

We start counting day 1 when bleeding starts. Day 1-5. But after bleeding a new follicle starts maturing which contains a new egg.

Ovarian cycle

- These are **periodic changes** which occur in the **ovary** every lunar month (28 days) during the **fertile period** of the **non pregnant** female.

↳ corpus luteum → stratum functionalis doesn't shed

- **The ovarian cycle is divided into three phases:**

- ① **Preovulatory** (follicular) phase. → FSH → estrogen released by granulosa of Graafian follicle (mature follicle) + other primary follicles
- ② **Ovulation.** → LH
- ③ **Postovulatory** (Luteal phase). → estrogen + progesterone

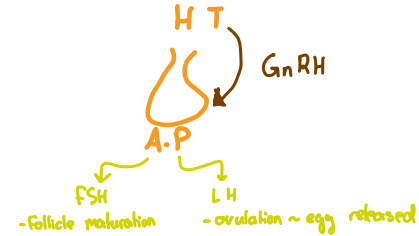
dominant follicle

FSH causes follicle to mature & release estrogen

Hormonal control of Ovarian cycle

Hypothalamus secretes Gonadotropin releasing hormone (GnRH)

GnRH stimulate anterior lobe of the pituitary gland which secrete two gonadotrophic hormones (FSH, LH),

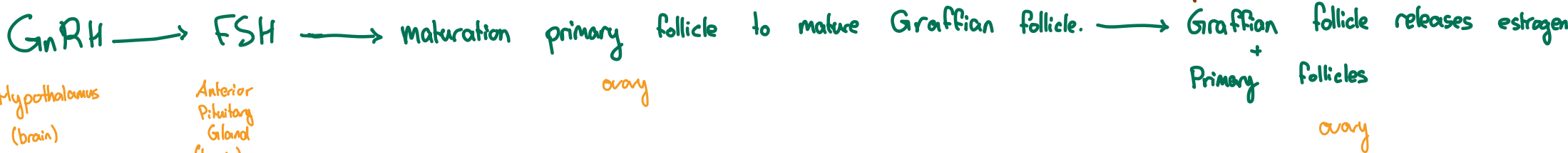


1. Follicle stimulating hormone (F.S.H): it acts in the first stage of the ovarian cycle and has the following effects.

- It induces maturation of primary follicle into Graafian follicle.
- It induces the follicular cells to secrete **estrogens**.

Follicular / preovulatory / proliferative phase
 ① Estrogen released from follicles is used to regenerate stratum functionalis using stratum basalis
 ② Estrogen released from corpus luteum used to thicken uterus for possible pregnancy & implantation
 luteal / post-ovulatory / secretory phase
 the estrogen increases the thickness of uterus (stratum functionalis)

↳ Graafian (NOT primordial)
 ↳ Primary → then die from LH. Form atretic follicles
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 Besh Doctor



Hypothalamus (brain)

Anterior Pituitary Gland (brain)

ovary

Graafian + Primary follicles
 ovary

* FSH => Begins maturation

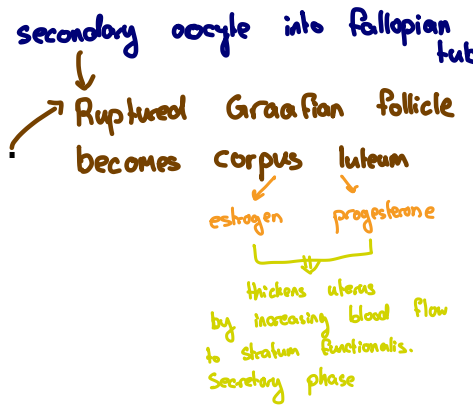
* LH => Ends maturation of follicle. Forms Graffian follicle

2. **Lutenising hormone (L.H)**: it acts mainly in the second stage of the ovarian cycle and has the following effects:

- 1- It induces final maturation of Graffian follicle and ovulation.
- 2- It induces the conversion of the ruptured follicle into a corpus luteum.
- 3- It induces corpus luteum to secrete **progesterone + Estrogen**.

→ ovulation

→ release of secondary oocyte into fallopian tubes.



Stages of the ovarian cycle

I. PREOVULATORY (FOLLICULAR) PHASE: (1st half of the cycle)

- At the **beginning** of each ovarian cycle, the anterior lobe of pituitary gland secretes **FSH** which stimulates several **primordial follicles** to develop → only one becomes Graffian follicle. Primordial → Primary → Secondary → Graffian (dominant follicle) → prim oocyte → prim oocyte → sec. oocyte → Graffian sec oocyte
- Only one follicle** reaches maturity and **secretes estrogen** which **inhibit** secretion of **FSH** by pituitary gland → Why? The Graffian releases estrogen which both regenerates uterus AND inhibits FSH to prevent any more follicles from maturing so only one egg is released AND stimulates LH which causes remaining follicles to die forming atretic follicles. And LH surge which causes ovulation
- Estrogen** stimulate secretion of luteinizing hormone (**LH**) leading to **degeneration** of the remaining follicles which become **atretic follicles**.
- The **estrogen** secreted in this phase is responsible for the **proliferative phase of the uterine cycle**. → regeneration of stratum functionalis.

FSH

estrogen

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① Inhibit FSH - So only one Graffian produced

Estrogen Role in Pre-Ovulation: ② Stimulate LH → kill all remaining follicles - No need for them. Become atretic follicles. + LH surge => ovulation

③ Regenerate uterus lining - Regenerates stratum functionalis from stratum basalis. + enlarge mucous glands → like osteogenic cells in periosteum regenerating bone

Ovulation: LH results in:

* Collagenase → Breaks down collagen fibers around Graafian follicle

* Prostaglandin → Contraction of uterus ⇒ squeezes Graafian follicle and causes release of secondary oocyte + corona radiata + zona pellucida

* kills other follicles → atretic follicles

* Forms corpus luteum

II. OVULATION :

→ estrogen surge results in LH surge → ovulation
also kills other follicles → atretic follicles

▪ Luteinizing hormone (LH):

1. Stimulates **collagenase** activity resulting in digestion of collagen fibers surrounding the mature Graafian follicle.
 2. Increases **prostaglandin** activity resulting in **ovarian contraction**.
- **Rupture of the mature Graafian follicle** on the surface of the ovary leads to release of secondary oocyte together with the corona radiata and the zona pellucida

↳ cortical & zona reactions ⇒ change sperm binding site so only 1 sperm enters.

III. POST OVULATORY (LUTEAL) PHASE:

- **After ovulation**, Under the effect of **luteinizing hormone**, the **corpus luteum is formed**.

Corpus luteum secretes **progesterone** hormone responsible for **secretory phase of uterine cycle** and **inhibit** pituitary LH.

↳ increase blood flow to stratum functionalis
Thickens endometrium.

Ready for implantation.

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Pre - Ovulation: Estrogen inhibits FSH + estrogen stimulate LH

Post - Ovulation: Progesterone inhibits both FSH & LH

* No Fertilization \Rightarrow No HCG hormone released. Corpus luteum degenerates & forms corpus albicans. Stops releasing progesterone and FSH levels increase

* Fertilization \Rightarrow Embryo releases HCG. Corpus Luteum stays & releases progesterone \rightarrow endometrium thickens & transforms into decidua.
↳ of pregnancy
Months 1 \rightarrow 4: progesterone from corpus luteum of pregnancy
Months 4 \rightarrow 9: progesterone from placenta.

- Fate of corpus luteum:

A. If fertilization does not occurs

the corpus luteum **degenerate**, becomes **corpus albicans**.

Degeneration of corpus luteum leads to **decrease progesterone** level in the blood.

progesterone inhibits FSH.
No progesterone so we get FSH
and new cycle starts. \rightarrow follicle maturation

B. If fertilization occurs the corpus luteum changes to **corpus luteum of pregnancy**

(which is maintained till the **4th month** of pregnancy by the human **chorionic**

HCG.

