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Lecture title: Embryology introduction / Early embryonic period

Lecturer Affiliation: ***Naziha Sultan Ahmed, BVMS, MSc***

Scientific degree(*Assistant Prof.), Department of Anatomy, College of Veterinary Medicine, University of Mosul, Mosul, Iraq*

https://orcid.org/0000-0002-2856-8277

https://www.researchgate.net/profile/Naziha_Ahmed

Early embryonic period

As soon as the morula enters the uterus, fluid begins to pass through the zona pellucida into the intercellular spaces between the blastomeres , these spaces gradually become confluent and form a large cavity known as blastocyst cavity (about 4 days after fertilization) , the developing embryo becomes known as the blastocyst or blastula .

*Blastocyst (or Blastula):

a hollow, fluid-filled , spherical or cylindrical structure, develops during the second week, after the zona pellucida ruptures. It consists of large number of blastomeres. Eventually the blastocyst attaches to or implants within the uterine wall (depending on species).

As the amount of fluid in blastocyst cavity increased , the cells become separated into two parts :

1-A flattened outer cell layer (mass) known as **the trophoblast** , which eventually gives rise to the embryonic part of the placenta .

2-A group of centrally located cells (or at one pole of blastula) known as the inner cell mass or **embryoblast** that is the primordium of the embryo .

At a species-specific stage of development, the blastocyst escapes from the zona pellucida by hatching. Around the time of hatching, the internal cells of the inner cell mass delaminate and form an epithelium, the hypoblast, inside the blastocyst, where as the external cells of the inner cell mass form the epiblast . At this stage, the epiblast and the hypoblast have established the bilaminar embryonic disc.

***Implantation :**

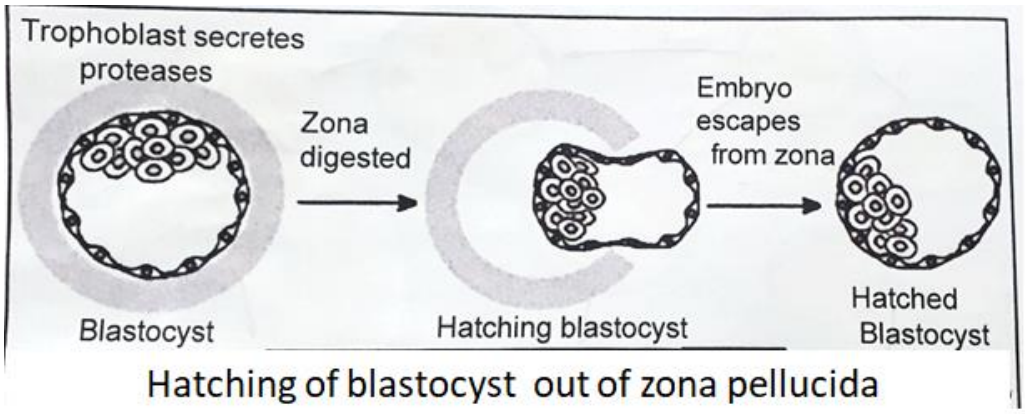
represents the process of embedding of blastula (blastocyst) within the endometrium, or just adhering of blastula to the wall of the uterus. By this embedding or adhesion, the embryo receives oxygen and nutrients from the mother to be able to grow. Implantation occur after fertilization about 6-10 days in human being and 30-35 days in cow , and 50-60 days in mare , and 15-20 days in ewe & goat.

The attached region of the trophoblast immediately differentiates into two layers:

1-An internal cellular layer known as the cytotrophoblast.

2-An external syncytial layer known as the syncytiotrophoblast.

Hatching of the blastocyst from zona pellucida occurs just prior to implantation ..
Occasionally, inability to hatch results in infertility.



