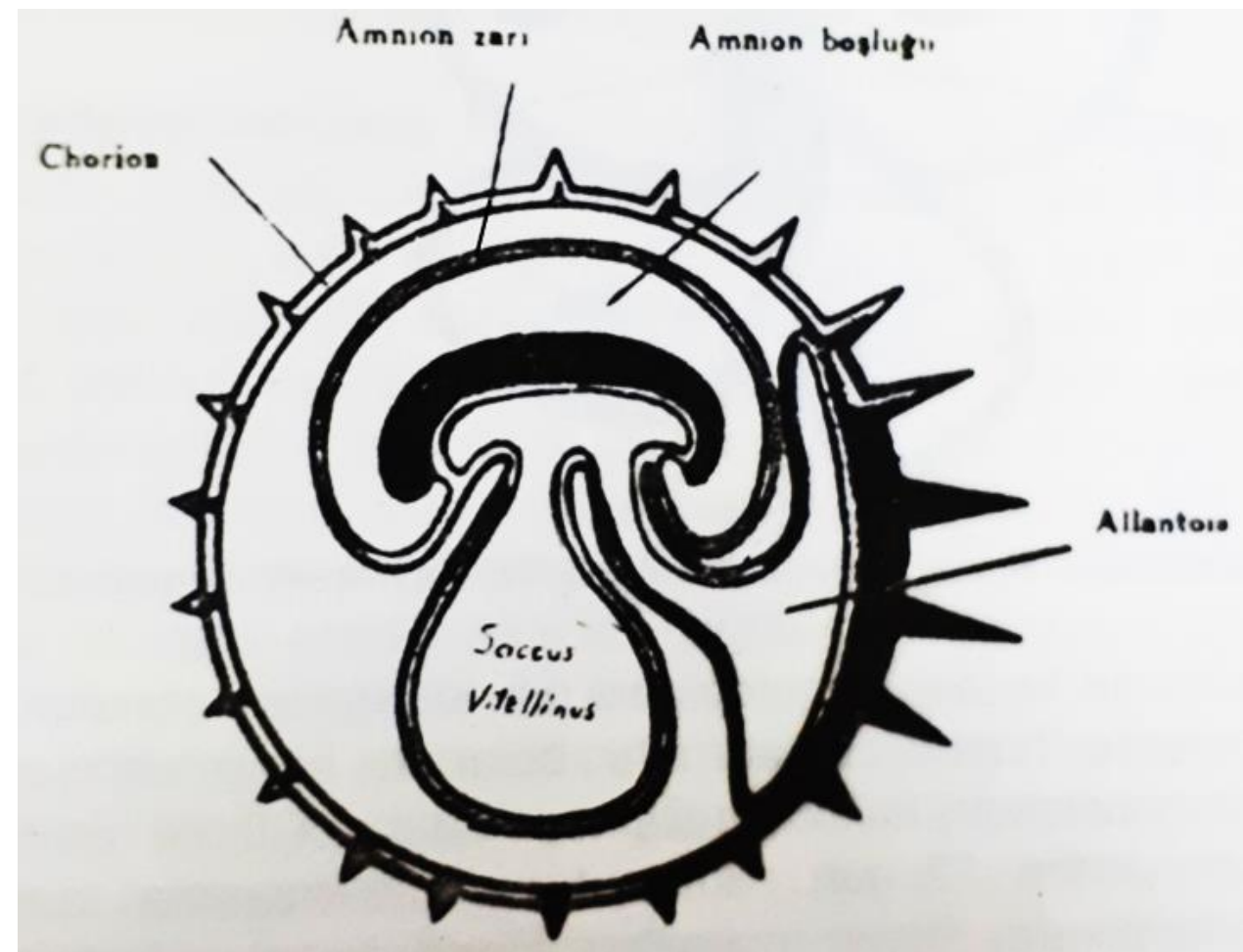
**Developments in the mammals  
after zygote**

**(Extraembryonic Sac Formation  
And Umbilical Cord)**

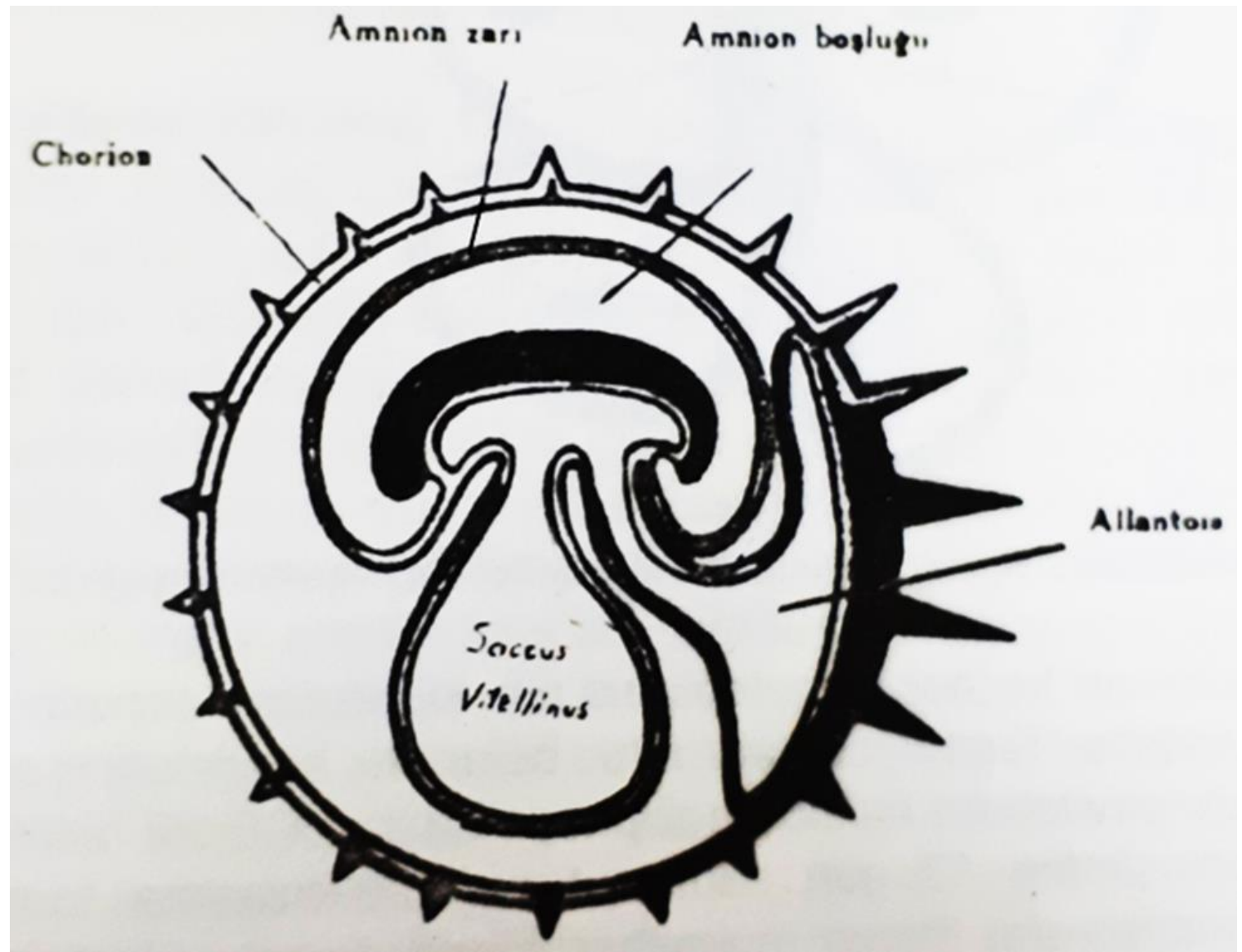
## EXTRAEMBRYONIC SAC FORMATION AND UMBILICAL CORD:

The blastocyst occurring after zygote formation must be protected against intrauterine effects and external pressures after entering the uterus.