Hormone used \leftarrow **gonadotropin hormone** secreted from the embryo). After that, the formed **placenta** will secrete progesterone till labor. \rightarrow after 3 months (4th month) the corpus luteum dies.
If fertilization then HCG is released by embryo

Uterine (Menstrual) Cycle

\rightarrow stratum functionalis + stratum basalis

- These are **periodic changes** which occur in the **endometrium** (mucous membrane of the uterus) every lunar month (28 days) during the **fertile period** of the **non pregnant** female. \rightarrow in pregnant. The embryo releases HCG hormone that causes corpus luteum to stay. Continuous production of progesterone means that FSH doesn't rise. No maturation of follicles \rightarrow no ovulation \rightarrow no enrichment of endometrium

It passes through **three phases**:

I. Menstrual phase \rightarrow bleeding. Cuz no progesterone

II. Proliferative (estrogenic or postmenstrual) phase \rightarrow Regenerate stratum functionalis

III. Secretory (premenstrual or progestational) phase \rightarrow Thickening. \uparrow blood flow to spiral long arterioles of stratum functionalis

\uparrow mucous gland length

\rightarrow no bleeding when no fertilization cuz corpus albicans, no progesterone & cycle starts again

During the **secretory** phase of the menstrual cycle, the **endometrium** itself is formed of :

1. **Stratum functional** → touching cavity → increase size then sheds if no pregnancy

2. **Stratum basalis** → touching myometrium → used to regenerate stratum functionalis

- The **Stratum functional** are supplied by **long spiral arteries**, which are dilated by progesterone hormone.
- The functional layer of the endometrium **shed at menstruation**.
- The **basal layer** is supplied by its own **short straight arteries**, and it does not shed during menstruation.
↳ not affected by progesterone
- It forms the regenerative layer of the endometrium, which is responsible for reformation of the uterine glands after menstruation.

I. Menstrual phase : (3-5 days)

- It corresponds to the **beginning** of the **pre-ovulatory phase** of the ovarian cycle.
- **Cause : decreased** progesterone level & estrogen level to less extent (at the end of the previous luteal phase of ovarian cycle) , leading to **constriction of spiral arteries** supplying the superficial part of endometrium .
↳ those of the stratum functionalis
- The superficial part of **endometrium** degenerates and expelled with **mucous & unclotted blood**.
↳ we have mucousal cells
- At the end of this phase the endometrium is reduced in thickness .

* Reduced progesterone & estrogen because corpus albicans form cuz no HCG hormone.

↳ Remains constant. Is used to regenerate stratum functionalis in proliferative phase

- The **basal layer** of the endometrium is not affected.

II. Proliferative (estrogenic or postmenstrual) phase : (10 days)

- It corresponds to the **last 10 days** of the **pre-ovulatory** phase of the ovarian cycle.
- It is under the effect of **estrogen** hormone secreted by developing follicle.
- The **endometrium** is gradually regenerate and thickened; its blood supply increases, and its mucous glands enlarge. ↳ long + spiral

III. Secretory (premenstrual or progestational) phase : (last 14 days)

- It corresponds to the **postovulatory** phase of the ovarian cycle.
- It is under the effect of **progesterone** hormone mainly (from corpus luteum) & estrogen to less extent .
- The thickness of the **endometrium** is markedly increased. The **arteries** become spiral, and the **mucous glands** become long , tortuous & distended with secretion .

↳ increased mucous gland secretion

→ NO HCG ⇒ Form corpus albicans

- **If fertilization does not occur:** the corpus luteum degenerates with drop in the progesterone hormone which leads to vasoconstriction of the spiral arteries leading to ischemia of the functional layer of the endometrium followed by its shedding with bleeding. ischemia → restricting blood flow

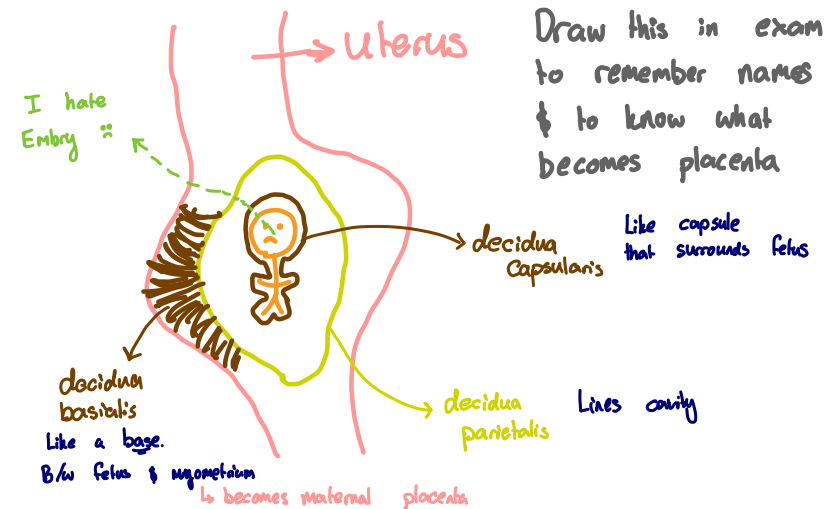
- **If fertilization occurs:** corpus luteum is transformed into corpus luteum of pregnancy and continues to secrete progesterone. ↳ cuz HCG

Now the uterine endometrium is transformed into what is called decidua of pregnancy to receive the zygote → implantation

C. The decidua has three parts :

- Decidua is the endometrium of pregnancy which is divided into three parts:

- 1. Decidua basalis:** between the fetus and myometrium. It will form the maternal part of the placenta
- 2. Decidua capsularis:** covers the rest of the foetus.
- 3. Decidua parietalis:** lines the uterine cavity.



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FSH ⇒ stimulate maturation

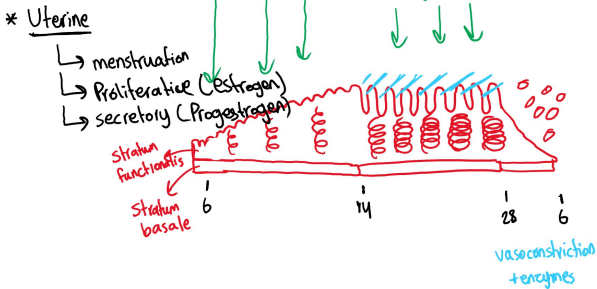
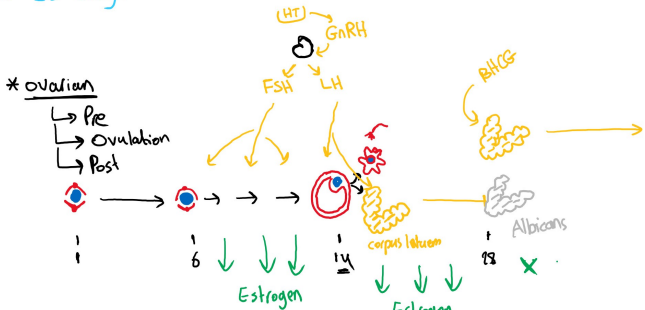
LH ⇒ ovulation + kill other follicles + final maturation

Estrogen ⇒ increase uterus lining + inhibit FSH + stimulate LH + forms corpus luteum

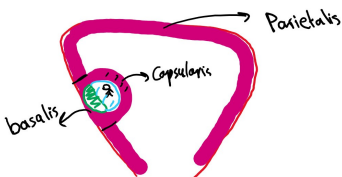
Progesterone ⇒ increase uterus lining + inhibit FSH + inhibit LH

Ovarian and Menstrual Cycle

~ 28 days



Decidua = Endometrium of Pregnancy



The intra-uterine life is **divided into** 3 periods :

	1-Germinal period	2-Embryonic period	3-Fetal period
Duration	1 st 2 weeks <i>includes Fertilization + Migration + Cleavage + implantation</i>	3-8 weeks <i>Gastrulation</i>	From beginning of 9 th week to birth
Characters	Formation of 2 germ layers (ectoderm & endoderm)	-Formation of mesoderm -Differentiation of 3 germ layers to organs & systems (organogenesis)	- Growth of organs & systems . - Appearance of external features of the fetus .
Congenital anomalies	More liable to occur during the germinal and embryonic periods .		Less liable to occur .

