Cleavage , Implantation & 2nd week of intrauterine life

Cleavage of the zygote leads to formation of morula and blastocyst

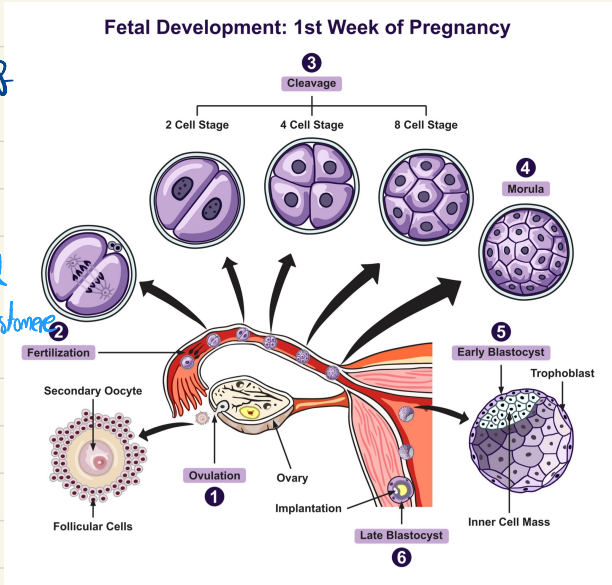
A) Formation of morula:-

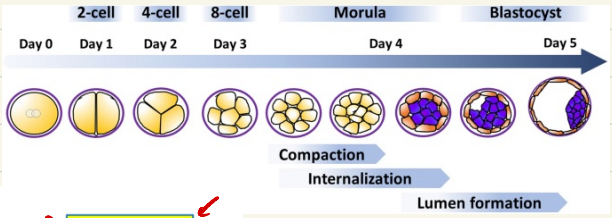
* in uterine tube the zygot divides by repeated mitotic divisions inside zona pellucida to form blastomeres

* it forms 2, 4, 8 cells stages

- The morula is a mass of 16 small blastomeres surrounded by zona pellucida

* it reaches uterine cavity by the 4th day after fertilization





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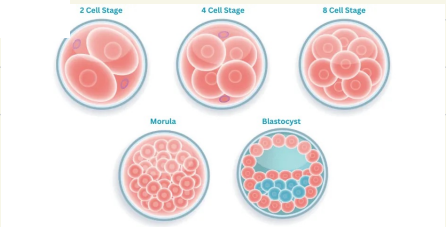
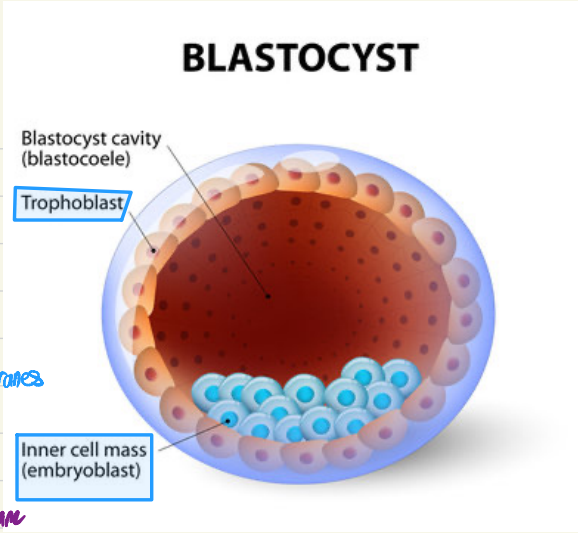
B. Formation of the blastocyst :

- The zona pellucida starts to degenerate at 5th day
- Uterine fluid passes through degenerative zona pellucida
- Many spaces appear between the central blastomeres of the morula
- These spaces fuse together to form a single cavity called the blastocoel.
- The morula is transformed into a blastocyst, formed of 50 - 60 blastomeres
- It lies in contact with the uterine endometrium at 5th- 6th day after fertilization.