For this reason, some changes occur in the embryo leaves and extra-embryonic membranes occur.



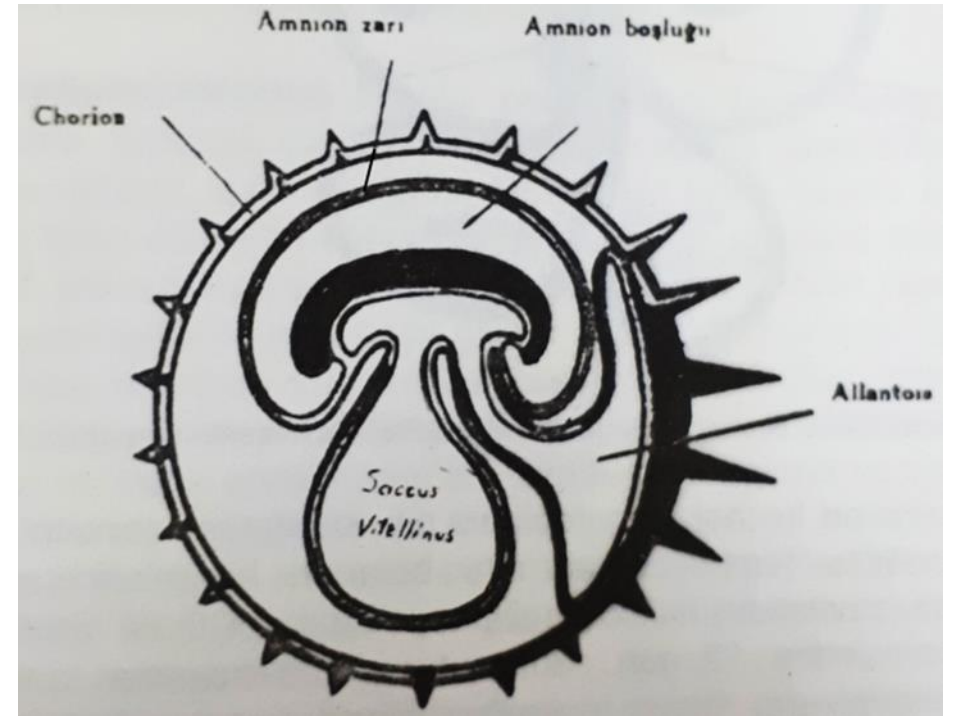
These are **amnion**, **vitellus** and **allantois** membranes. The **chorion** that covering these membranes are also included in this group.



# AMNION AND CHORION FORMATION:

First, a groove is formed on the somatopleure that, limits the embryonal field around.

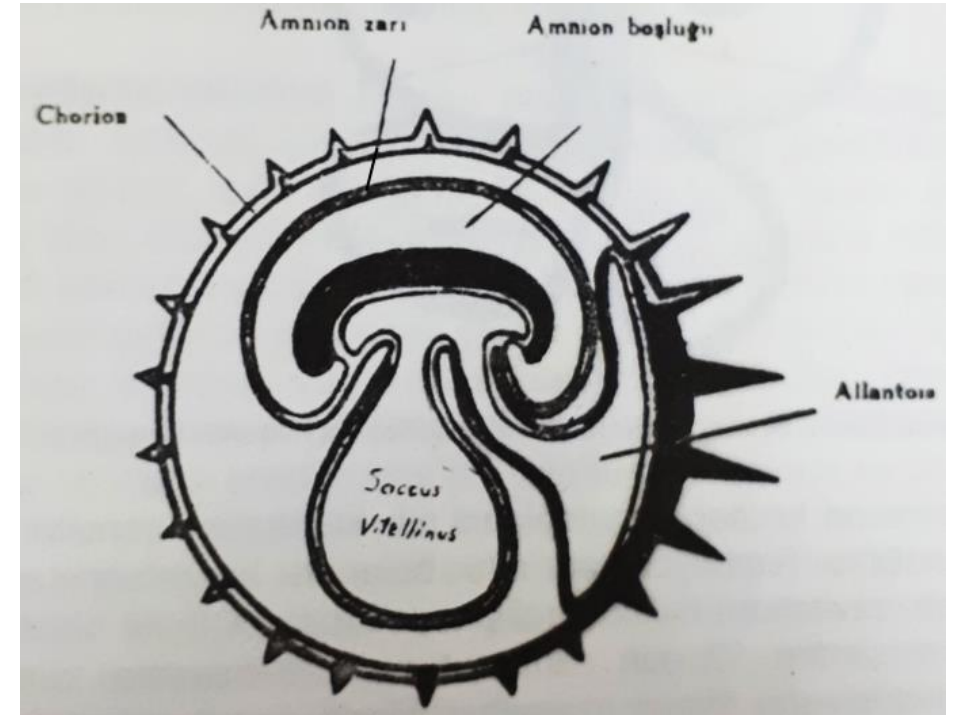
The only somatopleura is participated in the structure of this groove, splanchniopleura has no relation.



In the course of time, the outer folds of this groove rise and the embryo is surrounded to from the top.

The first sac that surrounds the embryo is the **amniotic sac**. This sac contains amniotic fluid.

The second sac is more outside found and takes the name **chorion**.



Chorion covers all extraembryonic sacs, including embryos, and plays an important role in the formation of the placenta.

The wall of the amniotic sac, as in the chorion sac, is made of somatopleura but exhibits an inverse layering due to the curvature of the somatopleura.

That is, the ectoderm is found inside of the amnion and the somatic mesoderm is found outside of the amnion.

The situation in chorion wall not change. Ectoderm is found external side, somatic mesoderm is found inside.

In humans, the amniotic cavity does not form by curling the somatopleura. But, with the melt of the inner cell mass forming the nodus embryonalis (embryoblast) is formed. The space created by the melted cells forms the amniotic sac.

This is because the blastocyst can completely be embedded in the uterine mucosa 13 days after the zygote is formed, and somatopleura can not be twisted onto the embryoblast within the uterine mucosa.

Because of this difference in implantation, amniotic forms occur in a different way in human.

## **Formation of Allantois:**

During the formation of the amnion and chorion sacs, an evagination occurs in the ventral wall of the posterior region of the first intestinal channel (archenteron) towards the exocoeloma.

With this expansion, the allantois, a third sac, is formed.

This sac acts as a bladder, where metabolic waste is collected.



## Vitellus sac (Saccus vitellinus):

The vitellus sac, whose wall is made of splanchnopleura, is the first formed extraembryonal sac and does not contain vitellus (egg yolk), unlike in the birds.

However, vitellin veins, which form on the vitellus sac, help in transporting nutrients into the embryo until the allantois sac and veins are formed.

The feeding of the embryo before the V. vitellins occur is through the activities of the **trophoblasts** on the **chorion** surface.

As a result of cytolytic functions of trophoblasts, tissue debris collected in the uterine tissue around the embryo (damaged capillaries, fibrin, degenerated blood cells and connective tissue cells, tissue fluid) and the secretion of the uterus glands, by the absorption of trophoblasts and by diffusion reach the embryo.