I-Fertilization

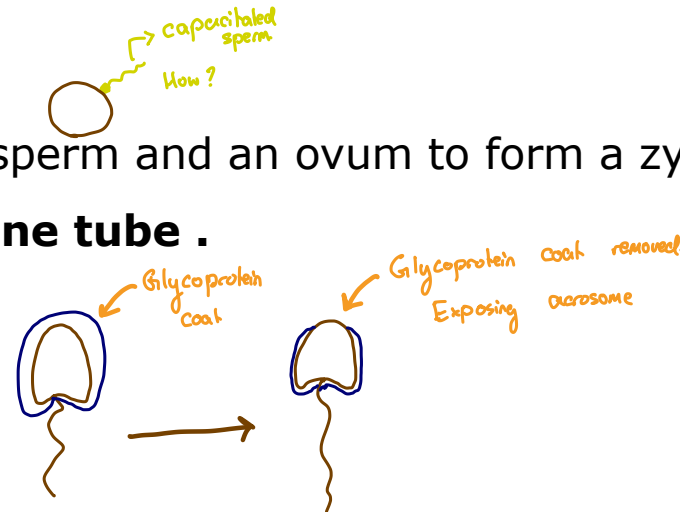
Definition : is the fusion between a single sperm and an ovum to form a zygote

Site : it occurs in the **ampulla of the uterine tube .**

Process of fertilization: -

1-Capacitation of the sperms:

- It occurs in the uterus and uterine tube.
- It is the process of removal of glycoprotein coat which covers acrosome of the sperm.
- This **increases** the **activity** of the sperms.



* Occurs in females uterus
* ↑ Activity

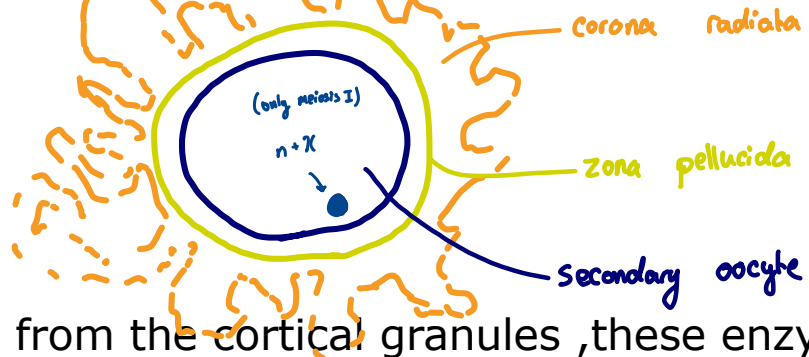
2-Penetration of the zona pellucida:

- The capacitated sperms **pass through corona** radiate to reach and **bind to the zona** pellucida at specific **binding sites**. → Imp: Receptors are on zona pellucida. Not corona radiata.
- They start secreting **acrosomal enzymes** that allow only **one** sperm to **penetrate** the zona pellucida (**acrosomal reaction**).
- The plasma membrane of the head **fuses** with that of the 2nd oocyte.

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↳ releasing sperm contents into 2nd oocyte.

Acrosomal RXN ≠ Cortical & zona RXN



→ Prevents more sperm from entering

3. Cortical and zona reactions:

The secondary oocyte releases enzymes from the cortical granules, these enzymes cause:

- Changing of the **sperm binding sites** at the **zona pellucida** preventing entry of more sperms. → Related. It 'Hides' sperm binding site so only one sperm enters
- Changing the **plasma membrane** to become **impermeable** to other sperms.

4. Completion of the 2nd meiosis:

The 2nd oocyte changes to a mature ovum.

5. Formation of male and female pronuclei:

- The nucleus of the sperm mature ovum enlarge to form the male and female pronucleus.

6. Fusion of the male and female pronuclei

to form a new cell called the zygote

ORDER:

① 2nd oocyte meiosis II → ovum produced

② sperm & ovum mature → female & male pronuclei

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③ fusion of F & M pronucleus to form zygote.

X X female
X or Y X Y male

* XXY → klinefelter syndrome

* XO → Turner syndrome

Results of fertilization

A. In the zygote:

1. Restoration of the diploid number of chromosomes (46).
2. Sex determination:

Fertilization by X - bearing sperm will form XX zygote giving rise to a female.

Fertilization by Y - bearing sperm will form XY zygote giving rise to a male.

3. Initiation of cleavage of the zygote, which is a series of rapid successive mitotic divisions.

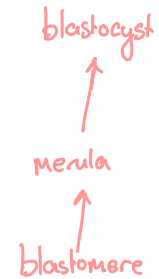
B. In the ovary:

1. Ovulation stops due to the feed back inhibition of the pituitary gland by the high level of estrogen and progesterone. → High levels of progesterone inhibit FSH

2. Corpus luteum enlarges and forms corpus luteum of pregnancy → Progesterone + estrogen secretion

C. In the uterus:

1. Menstrual cycles stop.
2. The secretory phase of the endometrium (under the effect of hormones of corpus luteum) continues to grow forming the decidua of pregnancy.



Chromosomal anomalies

A. Sex chromosome anomalies:

1. Klinefelter syndrome (44 + XXY): male with rudimentary testis. *Y so male.*
2. Turner syndrome (44 + XO): female with rudimentary ovaries and no sex maturation. *↳ nothing. Only X*

B. Autosomal anomalies:

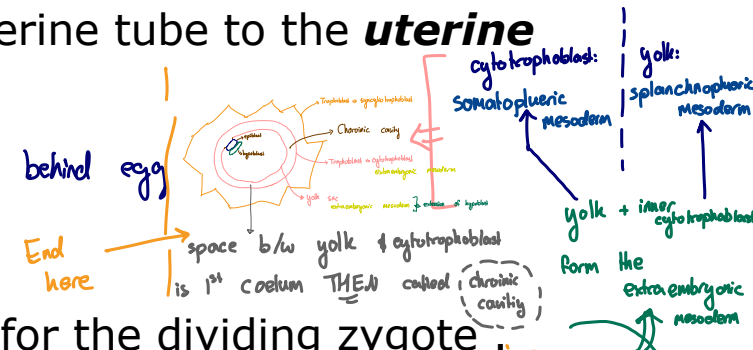
Represented by Down syndrome or trisomy of chromosome 21 (mongolism) in which the zygote contains 47 chromosome either 45 + XY (male) or 45 + XX (female). *↳ 3, instead of the 2 (pair)*

II-MIGRATION

- The **transport** of the zygote from the lateral 1/3 of the uterine tube to the **uterine cavity** takes place by 3 mechanisms:

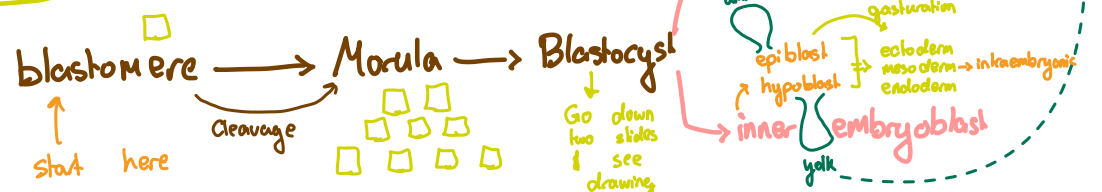
1. Muscular **peristalsis** of the uterine tube. *smooth muscle contraction behind egg*
2. The motion of the **cilia** of tubal mucosa.
3. **Secretion** of a fluid which act as a vehicle & nourishment for the dividing zygote.

cleavage takes place
uterine tube → Endometrium



Tubal Mucosa ⇒ type of epithelium
↳ Fallopian tube / uterine tube
↳ mucous
↳ cilia flopping.
↳ fluid secretion.

Simplified Summary: Memo names well.
Will make understanding easier
Follow Arrow



Fertilization

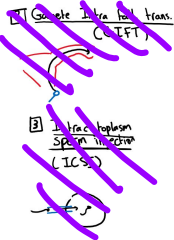
Intrauterine life : fertilization → birth

- ↳ Germinal 0-2 wks
- ↳ Embryonic 3-8 wks
- ↳ Fetal 9wk → birth

First week

1. Fertilization
2. migration
3. Cleavage
4. Implantation

~~Artificial Fert~~



* Fertilization

Fusion of sperm + oocyte (2n)



Site: Ampulla

* Capacitation
in uterus & tube



only capacitated sperm can pass ZP & Corona radiata

* Acrosomal Reaction
Penetration of ZP



* Cortical + Zona Reaction
changes binding site impermeable



→ completion of MII → male Pronucleus + female ♂ → fusion → Zygote (2n)

* Results of Fert.

