

DEVELOPMENT OF FEMALE GENITAL

SYSTEM

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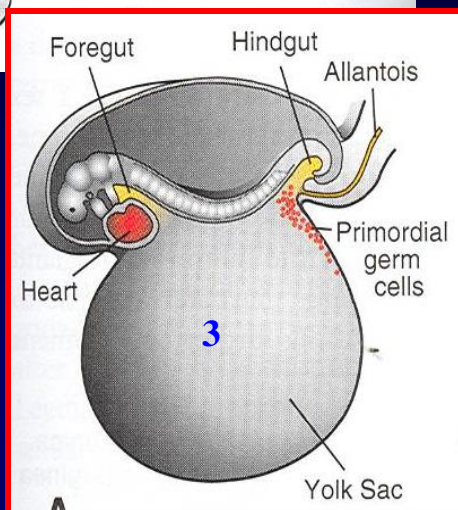
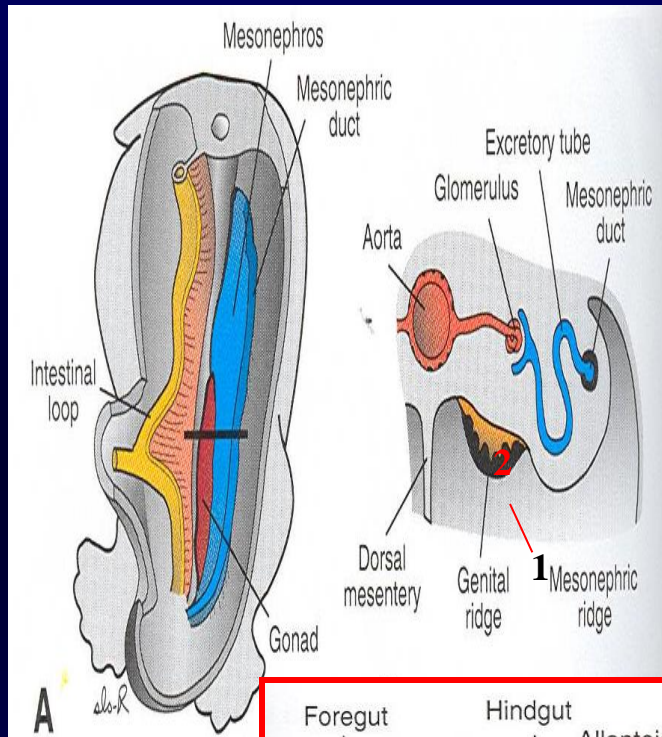
Objectives

- *At the end of the lecture, students should be able to:*
- *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.*

Development of Female Genital System

- It comprises the development of:
- *Gonad (Ovary).*
- *Genital Ducts.*
- *External genitalia.*
- *They all first pass through an Indifferent Stage.*
- The gonad acquires the female morphological characteristics about the 7th week.