Hatching of blastocyst out of zona pellucida

***Syncytiotrophoblast :**

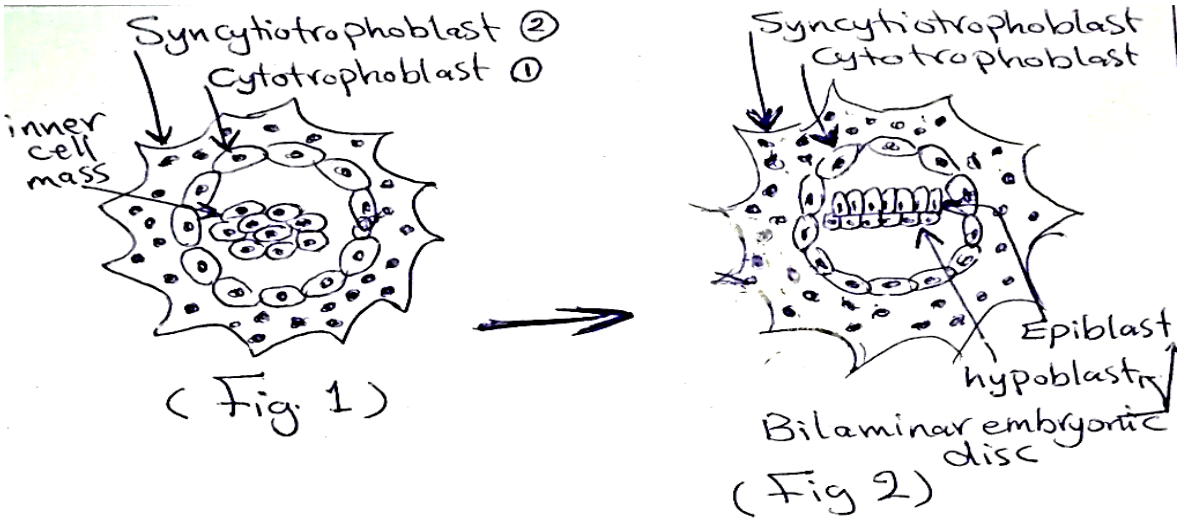
multinucleated protoplasmic mass or syncytium produced during differentiation and division from the migration of some cytotrophoblast to the external layer where they fuse and loose their cell membranes (Fig 1).

By the end of the first week, a layer of cuboidal known as the hypoblast (primitive endoderm) forms on the ventral surface of the inner cell mass, thereby forming the roof of the blastocyst cavity. The remaining cells of the inner cell mass give rise to the epiblast during the second week.

The inner cell mass morphological changes bilaminar embryonic disc

Epiblast (simple columnar) → primitive ectoderm

Hypoblast (simple cuboidal) ⟶ primitive endoderm (Fig 2)



Formation of fetal membrane:

The cytotrophoblast cells proliferate and separate forming the limit of a dorsal cavity with the aid of epiblast, this cavity called the amnion and a ventral cavity by the aid of hypoblast, this cavity called the primary yolk sac(Fig 3) .

Further separation of cytotrophoblast from the extra embryonic mesoderm (cellular layer) occupy the space between cytotrophoblast externally and amnion with the yolk sac. internally (Fig 4) .

Isolated spaces appear in this mesoderm which then coalesce to form a single large cavity known as the extra-embryonic coelom, this coelom separate extra-embryonic mesoderm into somatic layer externally and splanchnic layer internally.

The embryonic disc with it's amnion and yolk sac connect with the chorionic sac by a bundle of extra-embryonic mesoderm called the connecting stalk, which represent the primordium of the umbilical cord (Fig 5).