Just read it



The blastocyst has the following features:



1- Two cell groups are seprated by blastocoel :

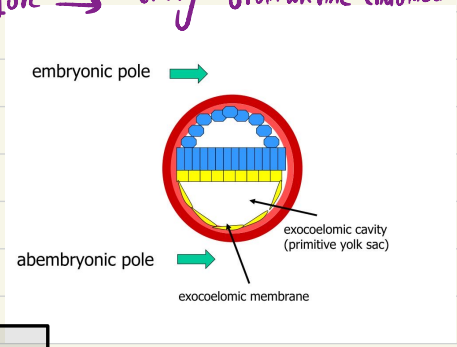
outer cell layer, Trophoblast → will form fetal membranes

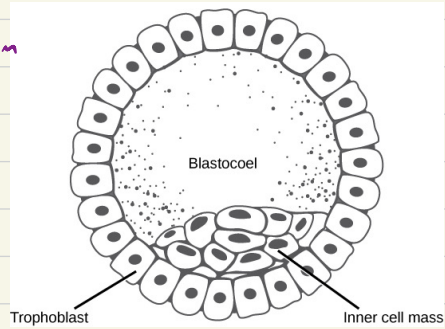
inner cell mass, embryoblast → will form embryo

2. Two poles

embryonic pole → adjacent to uterine endometrium

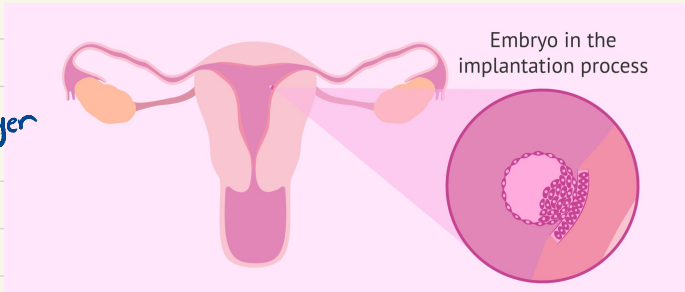
abembryonic pole → away from uterine endometrium





Implantation

Process of penetration of superficial layer of the endometrium by the blastocyte



Time: starts at 6th or 7th day and is completed at 11th or 12th day after fertilization

Site: upper part of the posterior wall of the body of uterus

Mechanism of implantation :

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1-The blastocyst comes in contact to the endometrium by its embryonic pole .

2- Erosion of the mucosa, by enzymes secreted by the trophoblast at the embryonic pole of the blastocyst , forming defect in the endometrium .

3- The blastocyst enter the endometrium , through the defect by its embryonic pole .

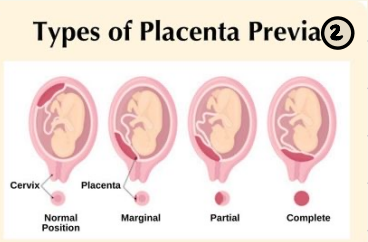
4- After complete embedding of the blastocyst into the endometrium, the defect in the endometrium is closed first by blood clot and later by proliferation of surrounding surface epithelium .

Abnormal sites of implantation

Outside the uterus ①

* Tubal Pregnancy : in uterine tube , usually ruptures within 1-2 months leading to internal hemorrhage
* Ovarian Pregnancy : in the ovary
* Abdominal Pregnancy : in abdominal cavity close to peritoneum or an omentum

② Inside the uterus — Placenta previa



- Partialis : placenta partially covers cervix
- marginalis : placenta reach margin of cervix but not covering it
- Centralis : placenta overlies internal os . It is the most dangerous type

Second week of development

The following changes occuring during 2nd week of pregnancy:

1- Completion of implantation by 11th or 12th day

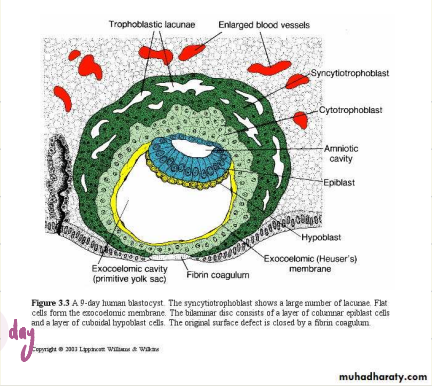
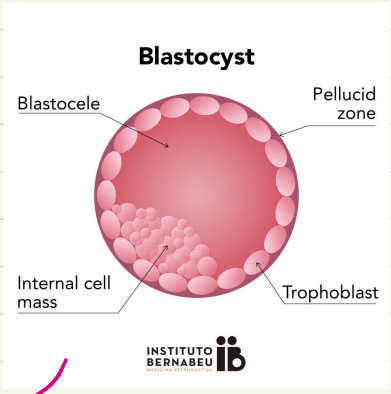
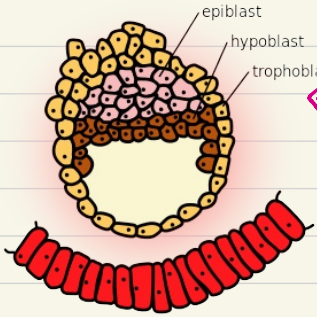