Development of Gonad

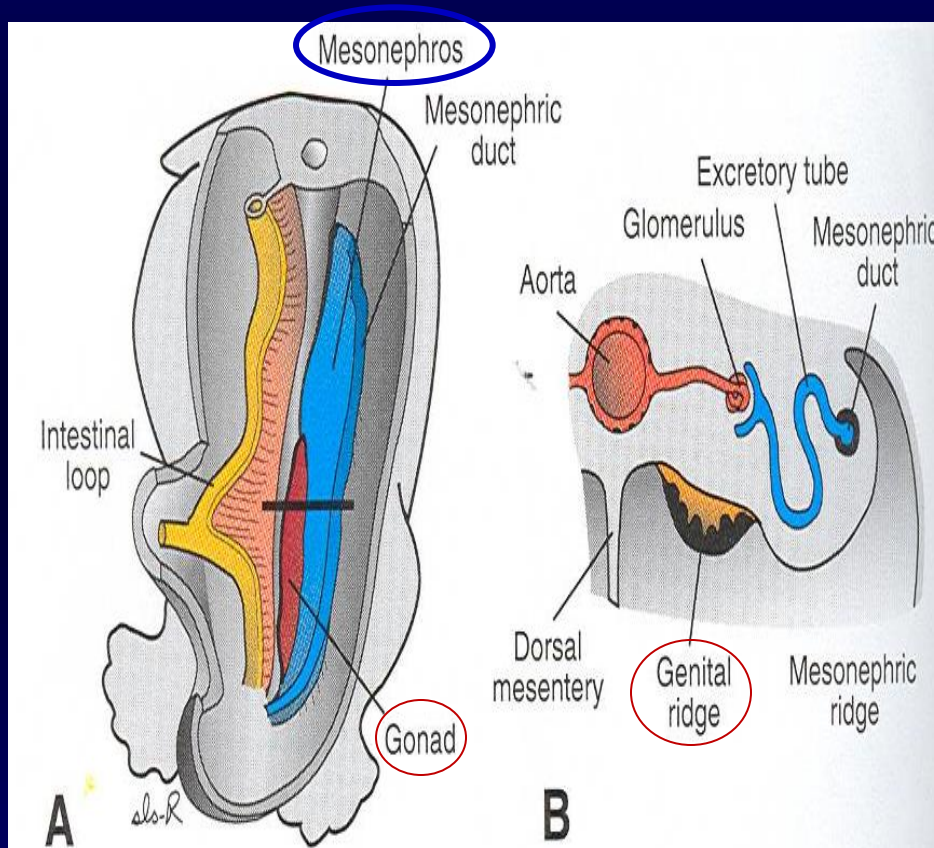


- *Is derived from three sources :*
- **1. Mesothelium;** (mesodermal epithelium) lining the posterior abdominal wall.
- **2. Mesenchyme;** (underlying embryonic connective tissue).
- **3. Primordial Germ cells;** (appear among the Endodermal cells in the wall of the yolk sac).