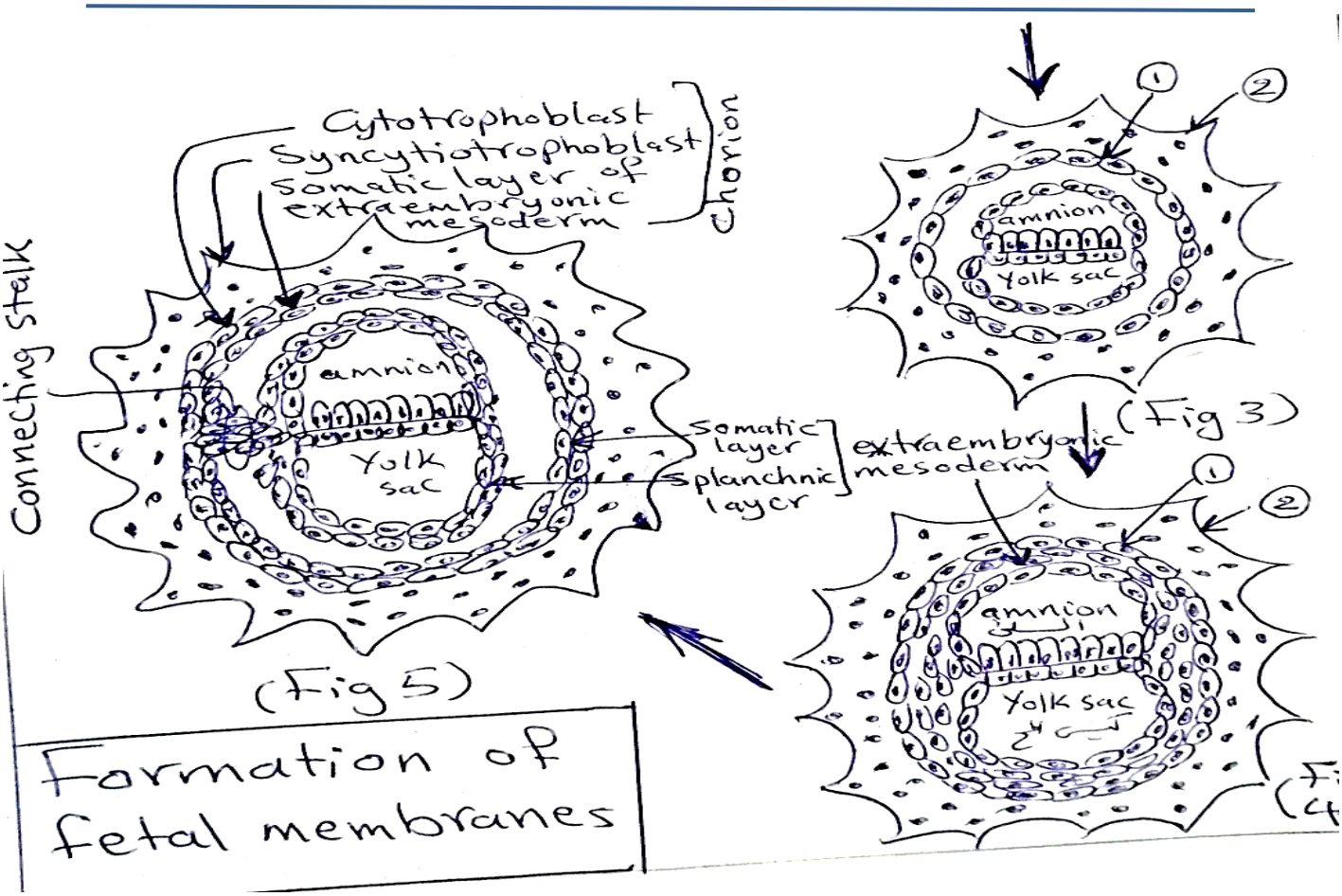
***connecting stalk :** a bundle of extra-embryonic mesoderm that connect the embryonic disc with it's amnion & yolk sac with chorionic sac .

Chorion consists of 3 layers:

1-Syncytiotrophoblast externally.
2-Cytotrophoblast in the middle.
3-Somatic layer of extraembryonic mesoderm internally**.**

***Placenta:**

an organ forms from chorion and endometrium and allow the embryo/fetus to exchange nutrients and wastes.



Functions of fetal membranes:

1-Function of yolk sac :

Nutrient supply for the early developing embryo

2-Functions of amnion :

1-Protects fetus from injury .

2-Provides lubrication for parturition .

3-Serves as a reservoir for urine and waste .

3-Functions of allantois :

1-Fuses with the chorion as chorio-allantoic placenta .

2-Carries blood vessels of umbilical cord , which attaches fetus to allantois.

3-A reservoir for nutrients and waste .

4-Functions of chorion :

1-Attaches to uterus .

2-Absorbs nutrients from the uterus .

3-Allows maternal-fetal gas exchange .

4-Production of hormones .