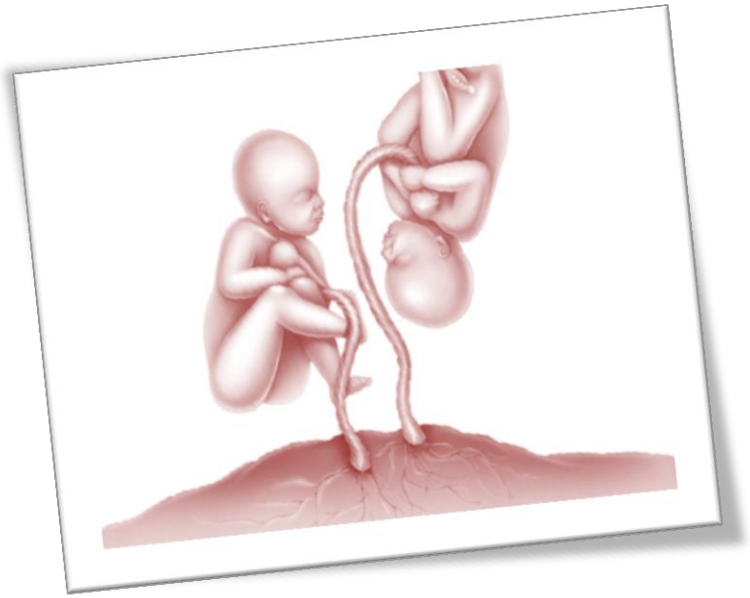
Reproductive system



LECTURE: Development of fmale genital system

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Anatomy Team 432

Objectives

- Describe the development of gonads (indifferent & different stages)
- Describe the development of the female gonad (ovary).
- Describe the development of the internal genital organs (uterine tubes, uterus & vagina).
- Describe the development of the external genitalia.
- List the main congenital anomalies.

Contents

1. Revision
2. Ovaries development
3. Uterine tube, uterus & upper vagina
4. Lower vagina
5. External genitalia
6. Genital glands
7. Anomalies

Let's review the basics

Reproductive system in both genders is formed of three parts (arranged according to the first appearance) :
- Gonads (ovaries / testes)
- Gentile Duct (uterine tube, uterus, vagina / epididymis, vas deferens, urethra)
- External genitalia
- Genital glands

1st/ Gonads:
5th week: development of gonadal Ridge (From the intermediate mesoderm) on the medial side of the Mesonephros (Nephrogenic cord) into a cortex and a medulla. (Indifferent gonads)
6th week: Primordial cell migrate to the ridge, stimulate development and differentiation of gonads from the primitive ridge (into either ovary or testis according to the presence or absence of Y chromosome in the nuclei of those primordial cells)
7th week: beginning of differentiation of the gonads

2nd/ Ducts + external + glands:
Formed consequently by the hormones secreted by the developed gonads

Don't be confused!
- Absence of primordial cells → No gonads formation
- Presence of primordial cells without having Y chromosome → stimulate development of Ovaries.
- Presence of primordial cells with Y chromosome → testis development

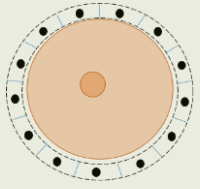
Summary:
Primordial cells → gonads differentiation & development (according to the XX/XY in primordial cells) → hormonal secretions from the gonads → differentiation of the duct and the external genitalia

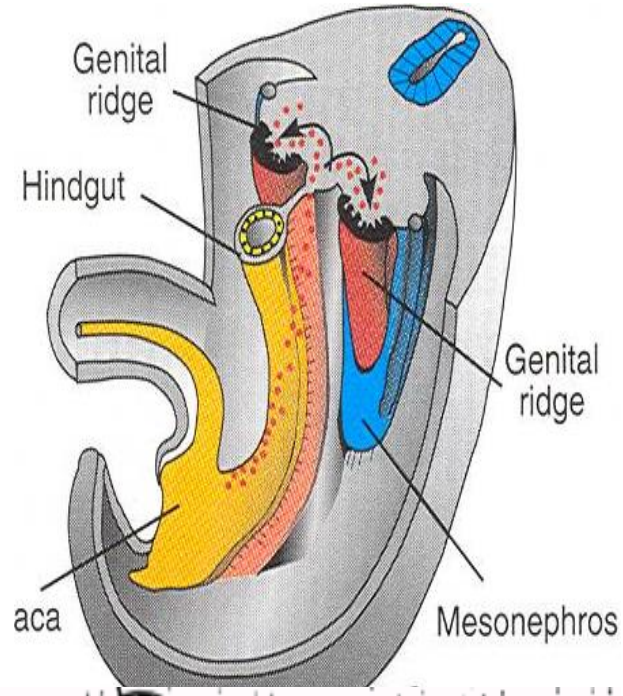
Ovaries development (1) :