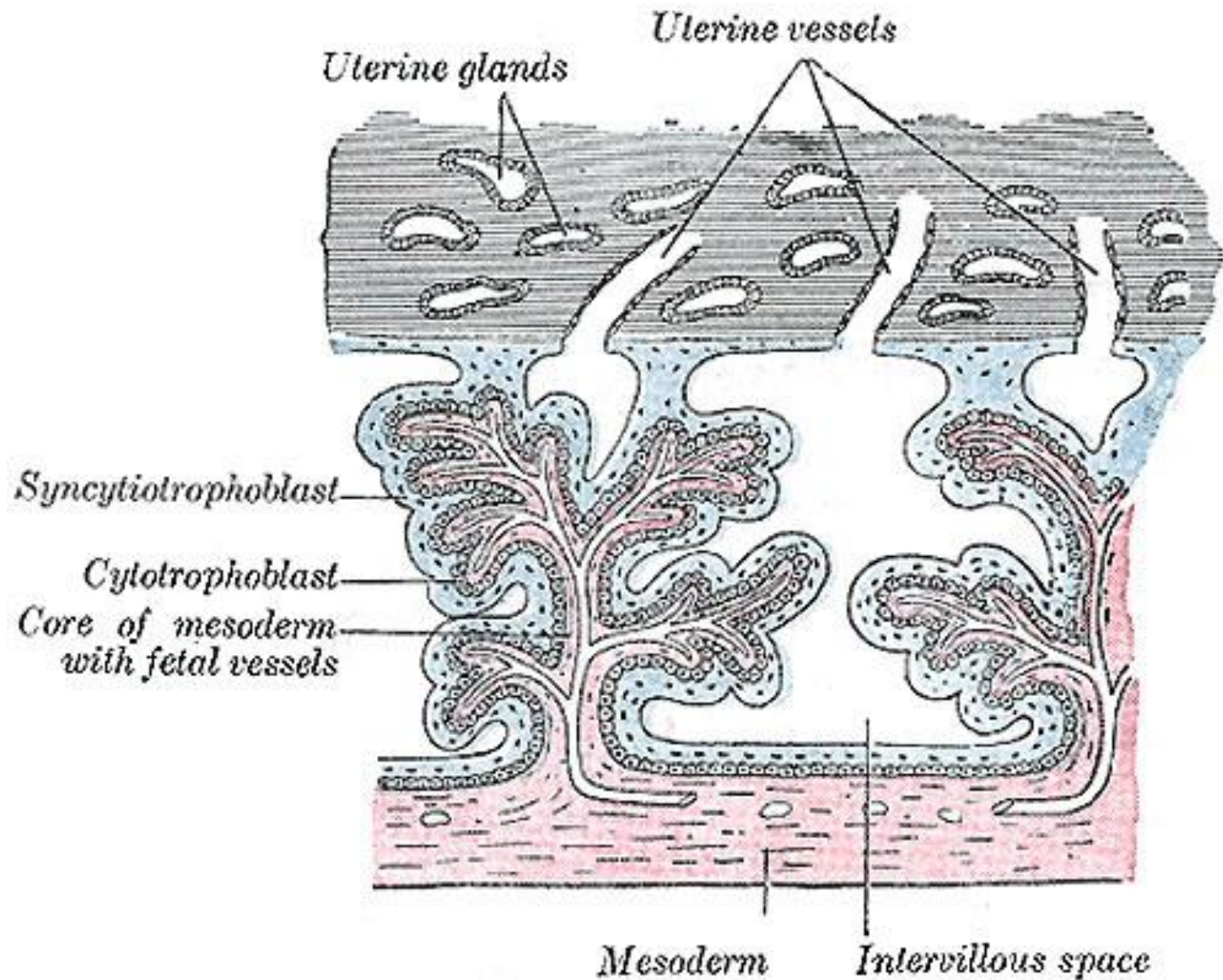
These nutrient substances are called **embryotroph** (**uterine milk**), and feeding type is called **embryotrophic nutrition**.

When the vitellin veins are formed, the same type of feeding is continued, ie. **embryotroph** is used.

However, when the circulation of allantois (A. and V. umbilicalis) occurs, the baby that grows and needs more nutrients starts to benefit from maternal blood continuously.

This type of feeding that continues until birth is called **hemotrophic nutrition**.

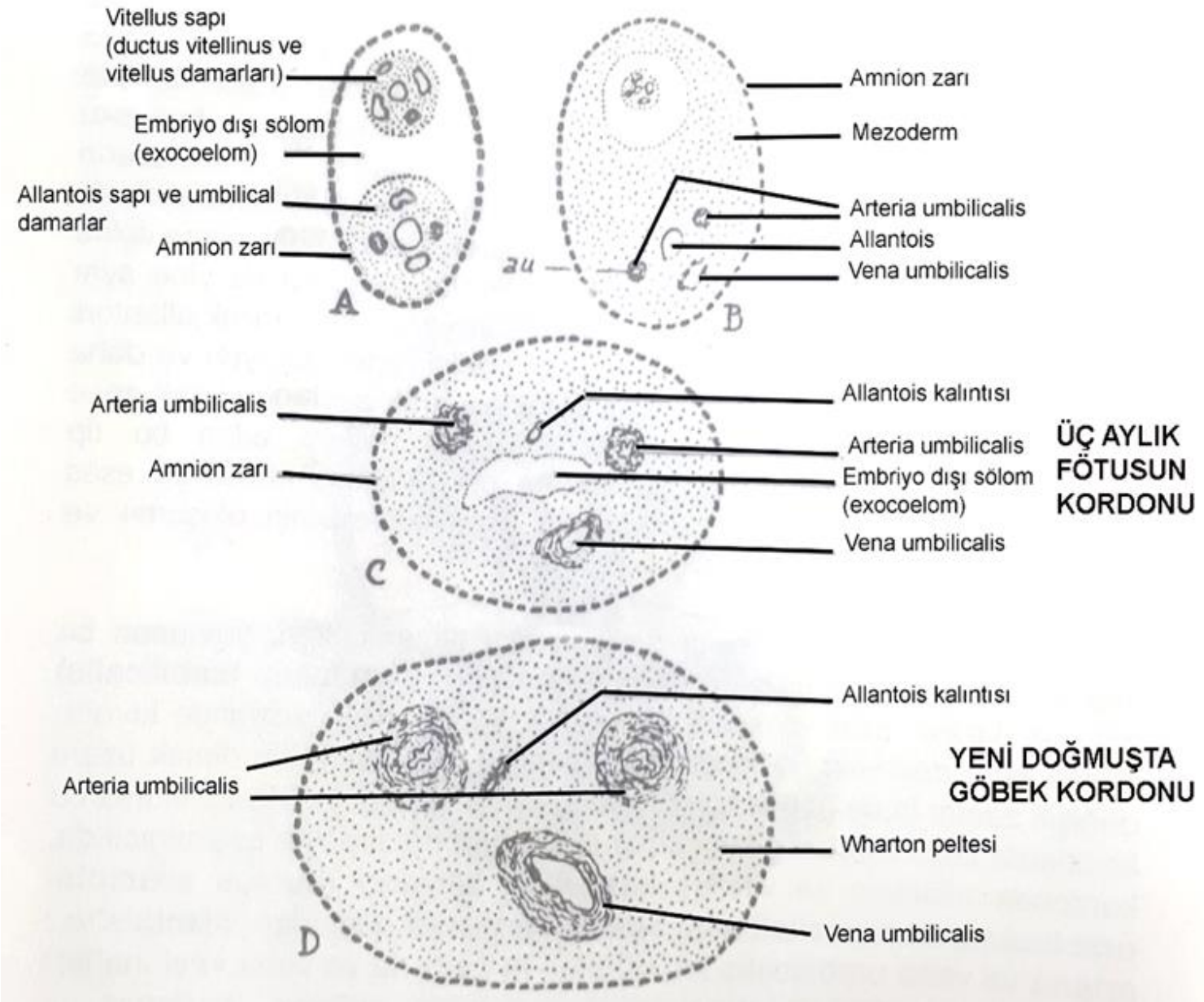
The main function of the vitellus sac is related to the formation of primitive blood cells, germ cells, and the formation of the intestinal tract.



While the extraembryonal sacs complete their development, the **umbilical cord (funiculus umbilicalis)**, which provide the baby to relate to these sacs, gradually becomes narrower, and elongated and is curved in a spiral manner on its axis.