• Zygote

2n

Sex determination

XX XY
female male

Starts cleavage

• ovary



no more ovulation

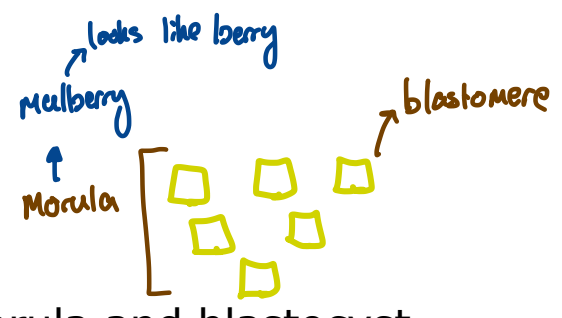
• uterus

Secretory Phase

no menstruation

Migration this happens: **Cleavage!** ○ → ⊕ → ⊗ → ⊛ → *blastomere*

blastomere ≠ Morula ≠ blastocyst



Memo how?
Blastocyst: Looks like a cyst. fluid filled
Morula: Looks like mulberry
Blastomere ⇒ individual cells

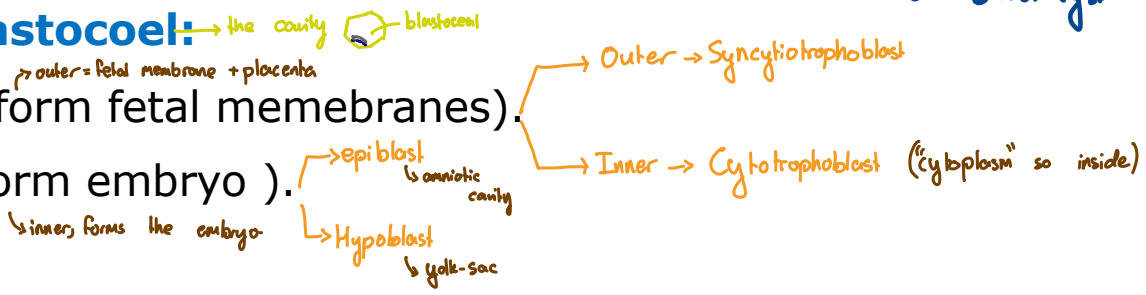
Cleavage of the zygote leads to formation of morula and blastocyst

A. Formation of the morula :

- In the **uterine tube** the zygote divides by repeated **mitotic** divisions to form small blastomeres. It forms 2, 4, 8 cells stages. → Cleavage, forming morula
- The **morula** is a mass formed of 16 small blastomeres surrounded by **zona pellucida**.
- The blastocyst has the following features: → Fluid enters morula and internal cavity formed. Now known as blastocyst

1. Two cell groups separated by the blastocoel:

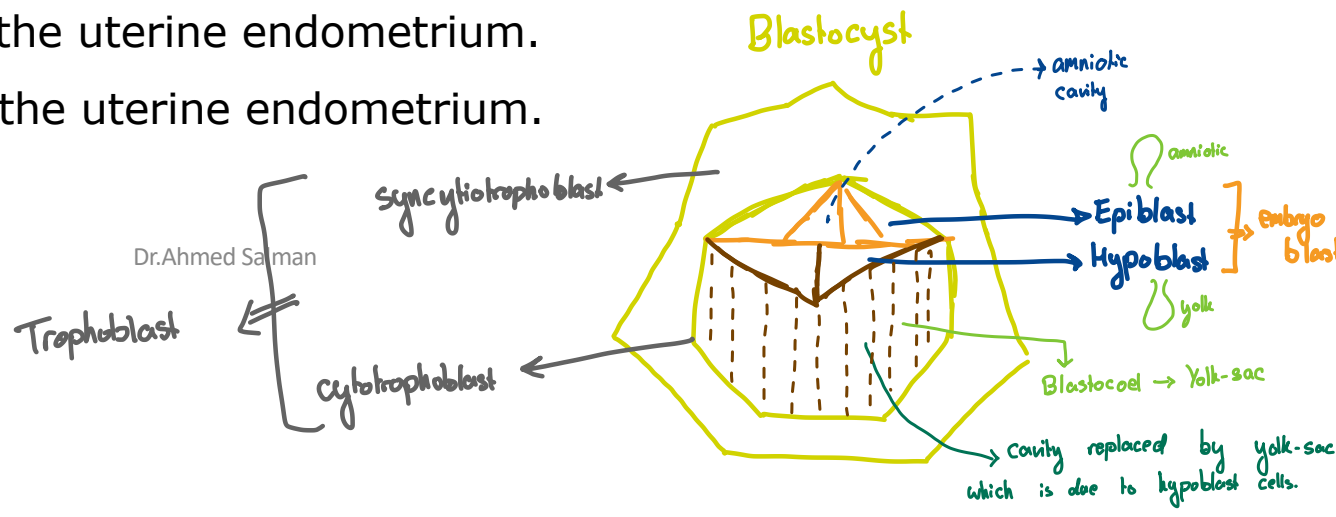
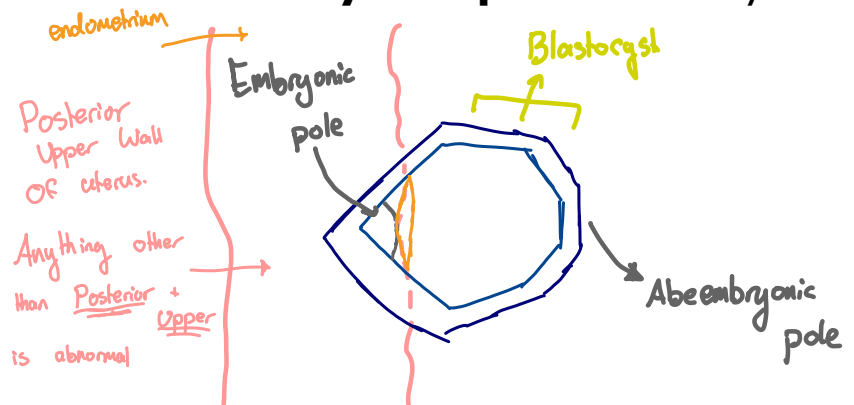
- Outer cell layer, **the trophoblast** (It will form fetal membranes).
- Inner cell mass, **the embryoblast** (will form embryo).



2. Two poles:

Embryonic pole: it is adjacent to the uterine endometrium.

Abembryonic pole: is away from the uterine endometrium.



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Implantation

Definition: It is the process of penetration of the superficial layer of the endometrium by the blastocyst.

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

Abnormal sites of implantation :

A-Outside the uterus

1-Tubal pregnancy : In the uterine tube ^{fallopian tube} **2-Ovarian pregnancy :** In the ovary .
3-Abdominal pregnancy : In the abdominal cavity

B-Inside the uterus (placenta previa):

-Implantation occurs in the lower segment of the uterus, it called the placenta previa may be one of three types:

•**1-Placenta previa Partialis** :The placenta partially covers your cervix.

2-Placenta previa marginalis : The placenta reach the margin of the cervix **BUT NOT** covering it .

3-Placenta previa centralis : The placenta overlies internal os.

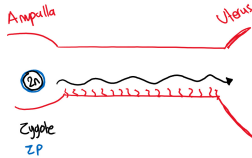
* Placenta Previa ⇒ Lower part of uterus.