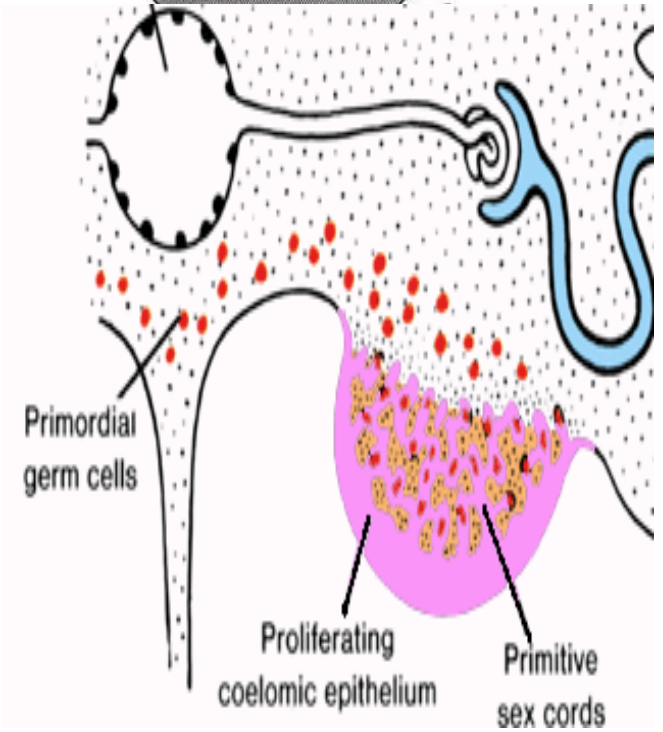
Starts as Primordial cells having XX chromosome reach the ridge → stimulate **proliferation of cortex**, **degeneration of medulla** (in contrast with testis formation that potentiated by proliferation of medulla, degeneration of cortex)

Developing cortex starts to form ***primary sex cords*** (finger like appearance) . The 1ry sex cords dissociate into Rete Ovarii. Both will then detach from the cortex and degenerate.
Then the cortex will develop ***secondary (sexual) sex cords*** (hot dog's appearance الله يكرم النعمة)
They extend from the surface epithelium into the underlying mesenchyme to replace the primary cords.
All the welcomed **primordial germ cells now are incorporated** (getting inside) into them.

The ovary is identifiable **histologically** at the **10th week**
At the **16 weeks**, the cortical cords break up into isolated cell clusters: ***Primordial Follicles*** (Primary Oocytes)





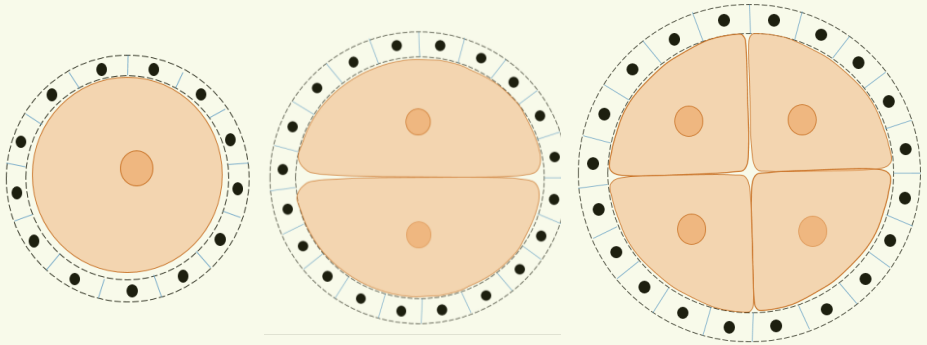


Ovaries development (2) :