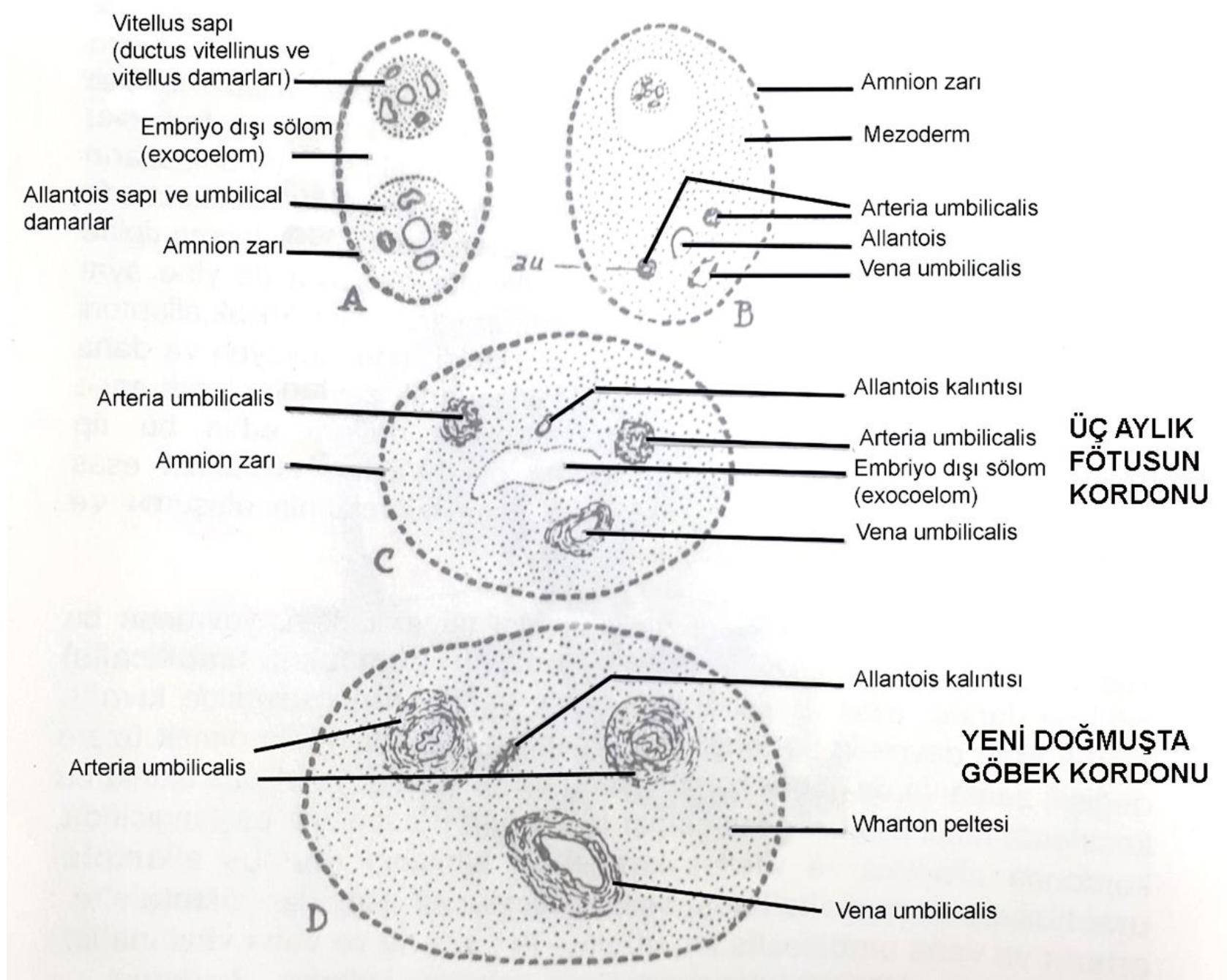
If cross sections are taken from the umbilical cord at the beginning of the fetal period, and near the birth, different structures are seen in these sections.

At the onset of fetal period, in the umbilical cord, the ducts of the allantois sac and vitellus sac (**ductus allantois-urachus** and **ductus vitellinus**) and the vessels of these sacs (**allantois: arteria and vena umbilicalis, vitellus: arteria and vena vitellina**) are found. In the middle of the cord, there are also exocoelom remains.

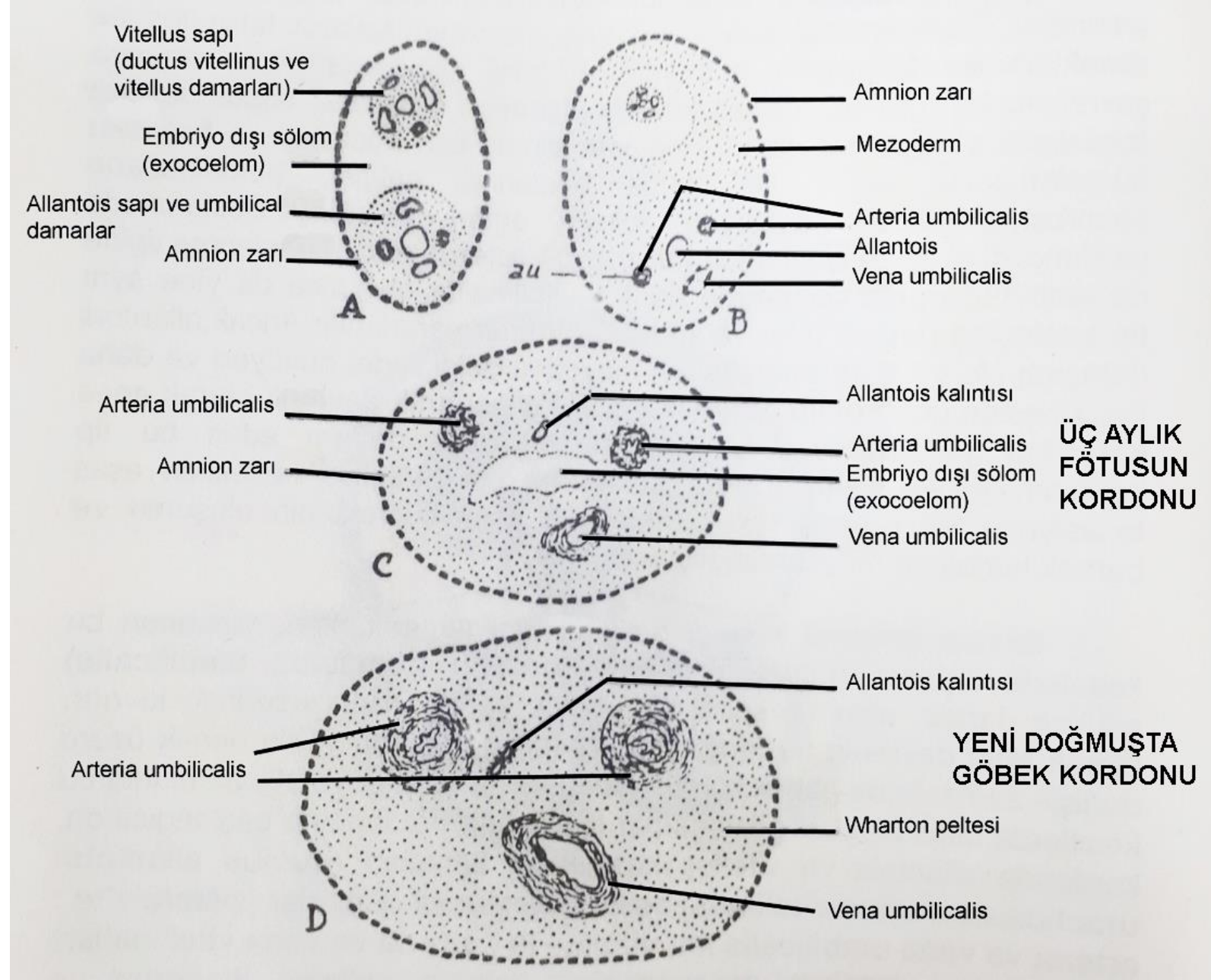


This canals and veins are wrapped with an embryonic connective tissue (**Wharton gelly**) in a soft consistency.

Towards the end of the fetal period, the channels and veins of the vitellus sac disappear, and only the **allantois canal** and **veins** remain in the cord.



The Wharton gelly, which surrounds the veins and canals, is further developed and spread. The ectoderm wraps the cord externally as a cover.