Figure 3.3 A 9-day human blastocyst. The syncytiotrophoblast shows a large number of lacunae. Flat cells form the exocoelomic membrane. The bilaminar disc consists of a layer of columnar epiblast cells and a layer of cuboidal hypoblast cells. The original surface defect is closed by a fibrin coagulum.

2- Changes in embryoblast → bilaminar germ disc

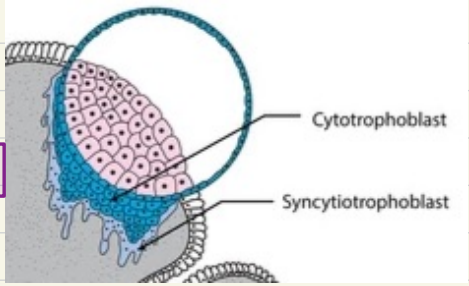
- Epiblast: adjacent to trophoblast in floor of amniotic cavity
- Hypoblast: adjacent to blastocele





3. Changes in the trophoblast:

During 2nd week, the trophoblast is differentiated into an outer syncytiotrophoblast an inner cytotrophoblast



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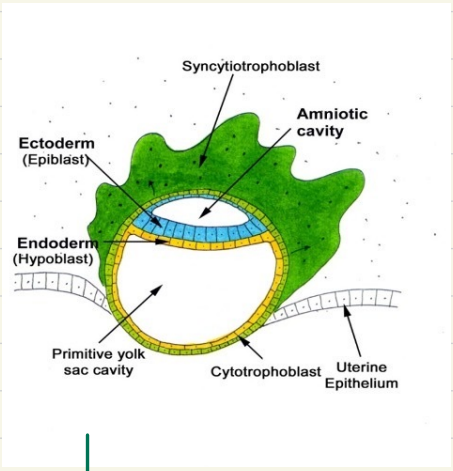
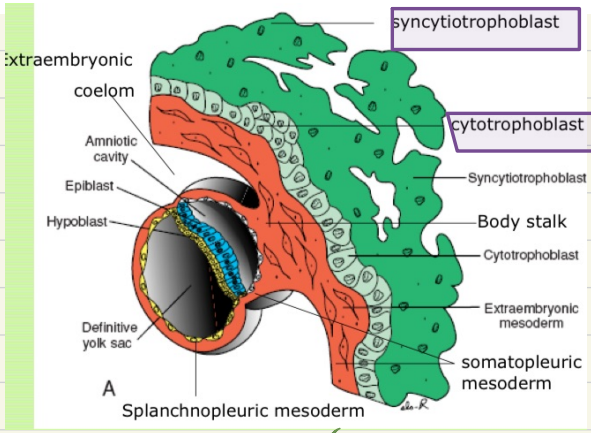
A.Cytotrophoblast:

Its cells maintain their cell walls.

B.Syncytiotrophoblast:

- It is formed of a multinucleated zone without distinct cell boundaries.
- Small spaces appear & coalesce (at the 9th day) in the syncytiotrophoblast, at the embryonic pole first then spread all over the syncytiotrophoblast , to form **trophoblastic lacunae (lacunar stage).**
- At the 11th & 12th days, the syncytiotrophoblast **erodes the maternal sinusoids** and its lacunae are filled with maternal blood & uterine secretions which begins to flow through the trophoblastic lacunae establishing the **utero-placental circulation** which allow nourishment of the germ disc & exchange of gases & metabolites.
- At the end of 2nd week , **1ry. Chrionic villi** appears at the embryonic pole





Formation of 2 cavities:

Ⓑ Primary yolk sac : (9th day) → hypoblast cells form a membrane called exocoelomic membrane (Heuser's) roofs: hypoblast and remaining part of its wall is formed by Hauser's membrane