Primary Oocytes:

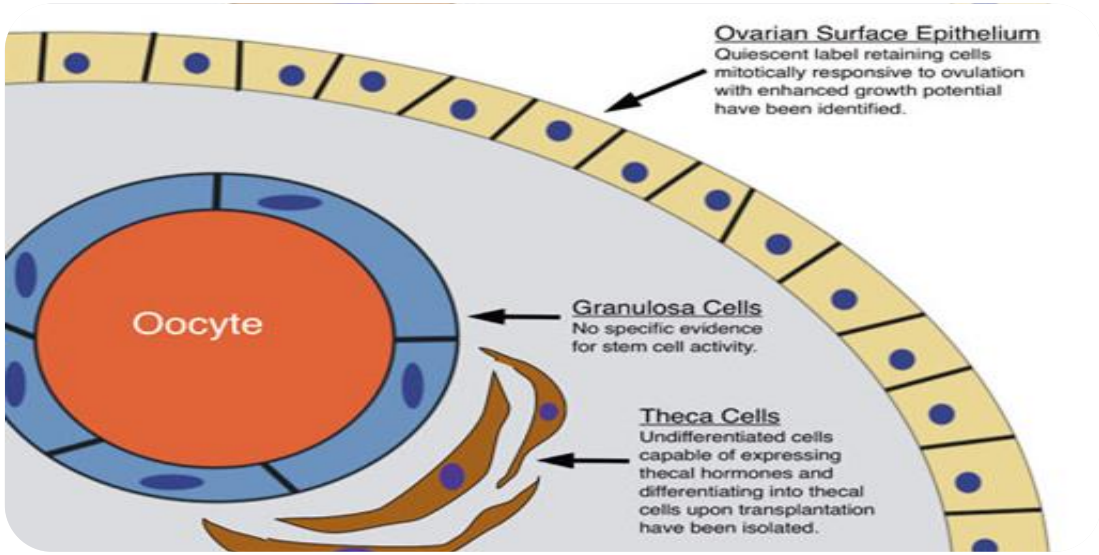
- Oogonium derived from the Primitive Germ Cell.
- Surrounded by a single layer of flattened Follicular Cells

Derived from the surface epithelium (Sex Cord)
(it has multiple layers but it's hard to draw, sorry)
Active Mitosis of Oogonia occurs during ***fetal period*** producing thousands of primordial follicles
(No New Oogonia Are Formed Postnatally)
Two million Oogonia enlarge to become Primary Oocytes (Before Birth).



Post natal changes:

1. Surface Epithelium: Flattened into a single layer and separated from follicles in the cortex by a ***thin tunica albuginea***.
2. The ovaries descend from the posterior abdominal wall into the pelvis; just inferior to the pelvic brim.



Genital Duct development:

In male: presence of testosterone → developing of mesonephric duct, presence of MIS* → paramesonephric regression.

In female: absence of testosterone hormone → mesonephric ducts regression, The paramesonephric ducts develop due to absence of MIS*.

P.s: the female sexual development <u>does not</u> depend on the presence of ovaries or hormones.

**Müllerian Inhibiting Substance*

Paramesonephric ducts form most of the female genital tract. They develop lateral to the degenerative mesonephric duct and the developing gonads with their funnel-shaped cranial ends open into the peritoneal cavity. They pass caudally, parallel to mesonephric ducts to reach the future pelvic region.