## CHORION:

The wall of chorion that contains extraembryonal sacs and helps to shape the placenta is made of somatopleura (ectoderm + somatic mesoderm).

The ectoderm covering the outer face of chorion is called **trophoblast (trophoectoderm)** because it provides the feeding of the baby by fusion with the uterine mucosa during the formation of the placenta.

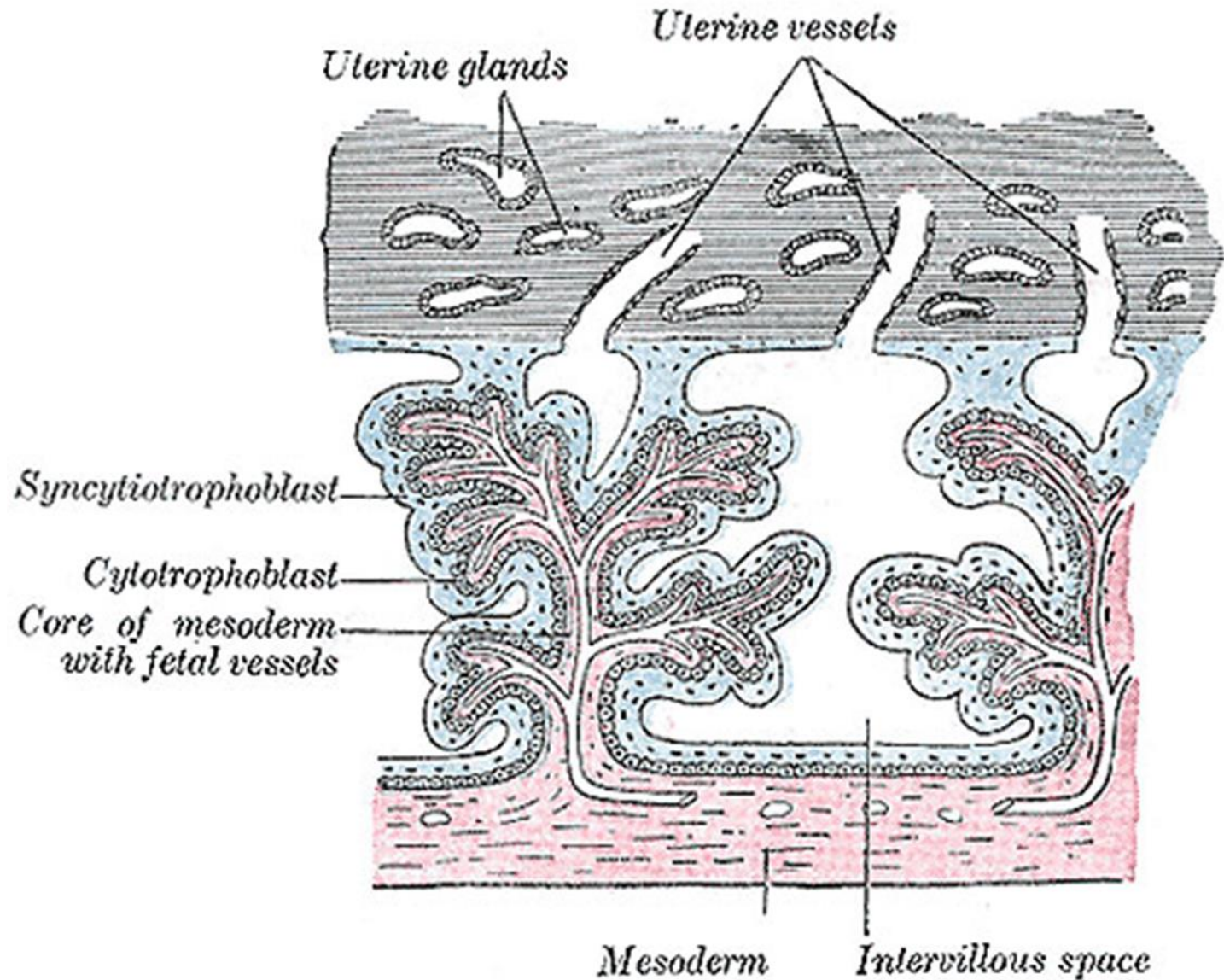
In the development and nutrition of baby, chorion's extensions to the uterine mucosa play an important role.

These branched extensions are called **chorionic villi (villi choriales)**.

# CHORION :

The outer face of the villi is covered with trophoblast cells.

Chorion villi have two different types of **trophoblast** in terms of function and shape; **syncytio-trophoblast** and **cyto-trophoblast**.

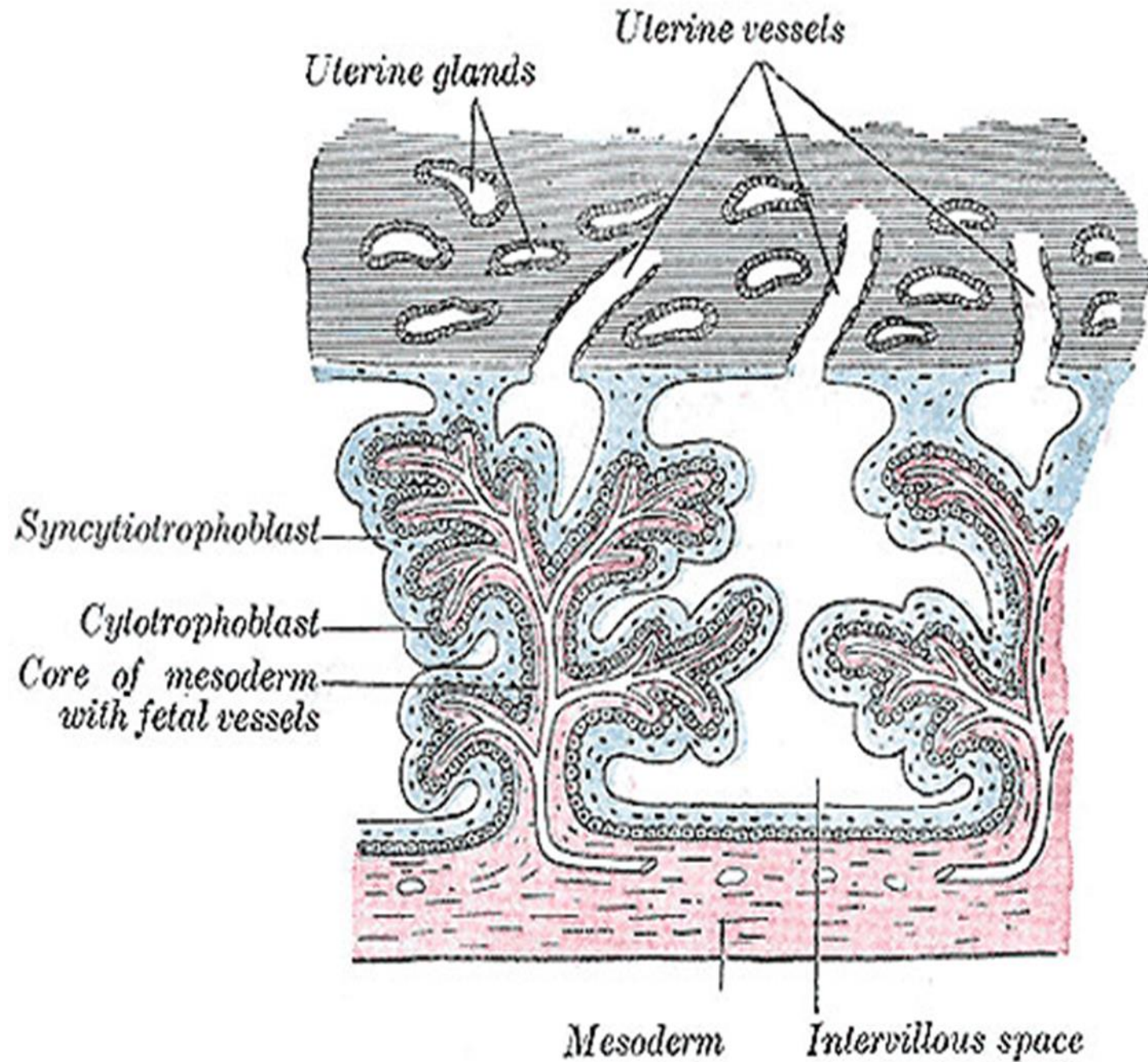




# CHORION :

External trophoblast, the cell boundaries are unclear, the cytoplasm mixes with each other and consists of syncytium cells. These cells are called **syncytiotrophoblast**.