* Partialis ⇒ Partially covering cervix

* Marginalis ⇒ Margins of cervix. NOT covering

* Centralis ⇒ Fully covers cervix

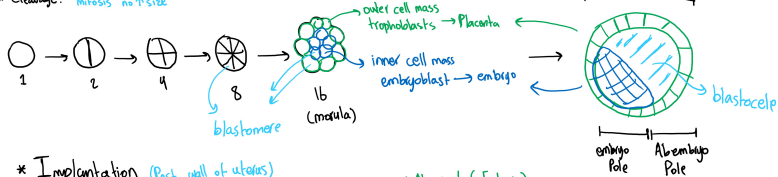
First Week



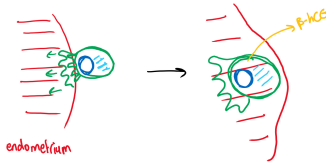
* migration:

Cilia, Peristalsis, secretions

* Cleavage: mitosis \rightarrow size



* Implantation (Post. wall of uterus)

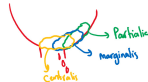


* Abnormal (Ectopic)

A. Outside the uterus

- Tubal
- Ovarian
- Abdominal

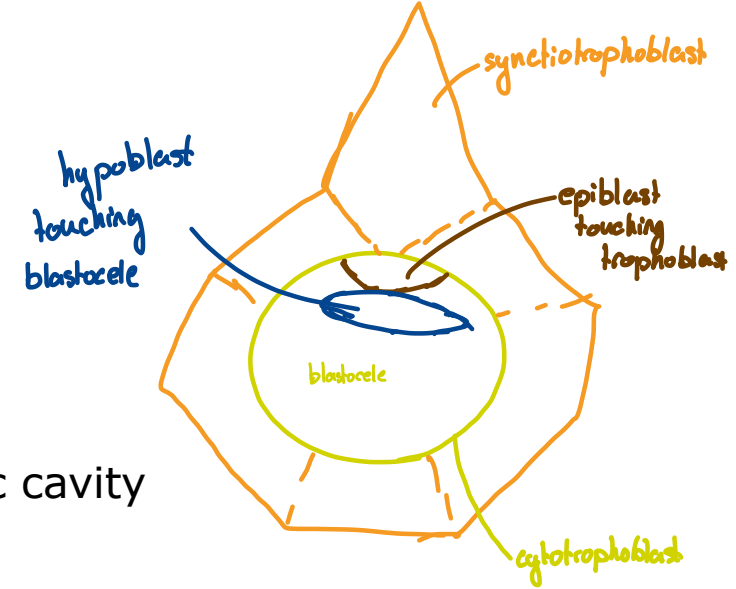
B. in the uterus
[Placenta Pervia]



The following changes occur during 2nd week of pregnancy :

Changes in the ^{inner}embryoblast :

- Formation of the **bilaminar germ disc** :
- 1-**Hypoblast** adjacent to the blastocele. ^{cavity}
- 2-**Epiblast** adjacent to the trophoblast in floor of the amniotic cavity



Changes in the ^{outer}trophoblast :

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

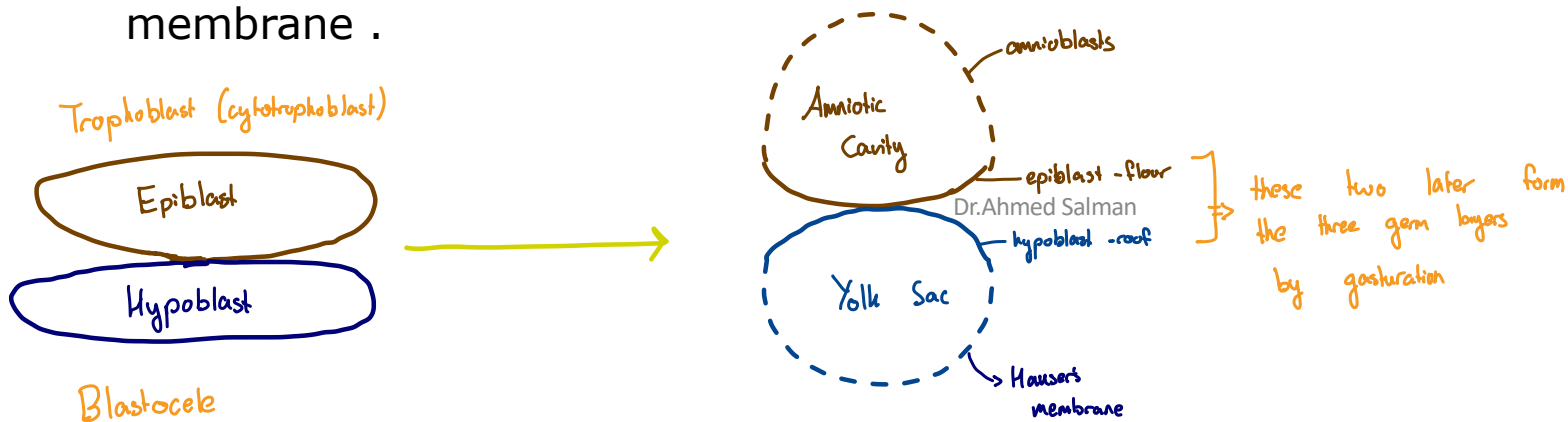
- Formation of 2 cavities :

A. Amniotic cavity : (8th day) → Epiblast

- The **amnioblasts** form the **roof** of the amniotic cavity while its **floor** is formed by the epiblast .

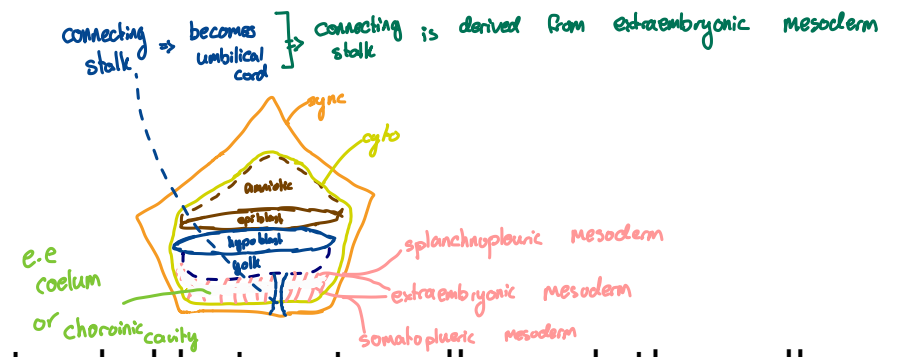
A.Primary yolk sac : (9th day) → Hypoblast

- Its **roof** is the hypoblast and the remaining part of its wall is formed of Hauser's membrane .



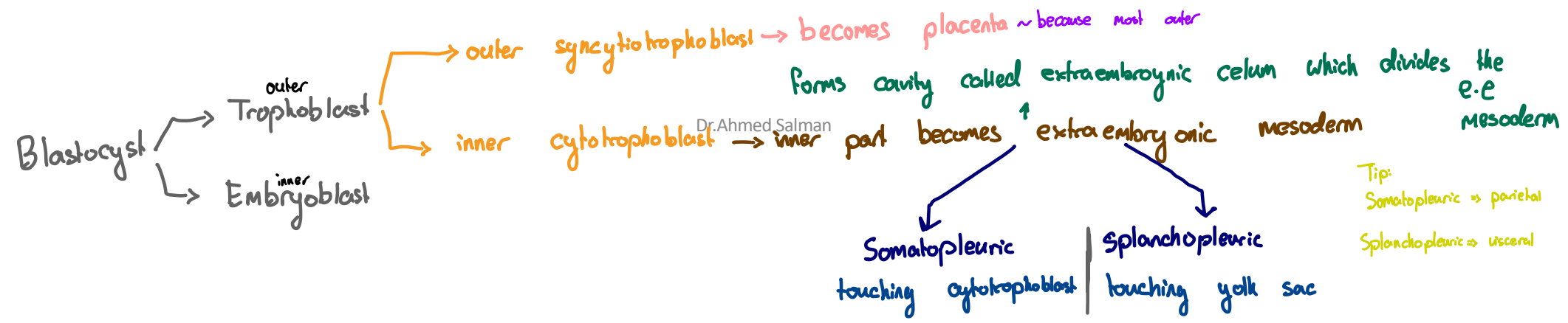
Extraembryonic mesoderm → blood vessels for nutrient exchange

Intraembryonic mesoderm → blood vessels of uterus



-Extraembryonic mesoderm:

- It is a very loose tissues between the cytotrophoblast externally and the yolk sac internally.
- Cavities appear & coalesce , in the extra-embryonic mesoderm , forming a single large C shape cavity called the extra-embryonic coelom (or chorionic cavity).
- The extra-embryonic mesoderm is **divided** by the extra-embryonic coelom into:
 - a. **Extraembryonic somatopleuric mesoderm** which line the cytotrophoblast
 - b. **Extraembryonic splanchnopleuric mesoderm** which cover the yolk sac.
 - c. **Connecting stalk** : (future umbilical cord).