They then cross ventral to the degenerative mesonephric duct (*) & approach each other in the median plane and fuse to form the Y shaped ***<u>Uterovaginal Primordium</u>*** (which opens into the dorsal wall of the urogenital sinus and produces Paramesonephric (Mullerian) Tubercle)

Differentiation Of Paramesonephric Ducts in Tubes:

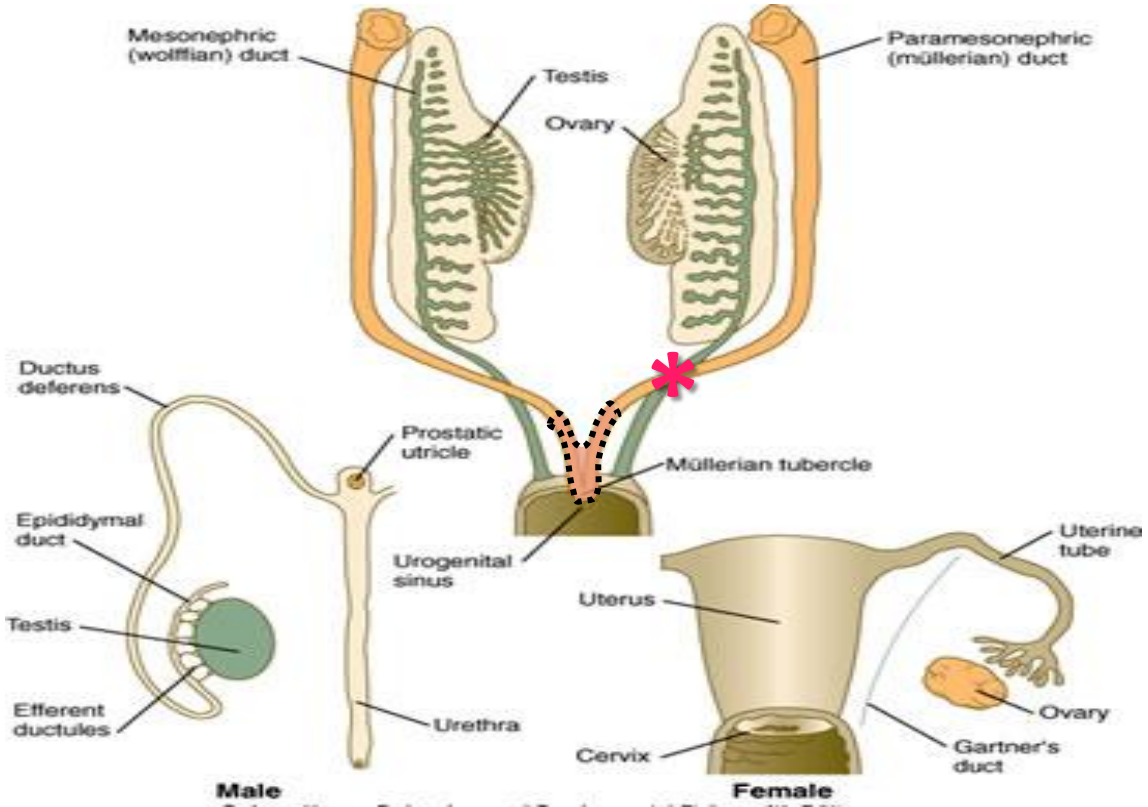
<u>1. Uterine Tubes:</u>

Formed from the cranial unfused parts of the ducts.

<u>2. Uterovaginal Primordium</u> which will form:

- Uterus
- Superior Portion of the Vagina

The endometrial stroma and myometrium are derived from the *splanchinic mesoderm.*



Lower part of vagina

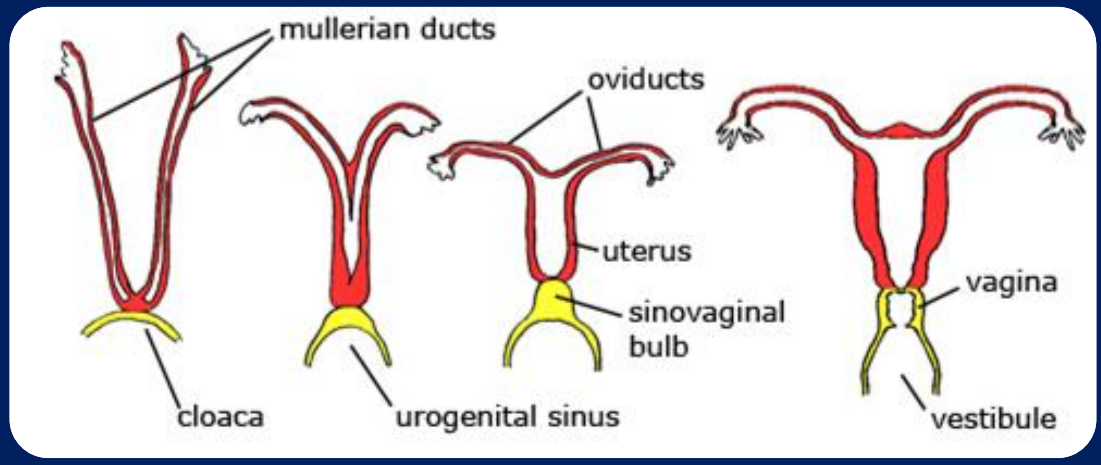
It is derived from the Urogenital Sinus:

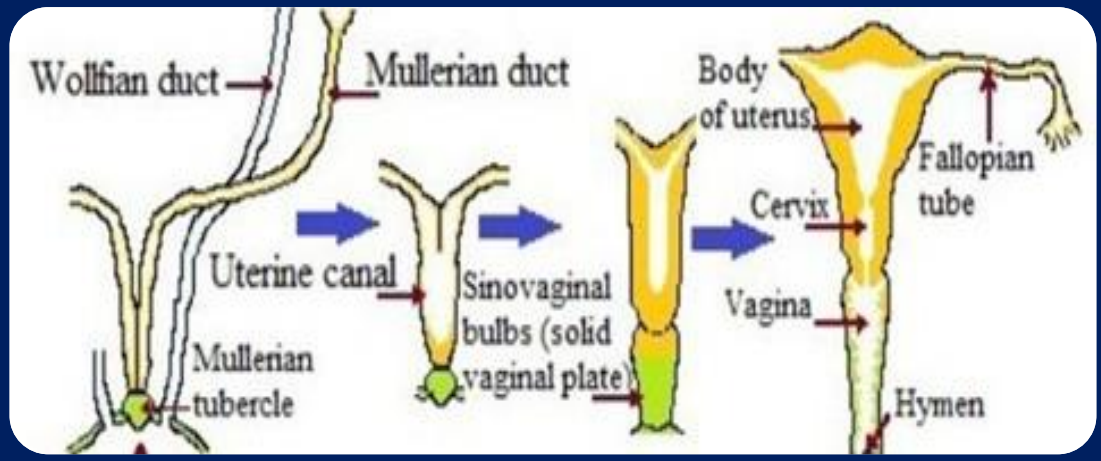
The contact of the uterovaginal primordium with the urogenital sinus induces formation of SinoVaginal Bulbs.

Then, both bulbs proliferate and fuse to form a solid Vaginal Plate.

The central cells of the vaginal plate degenerate to canalize the lumen of the vagina. Thin fold of mucous membrane remains within the vaginal orifice to form the hymen which separate the lumen of vagina from the urogenital sinus.

The lining of the entire vagina is derived from the Vaginal Plate /urogenital sinus *(endodermal origin). The upper part is Mesodermal in origin.)*





External genitalia:

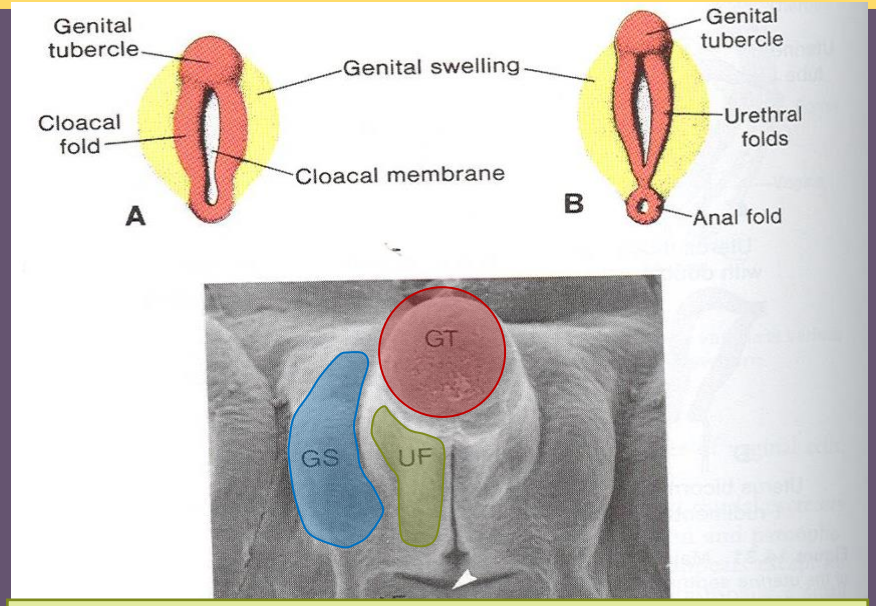
Both sexes are similar up to the **7th week**
Start to differentiate in the **9th week**
Mesenchymal tissue Proliferate at the cranial end and Sides of the Cloacal Membrane, to form:
1. Genital Tubercle.
2. Urogenital Folds (Urethral Folds)
3. Labioscrotal Swellings (Genital Swellings)