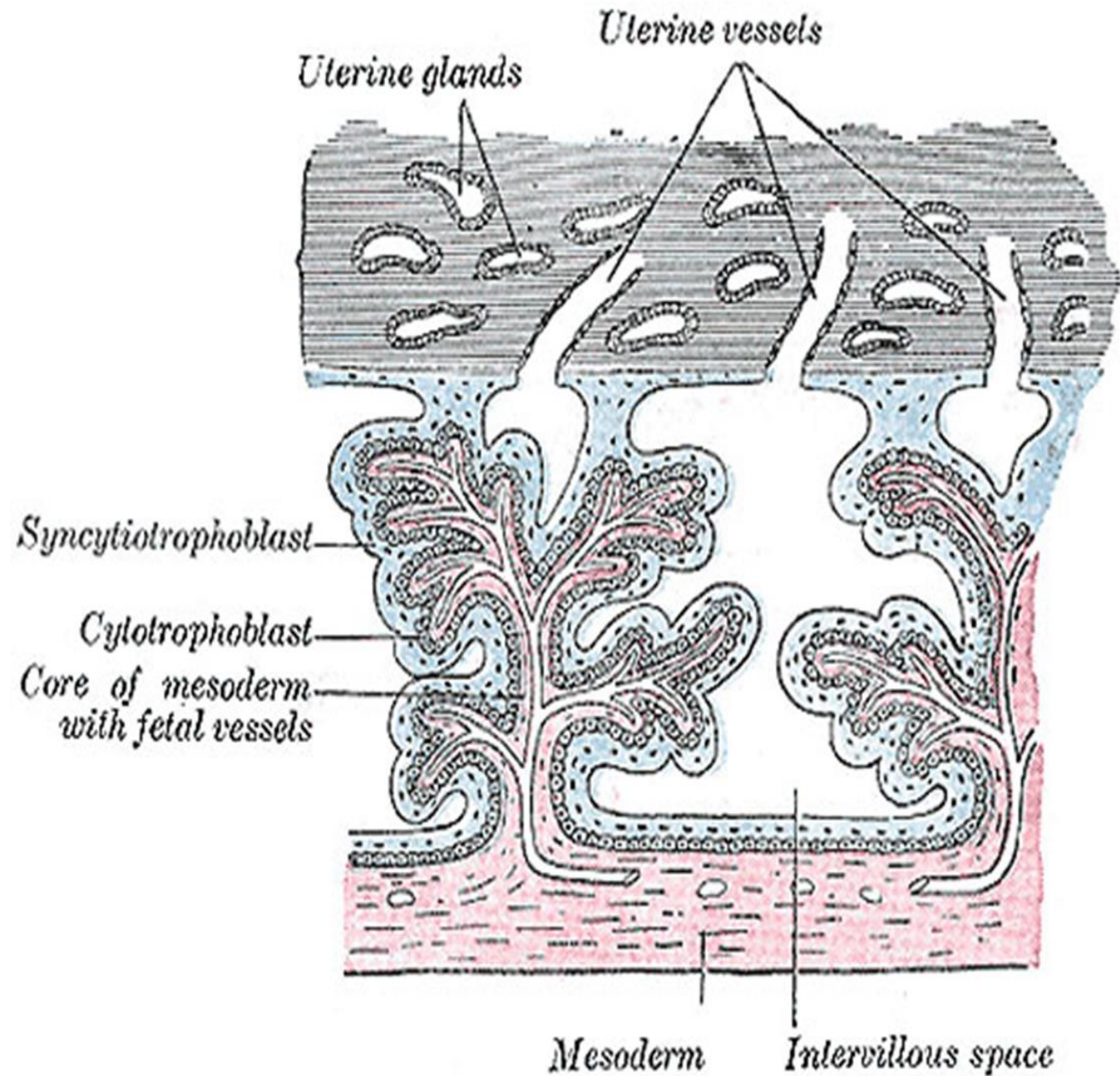
Right below this layer is found main epithelium of chorion, where the boundaries of the cells are clear and the cytoplasm is not mixed. The single-row epithelial layer formed by these cells is called **cyto-trophoblast**.



# CHORION :

**Synctio-trophoblasts**, dissolve the epithelial layer in the uterine mucosa with their enzymes, dissolve the connective tissue and even the vascular wall, and lead to villi and facilitate implantation.

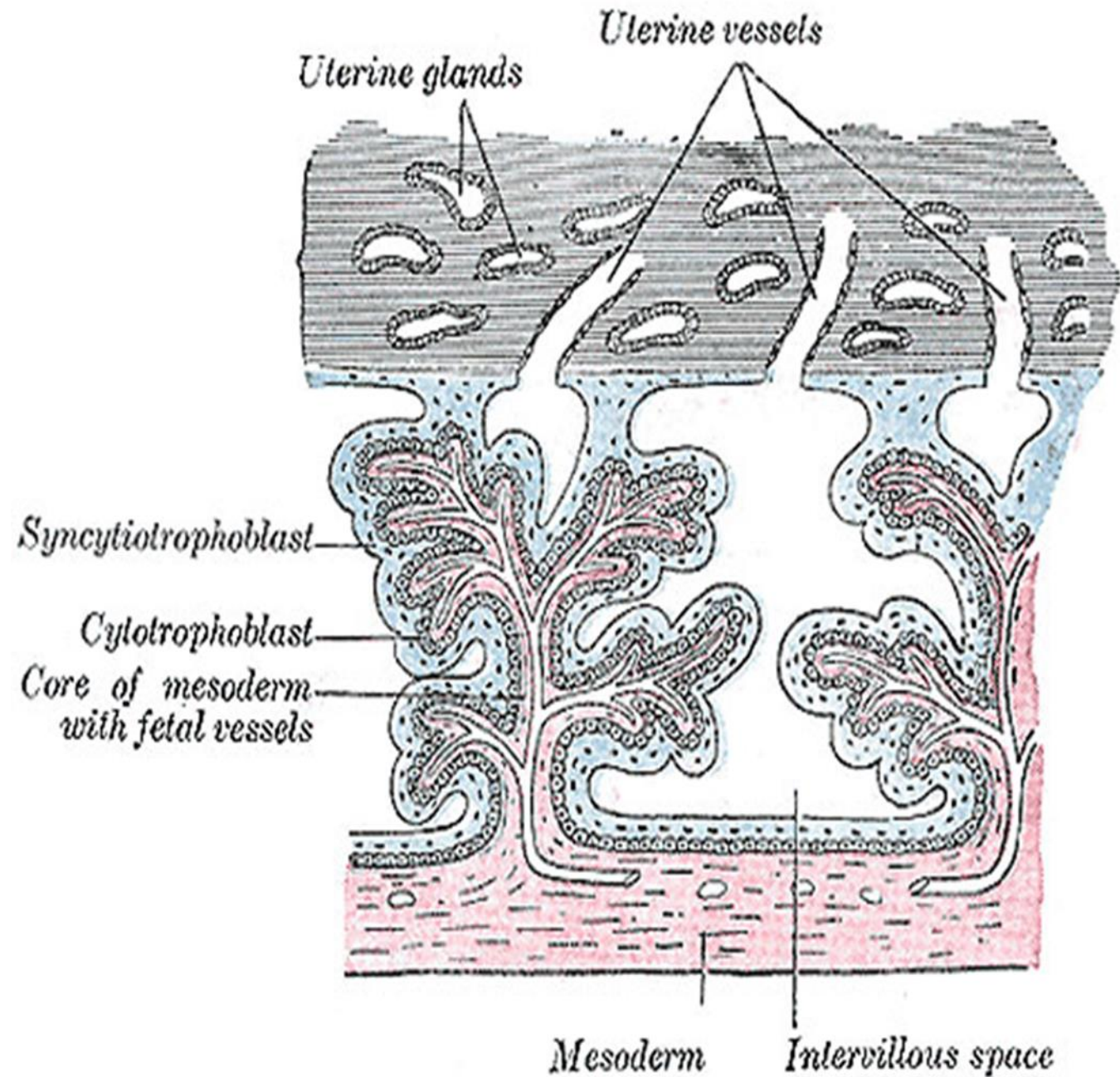
The internal structure of the villi contains chorion mesenchyme (embryonal connective tissue) and umbilical vessels.