Blastocyst

Outer cell layer, Trophoblast

Inner cell mass, the embryoblast

outer syncytiotrophoblast

Epiblast adjacent to the trophoblast

Hypoblast adjacent to the blastocele

Inner cytotrophoblast

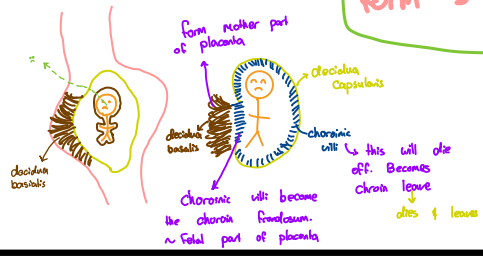
gastulation
epiblast cells migrate & form 3 germ layers

exocoelomic membrane

utero-placental circulation

Yolk sac

→ Decidua Basalis ⇒ mother's placenta
→ Syncytiotrophoblast ⇒ fetus's placenta



Extraembryonic mesoderm

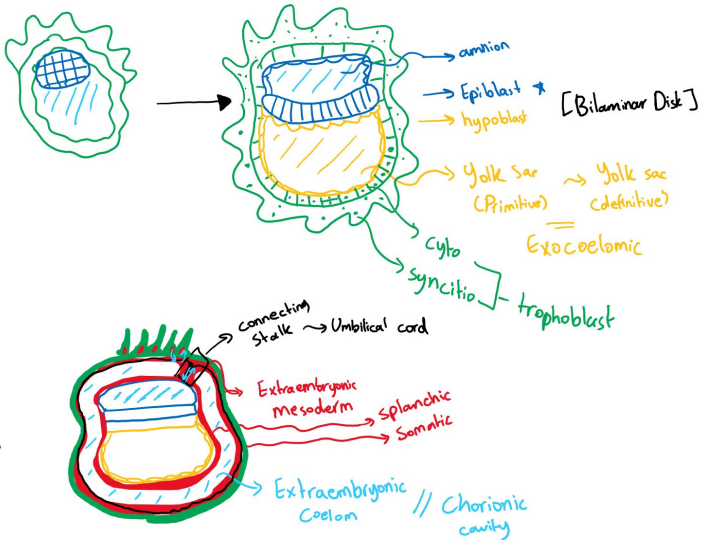
Connecting stalk (future umbilical cord) **connecting** the roof of amniotic cavity with the over lying cytotrophoblasts

Extraembryonic splanchnopleuric mesoderm (cover the yolk sac)

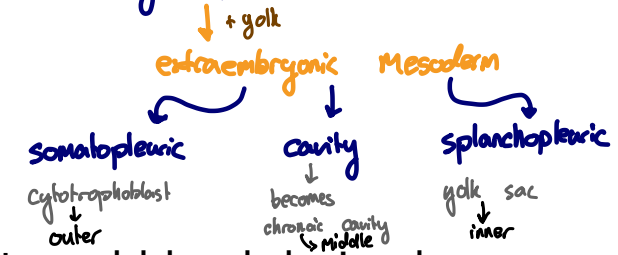
Extraembryonic somatopleuric mesoderm (line the cytotrophoblast)

Embryology

2nd week



Extraembryonic Celum $\xrightarrow{\text{Expands}}$ Chorionic Cavity \therefore Blastocyst \rightarrow trophoblast \rightarrow cytotrophoblast



Placenta:

- The chorionic villi** \rightarrow these dig into the mother's endometrium & form placenta
- The chorion gives rise to finger-like processes called chorionic villi
- The spaces (lacunae) between the chorionic villi are filled with maternal blood derived from the uterine vessels.

Types of Chorionic Villi

A. Primary chorionic villi

Consists of a (syncytiotrophoblast + cytotrophoblast)

B. Secondary chorionic villi:

2ry villus is formed of (cytotrophoblast + syncytiotrophoblast + core of mesoderm)

C. Tertiary chorionic villi:

Tertiary villus is formed (syncytiotrophoblast + cytotrophoblast + core of mesoderm + blood capillaries).

- 1 $^{\circ}$ \rightarrow Syncytio + cyto
- 2 $^{\circ}$ \rightarrow Syncytio + cyto + extraembryonic core of mesoderm
- 3 $^{\circ}$ \rightarrow Syncytio + cyto + ee mesoderm + blood capillaries for nutrient exchange

Parts of chorion

➤ Chorion frondosum

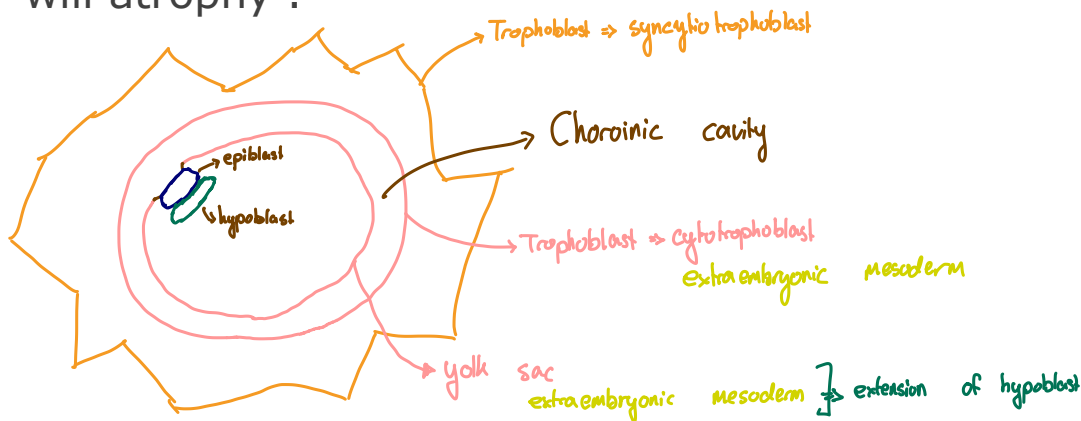
The villi adjacent to decidua basalis (of endometrium) enlarge and form chorion frondosum, which will form the fetal part of the placenta.

➤ Chorion leave

The villi adjacent to decidua capsularis (of endometrium) will form the chorion leave, which will atrophy.

Chorion \neq chorionic villi \neq chorionic cavity $\} \rightarrow$ all help form the placenta

See explanation above

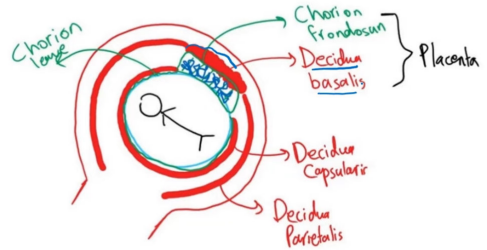


Gastrulation:



- \therefore epiblast cells: Remain: ectoderm
- Intrae hypoblast: endoderm
- B/w hypoblast & epiblast: mesoderm

Placenta



3rd week → 3 germ layers formed. So... Gastrulation occurs in third week

Gastrulation :

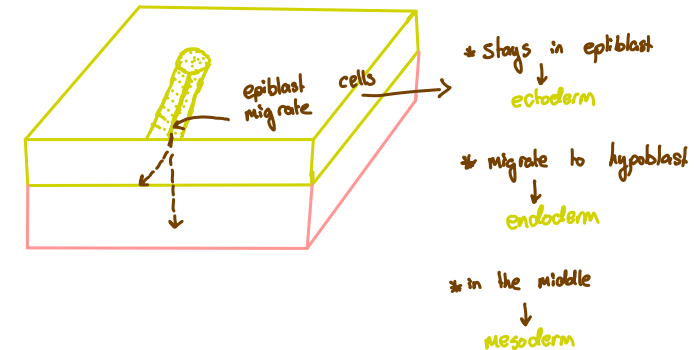
It is the process of transformation of the **bilaminar embryonic disc** to form a **trilaminar germ disc**



2. Invagination :

The cells of epiblast, slip beneath primitive streak to :

- Invade and replaces the hypoblast to form the **endoderm**.
- The remaining part of the epiblast forms the **ectoderm**
- Some of the invaginated epiblast cells migrate between the ectoderm and the endoderm to form **intra-embryonic mesoderm**. → intra & NOT extra



The embryonic disc remain bilaminar (ectoderm and endoderm with no intervening mesoderm) in **2 sites** : → The two extreme ends.