Indifferent gonads

Genital (Gonadal) Ridge

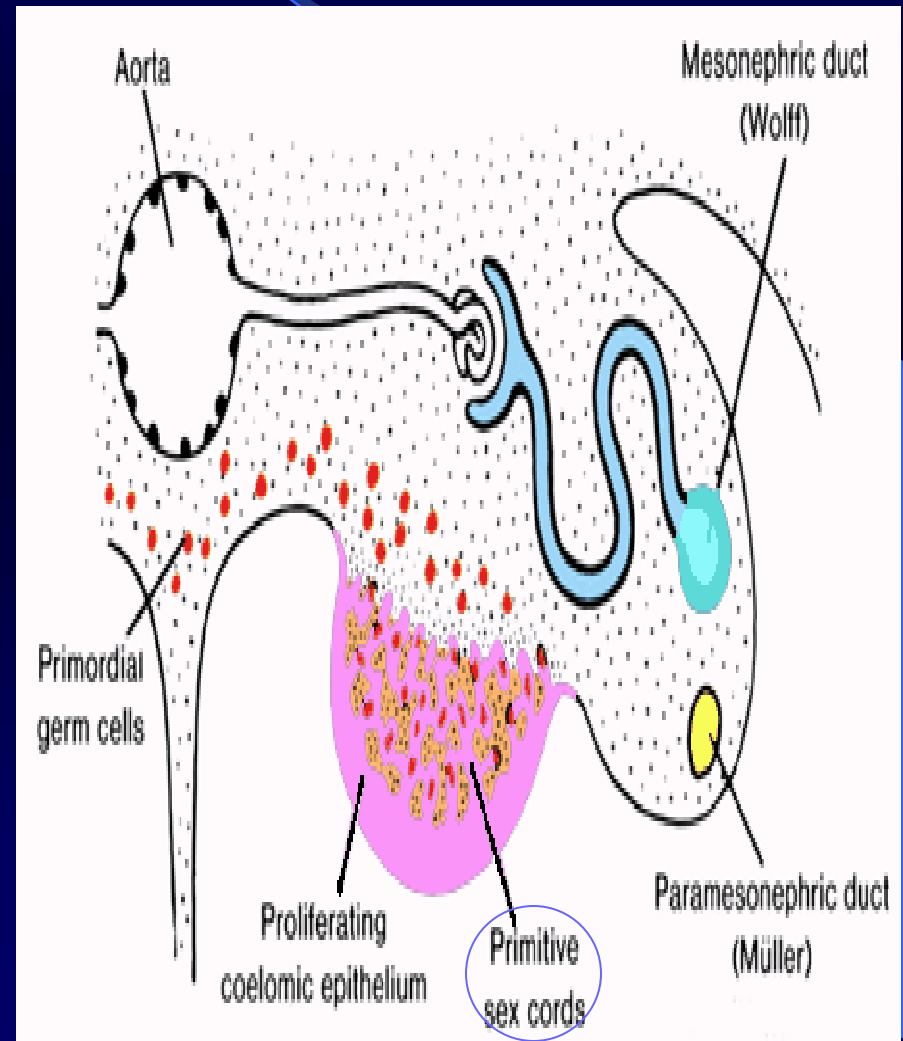


- *Appears during the 5th week as a pair of longitudinal ridges, on the medial side of the Mesonephros.*
- *It is formed due to Proliferation of (Mesothelium) and Condensation of underlying Mesenchyme.*

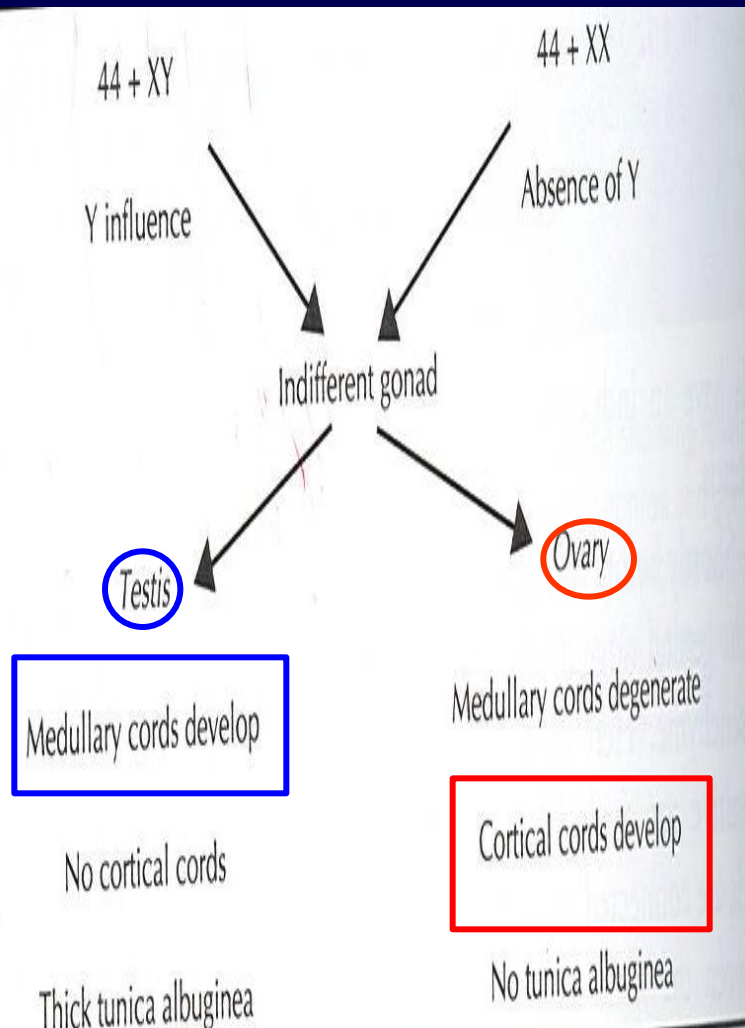
Gonadal cords

Primitive (Primary) Sex Cords

- Fingerlike epithelial cords (gonadal cords) grow into the underlying mesenchyme.*