Fully differentiated by the **12th week**

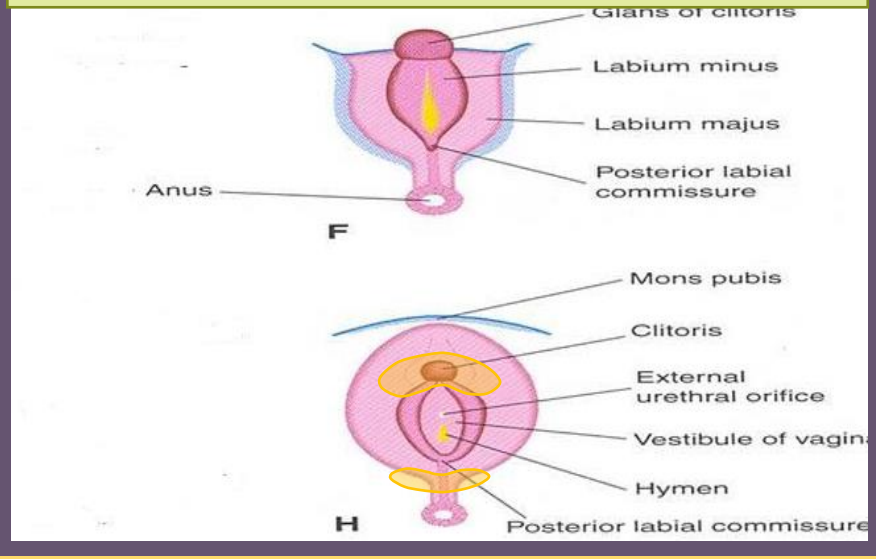
(the white area inside represents cloacal membrane inerfiorly where urethral and vaginal orifices will open)

Feminization of External Genitalia:
placenta and the fetal ovaries produce **Estrogen** which plays a role in feminization (giving the mature final shape) of the external genitalia as following:

- Genital Tubercle proliferates to form the Primordial Phalls which will elongate slightly to form the Clitoris *(mimics the sexual cooperated function of penis in male: sexual stimulation area)*
- Urethral Folds do not fuse and form the Labia Minora.
- Labioscrotal Folds form the Labia Majora, they fuse Posteriorly & Anteriorly to form the anterior and posterior **Labial Commissures.**



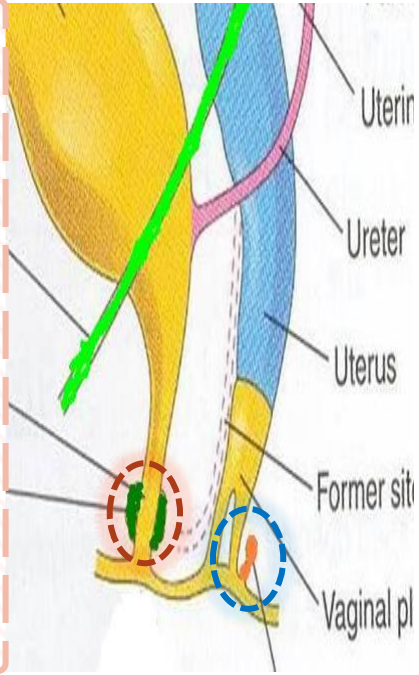
Note: initiating development of the external genitalia requires NOTHING, it's a result of testes absence.
But growing to the normal size requires Estrogen



Female Sex Glands:

1. Urethral & Paraurethral Glands:
Grow from the urethra, they are corresponding to the *Prostate Gland* of the male.

2. Greater Vestibular Glands:
Outgrowths of the *urogenital sinus*, they are corresponding to the *Bulbourethral Glands* of the male.