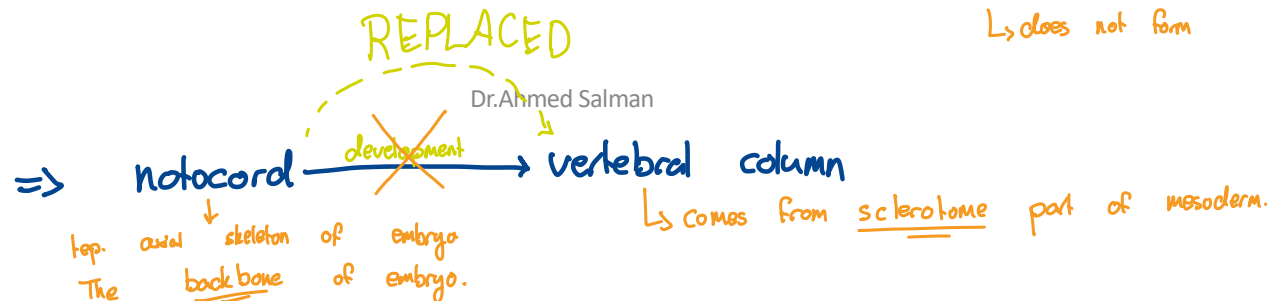
1) Prochordal plate

2) Cloacal membrane

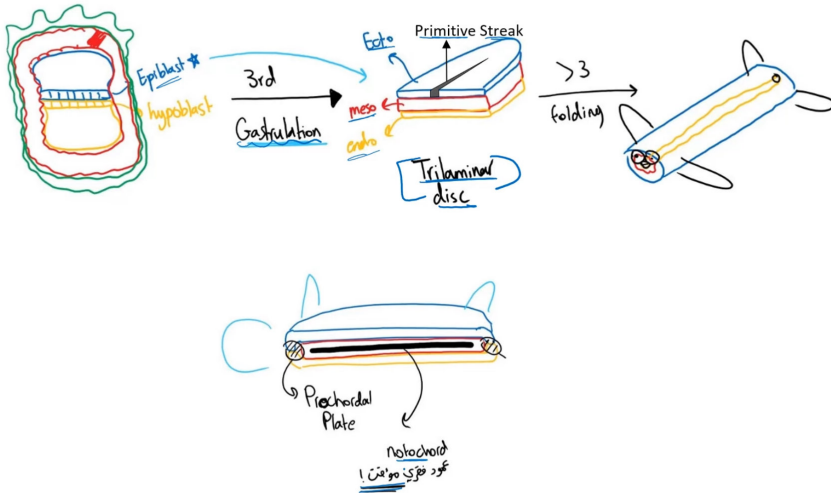
See karam's pic next slide

➤ Significance of notochord :

It acts as **temporary axial skeleton** for the embryo being replaced later on by the vertebral column.

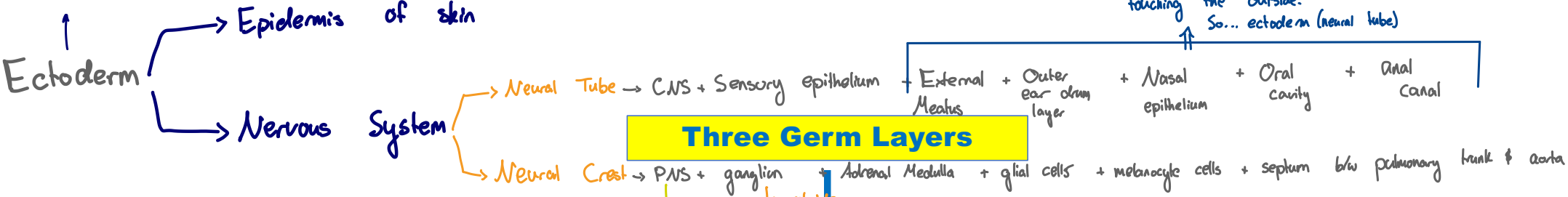


Third Week



forms tube + ectoderm outside so skin is logical

all these are touching the outside. So... ectoderm (neural tube)



Three Germ Layers

Ectoderm

Endoderm

- 1-The epidermis of the skin
- 2. Nervous system :
 - **The neural tube** gives brain , spinal cord Peripheral nerves.
 - **Sensory** epithelium of sensory organs
- 3. External auditory meatus & outer layer of ear drum .
- 4. Nasal epithelium
- 5. Anterior part of oral cavity and lower 1/2 of anal canal .

- Neural crest**
- 1.Ganglia
 - 2.Cells : Glial and melanocyte cells
 - 3.Adrenal medulla
 - 4.Septum between ascending aorta & pulmonary trunk

- 1- Epithelium lining of
 - A. Most of GIT
 - B. Most of urinary bladder and urethra
 - C. Middle ear and Eustachian tube
- 2-Parenchyma of Palatine tonsils, thyroid, Liver & pancreas

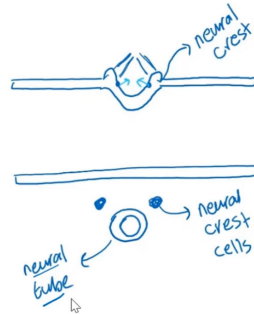
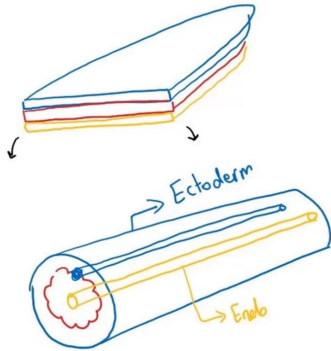
in slides they wrote part of neural tube IDK why really??
CNS... crest outside

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Endoderm → GI tract / urinary bladder / urethra / middle ear / eustachian tube] inner organs
inner layer. Lining of inner organs + glands → Glands: Parenchyma of tonsils / thyroid / Liver / pancreas
Adrenal Medulla is ectoderm neural crest NOT endoderm

Endoderm inner layer. So it forms the lining of body cavities. Logical...