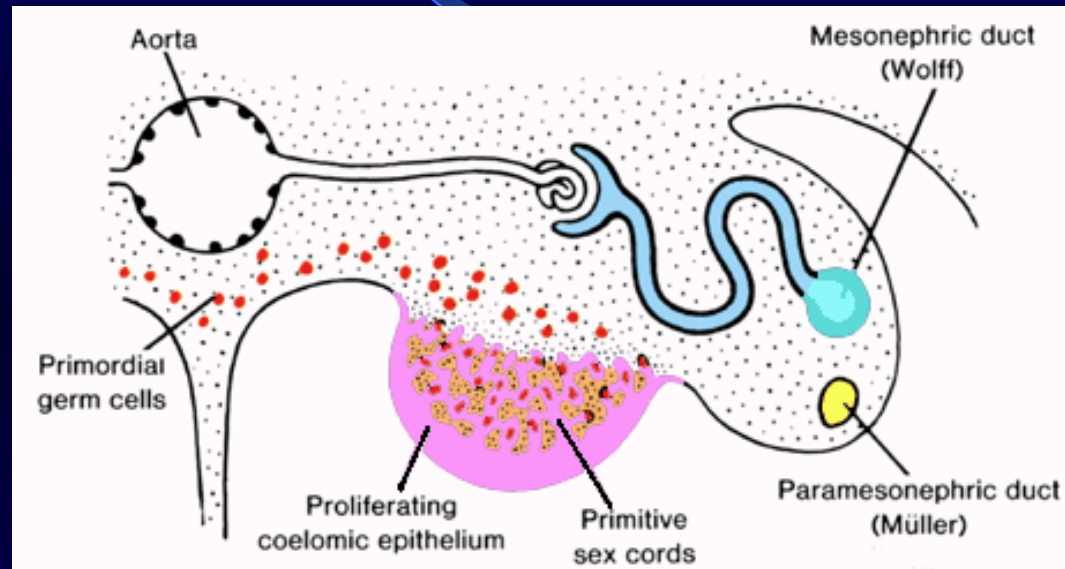
Structure of Indifferent Gonad

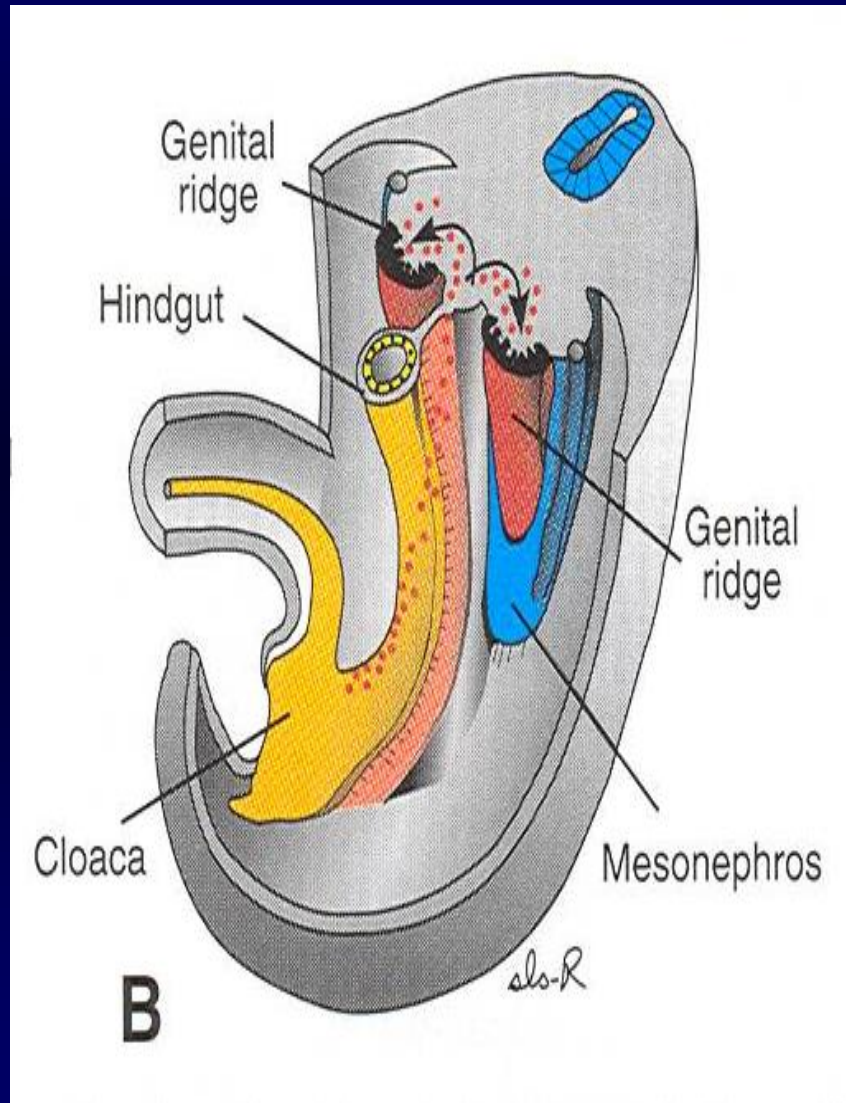


- The indifferent gonad consists of an External cortex and Internal medulla.
- In embryos with **XX** chromosomes, the Cortex differentiates into the Ovary and the medulla regresses.
- In embryos with an **XY** chromosomes, the Medulla differentiates into Testis and the cortex regresses.

The primordial germ cells

- They are large spherical sex cells visible in the **4th week** among endodermal cells of the yolk sac near origin of the allantois.
- (During folding the dorsal part of the yolk sac is incorporated within the embryo.)
- The Primordial germ cells migrate along the dorsal mesentery to the **Gonadal Ridges**.
- During the **6th week**, they are incorporated in the **primary sex cords**.