Congenital Anomalies:

1. Failure of parts of one or both paramesonephric ducts to develop.
2. Incomplete development of the paramesonephric ducts.
3. Incomplete fusion of the paramesonephric ducts.
4. Arrest of development of the uterovaginal primordium during the 8th week.
5. Incomplete canalization of the vagina.

Uterus anomalies:

1. Double uterus (Uterus Didelphys:
Due to failure of fusion of inferior parts of the paramesonephric ducts.
May be associated with a double or single vagina.

2. Bicornuate uterus:
The duplication involves the superior segment.

3.Unicornuate Uterus:
One paramesonephric duct fails to develop.

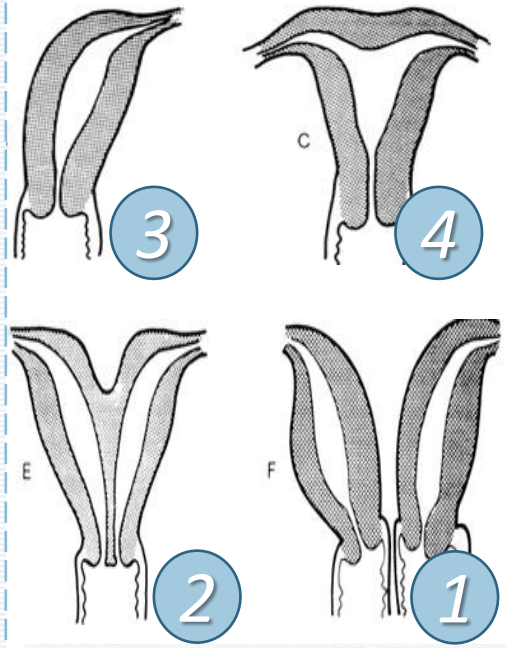
4. Arcuate Uterus.

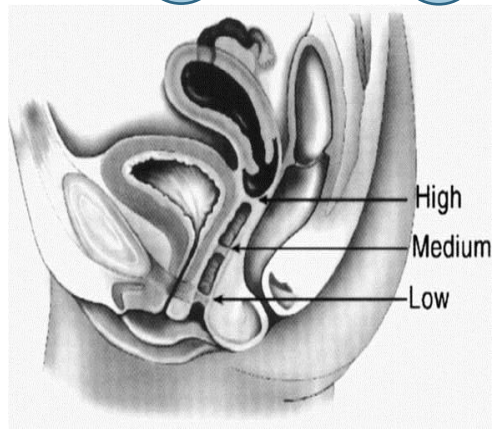
Cervical Atresia:

It may be combined with incomplete development of the upper vagina or lower uterus.

Vaginal anomalies:
-Atresia: closed cervix (Partial or complete).
-Double vagina.
-Transversely septate vagina:
Results from faulty canalization of the fused müllerian ducts.

Remnants of the mesonephric (wolffian) ducts, like the Gartner's duct or Gartner's ducts cyst may persist in the anterolateral wall of vagina or adjacent to the uterus within the broad ligament or mesosalpinx





Timeline

5th week	**Formation of gonadal ridges.**
6th week	**Migration of primordial germ cells.**
7th week	**Differentiation of gonads.**
9th week	**Differentiation of the external genitalia.**
10th week	**Ovaries are histologically differentiable.**
12th week	**Gonads are totally developed.**

Questions

Q1/ which one of the following structures the origin of the core of Oocytes?

A. Follicular cells
B. Oogonia
C. Mesenchymal cells
D. Primordial cells

Q2/ which one of the following structures is endodermal in origin?

A. Uterus
B. Lower vagina
C. Primordial germ cells
D. B & C

Answers: D - D

Anatomy Team 432

GOOD LUCK

Anatomy Team Leaders:

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