Ectoderm Derivatives

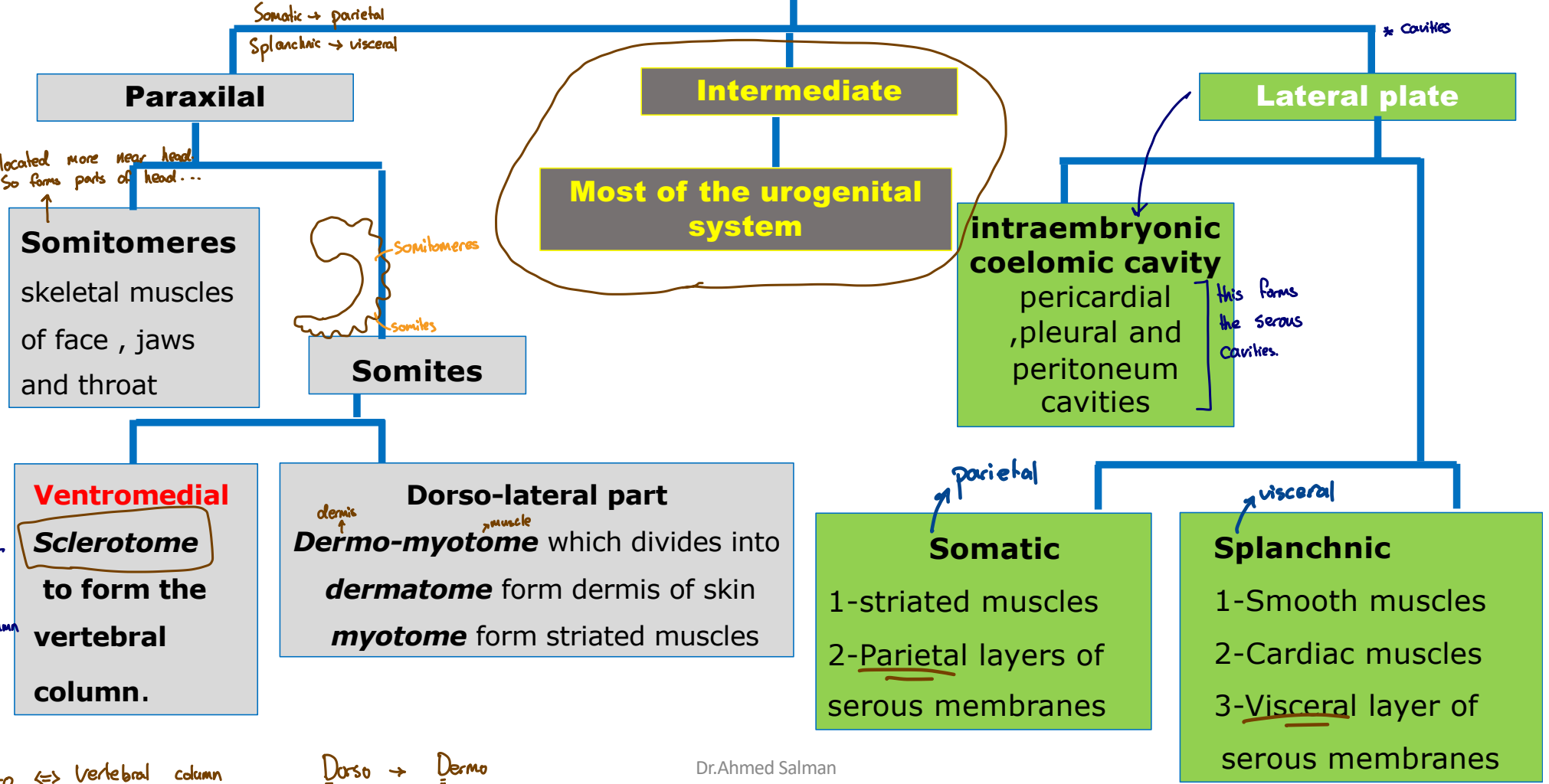


Mesoderm (medial)

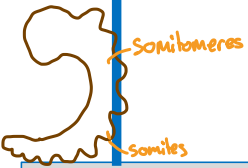
- **Paraxial** → bones + muscles + throat
- **Intermediate** → urogenital system... like kidneys
- **Lateral** → cavities. 3 types of muscles.

Mesoderm is middle part. So it basically creates everything in human body situated between skin & cavities.
Like... muscles/bones/blood vessels/dermis

Mesoderm



located more near head
So forms parts of head...



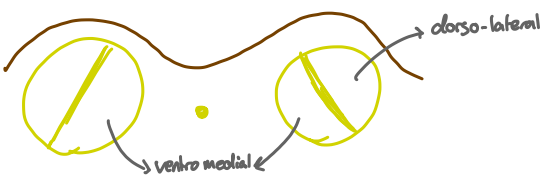
Sclerotome forms the vertebral column

Ventro ↔ vertebral column

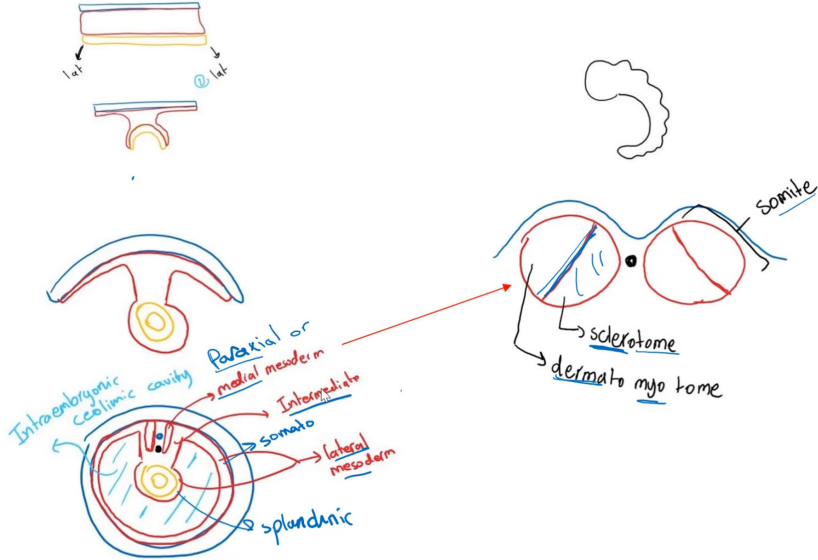
Dorso → Dermo

Dr.Ahmed Salman

Remember extraembryonic mesoderm?
 * inner visceral yolk ⇒ splanchnopleuric mesoderm
 * outer parietal cytotrophoblast ⇒ somatopleuric mesoderm



Mesoderm Derivatives





• It is formed of 2 parts :

Intra-embryonic part :

- **The proximal part :** form the apex of urinary bladder .
- **The distal part , called urachus** connect the urinary bladder to the yolk sac

Extra-embryonic part : inside the umbilical cord , become **obliterated** .

Allantoic vessels form the **umbilical vessels** .



Folding of the embryonic disc

★ At the **end of 3rd. week** , the flat embryonic disc starts to **fold** and **bulges** into the amniotic cavity .

Two types of folding:

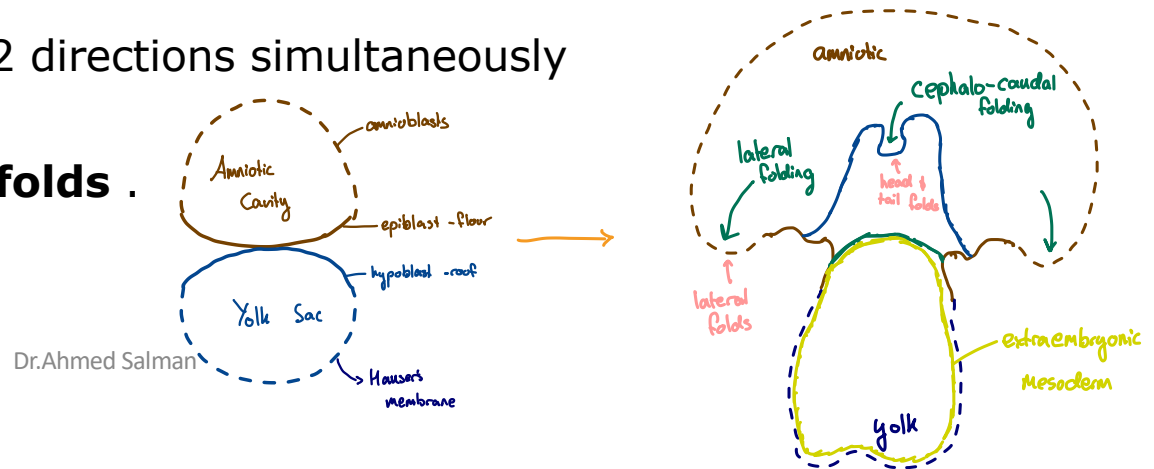
• The embryonic disc becomes folded in 2 directions simultaneously

1-Cephalo-caudal folding :

▪ It leads to formation of **head and tail folds** .

2- Lateral folding :

▪ It leads to formation of **lateral folds** .





Results of folding:

1-The flat shaped **embryonic disc** changes to the **cylindrical** appearance with formation of **body cavity**.



2- The **amniotic cavity** surrounds the embryo almost completely . → See above slide. Logical really.

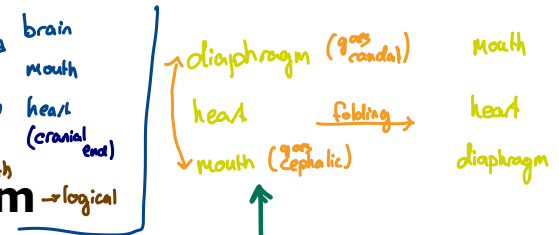
3- A large part of the cavity of the **yolk sac** is incorporated into the body of the embryo forming the **primitive gut** which is lined by endoderm. → logical. GI tract inside, so needs the endoderm. ↳ most inside layer.

4-The part of the gut found in the **head fold** is called the **foregut**, the part found in the **tail fold** is called the **hind gut**, whereas the part in between within the **lateral folds** is called the **midgut** .

5- The **buccopharyngeal membrane** becomes the **cephalic**, and the **septum transversum** becomes the **caudal** to pericardial cavity , while the pericardial cavity and heart remain in between.

6-The **cranial end** of the folded embryonic disc shows the followings :

- a) **Forebrain swelling** produced by the developing forebrain . Logical
- b) **pericardial swelling** produced by the developing heart . Logical
- c) Depression between the previous 2 swellings called **stomatodeum** → logical



5:
 * **Buccopharyngeal membrane** → goes up ~ cephalic / cranial
 * **Septum transversum** → goes down ~ caudal

the mouth used to be below heart. & diaphragm above.
 So due to folding, the mouth goes above heart. Cephalic.
 The diaphragm below heart. Caudal Heart in place.