Ⓐ amniotic cavity (8th day) → The epiblast cells form a layer of flat cells called ↑ amnioblast which form the roof of amniotic cavity while its floor is formed by epiblast

سورة العلق

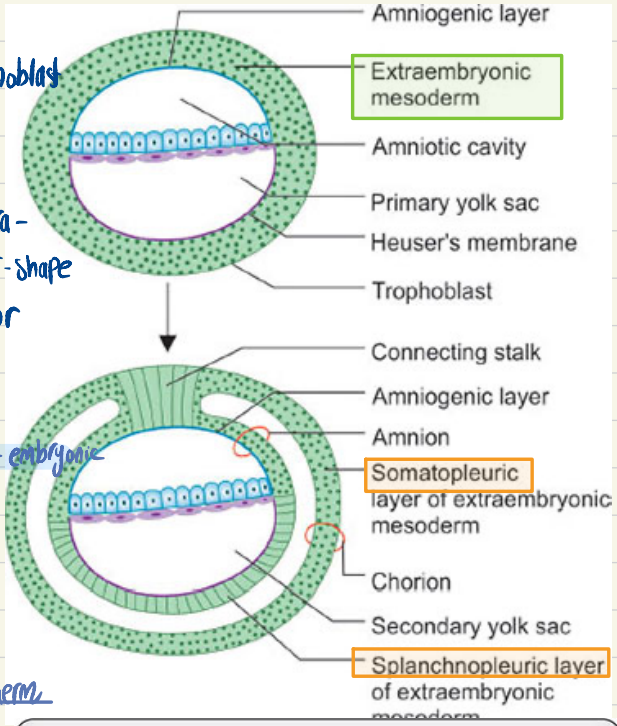
بسم الله الرحمن الرحيم

خَلَقَ الْإِنسَانَ مِن نُّطْفَةٍ فَإِذَا هُوَ خَصِيمٌ مُّبِينٌ ﴿٤﴾

Extra embryonic mesoderm:

* it is a very loose CT between cytotrophoblast externally and yolk sac internally

* cavities appear & coalesce ("unit"), in the extra-embryonic mesoderm, forming a single C-shape cavity called extra-embryonic coelum or chorionic cavity

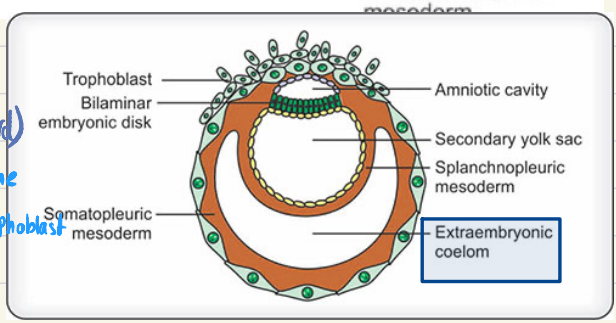


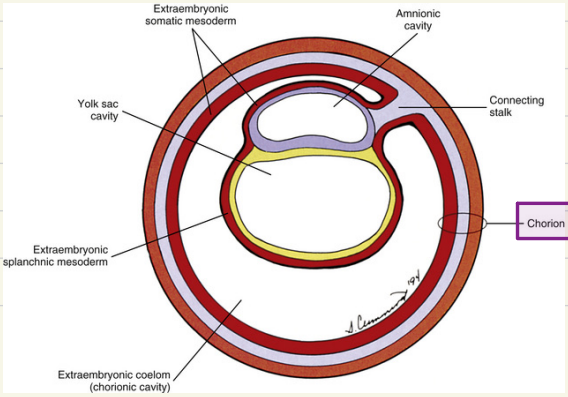
Extra embryonic mesoderm is divided by extra-embryonic coelom into:

(a) Extra embryonic Somatopleuric mesoderm lines the cytotrophoblast

(b) Extra embryonic Splanchnopleuric mesoderm covers yolk sac

(c) Connecting stalk: (future umbilical cord) it is the extra embryonic mesoderm connecting the roof of amniotic cavity with overlying cytotrophoblast





Cytotrophoblast + Syncytiotrophoblast + Extra embryonic mesoderm

→ Chorion

Blastocyst is now called chorionic vesicle