## CHORION :

These vessels in the villi are the arteries and vena umbilicalis from the allantois.

However, in mammals, since the allantois sac is fused with chorion in many parts, the veins on this sac pass to the chorion wall, and into the villi.



## **CHORION :**

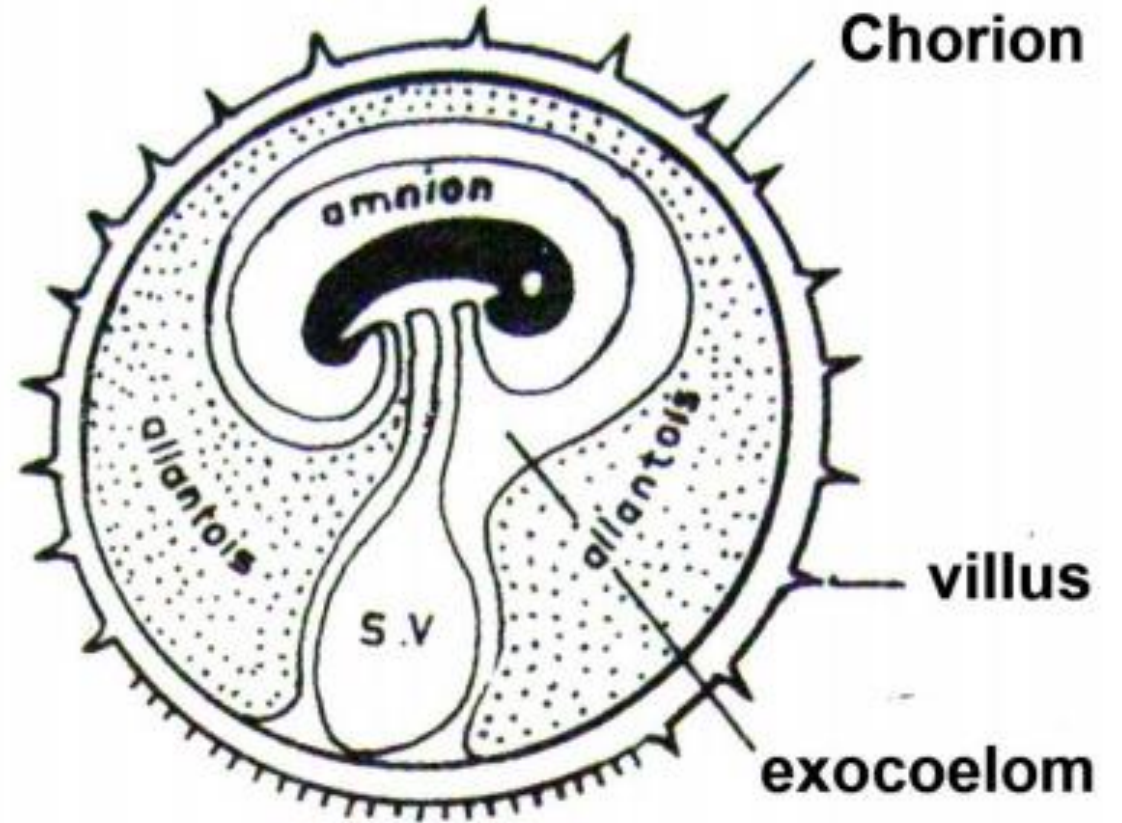
The exchange of nutrition and gas ( $O_2$  and  $CO_2$ ) between the veins in villi with the blood of the mother is through by diffusion.

The villi-containing part of chorion is called **chorion frondosum**. The villi-free part of chorion is also called **chorion laeve**.

## NAMES OF CHORION ACCORDING TO THE RELATION WITH EXTRAEMBRYONIC SACS:

Chorion takes the name of **vitello-chorion** if it contacted with the vitellus sac.

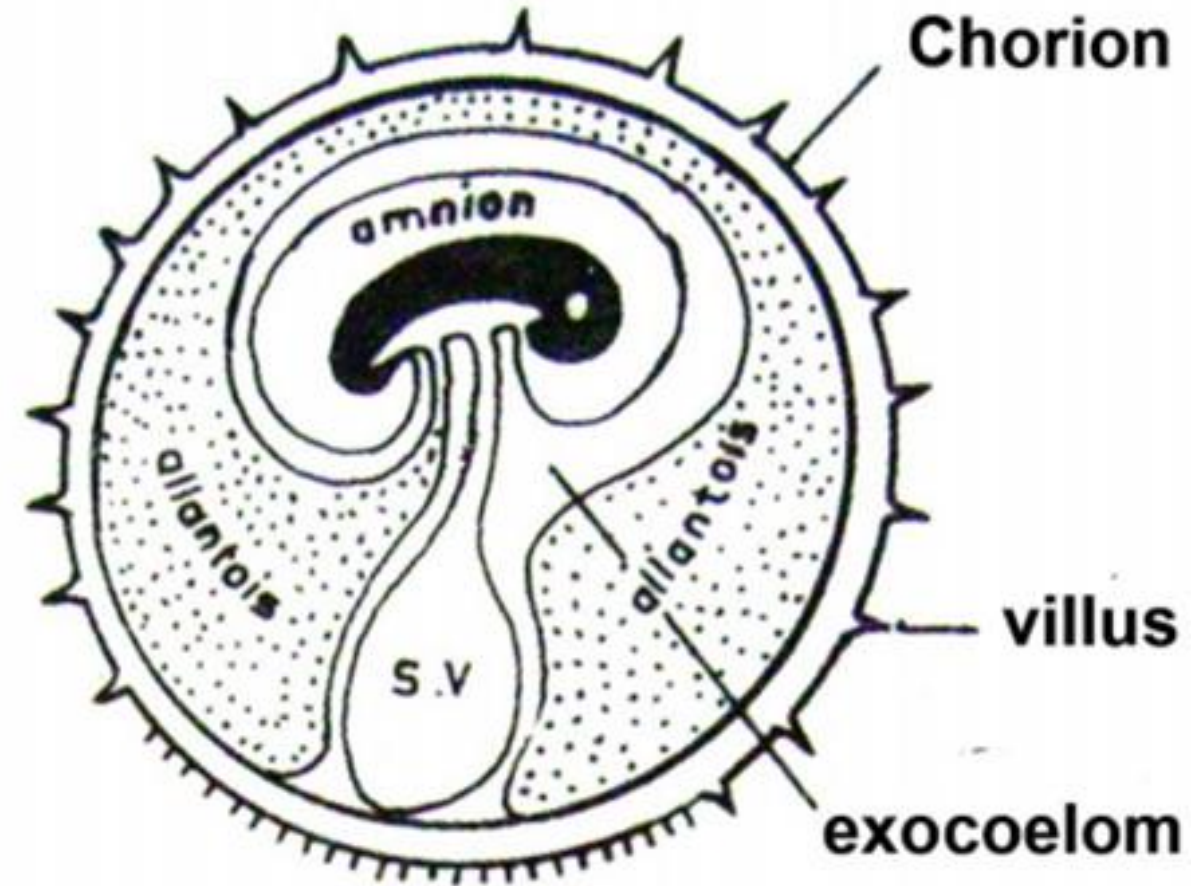
Chorion takes the name of **allanto-chorion** if it contacted of the allantois sac.



**allanto-vitello chorion**

Chorion may be in contact with both the vitellus sac and the allantois sac, which is called **allanto-vitello chorion**.

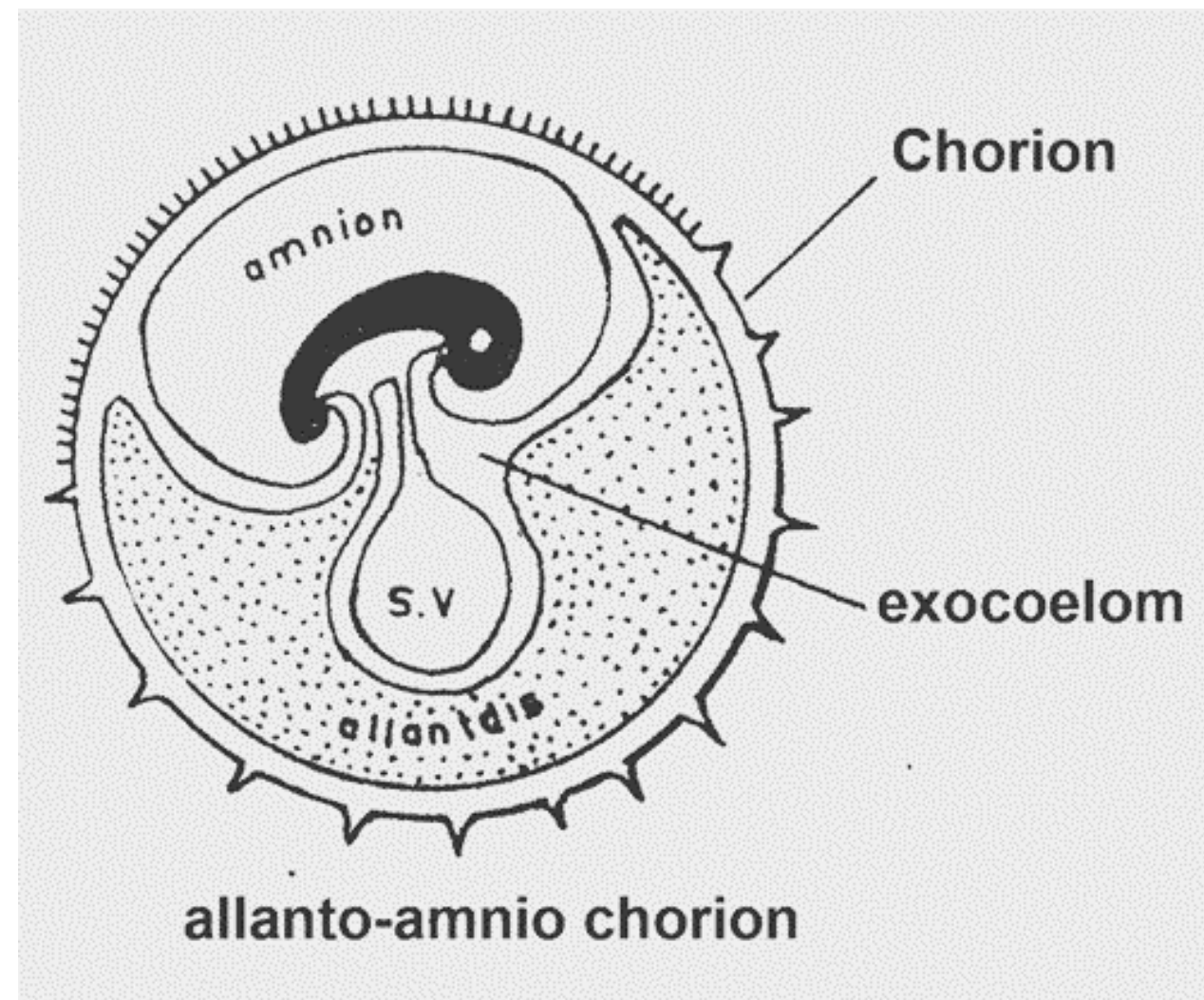
Allanto-vitello chorion is found in **carnivor** and **equidae**.



**allanto-vitello chorion**

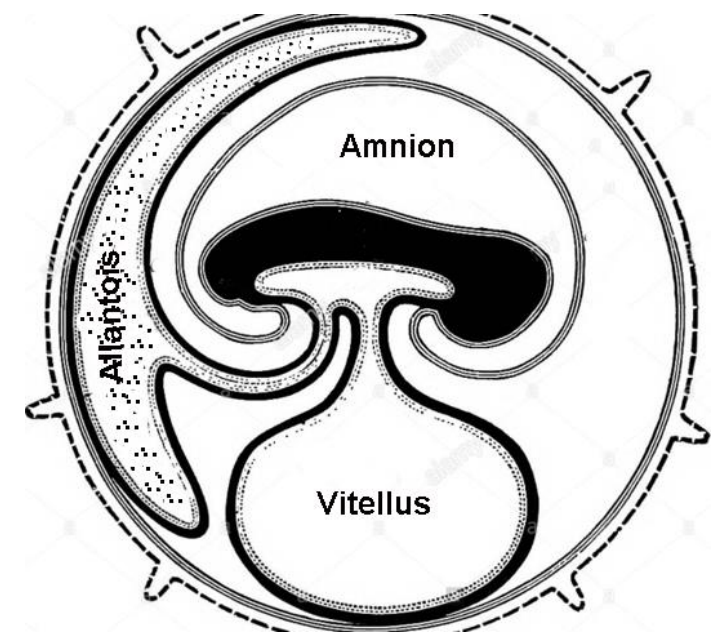
In other animals, the vitellus sac usually has no contact with the chorion, whereas the allantois and amnion sacs are associated with chorion.

In this case chorion, **allanto-amnio chorion** takes its name. This type is found in **pigs** and **ruminants**.

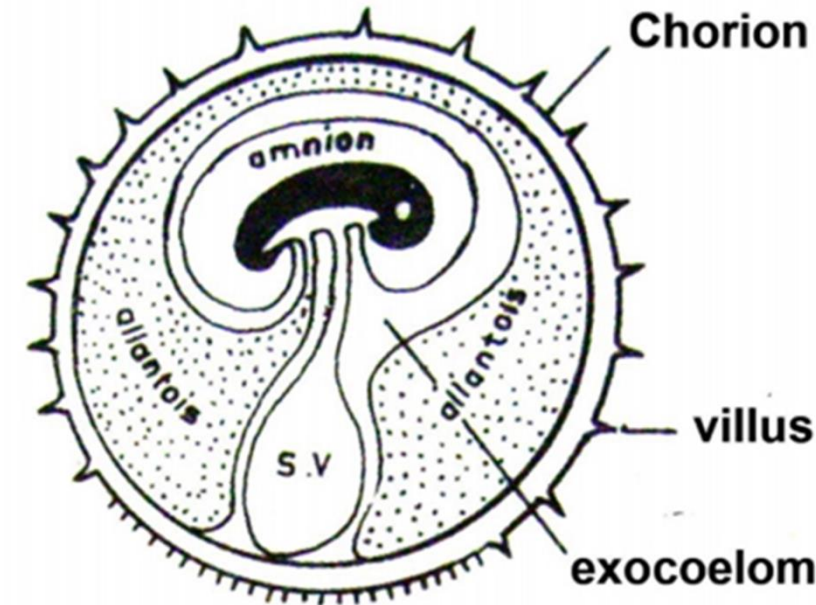


In poultry, all three sacs are associated with chorion (**allanto-vitello-amnio chorion**).

But as the development progresses, the chorion is only confronted with allantois and vitellus sacs (**allanto-vitello chorion**), as the amniotic sac remains inside.



allanto-vitello-amnio chorion



allanto-vitello chorion



## KAYNAKLAR

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