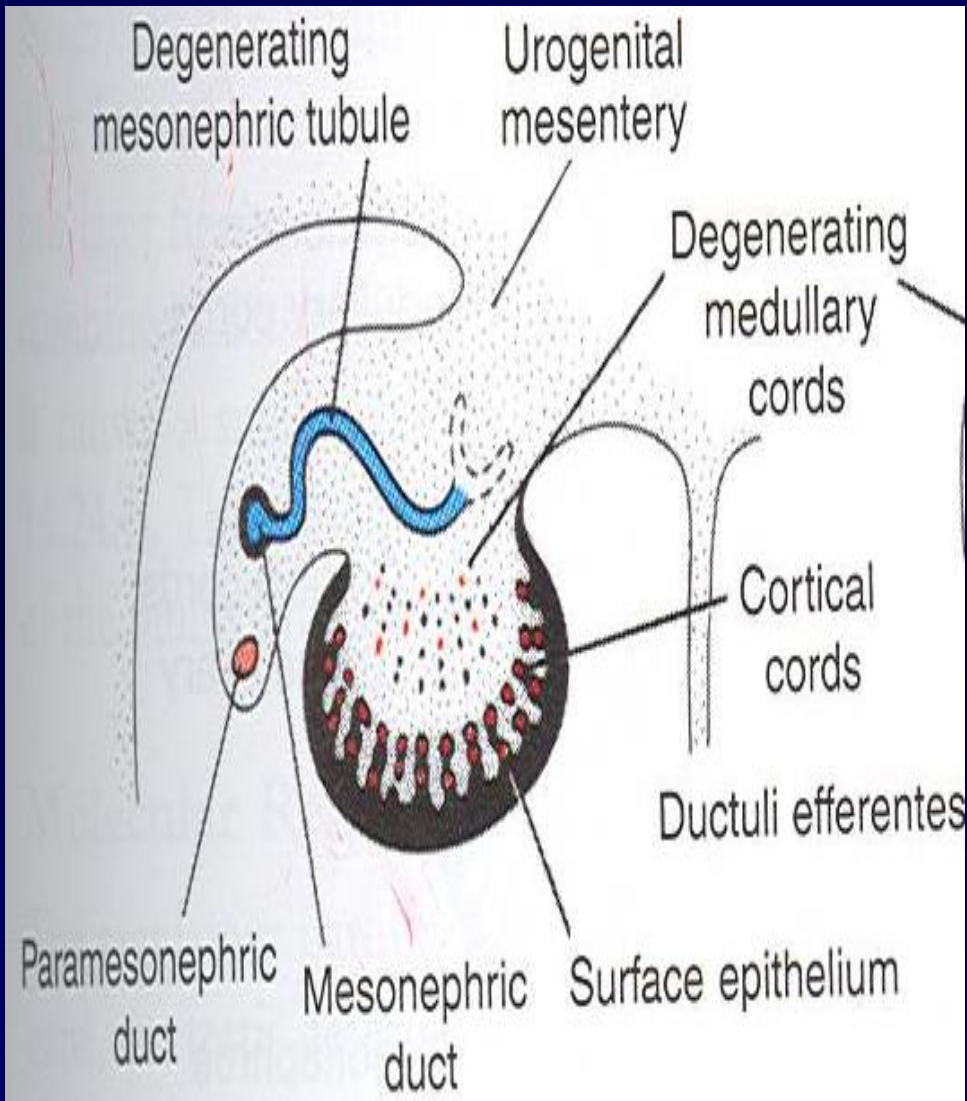


- The primordial germ cells have an **Inductive Influence** on the differentiation of the gonad into ovary or testis
- ***If they fail to reach the ridges, the gonad remains Indifferent or Absent.***

Sex determination

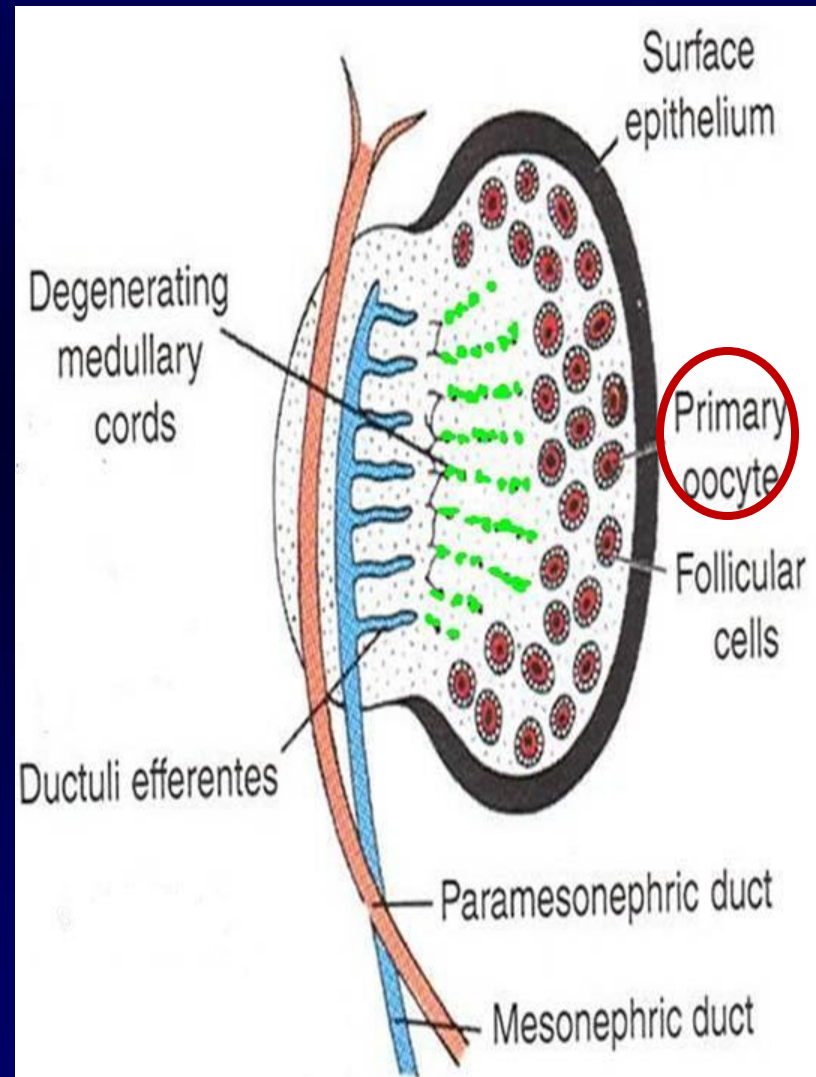
- *Chromosomal and genetic sex is established **at fertilization** and depends upon the Y or X chromosome of the sperm.*
- *Development of female phenotype requires **two X chromosomes**.*
- *The Y chromosome has **testis determining factor (TDF)***
- *The primary female sexual differentiation is determined by the presence of the X chromosome , and the absence of Y chromosome and does not depend on hormonal effect*

Differentiation of the Ovary



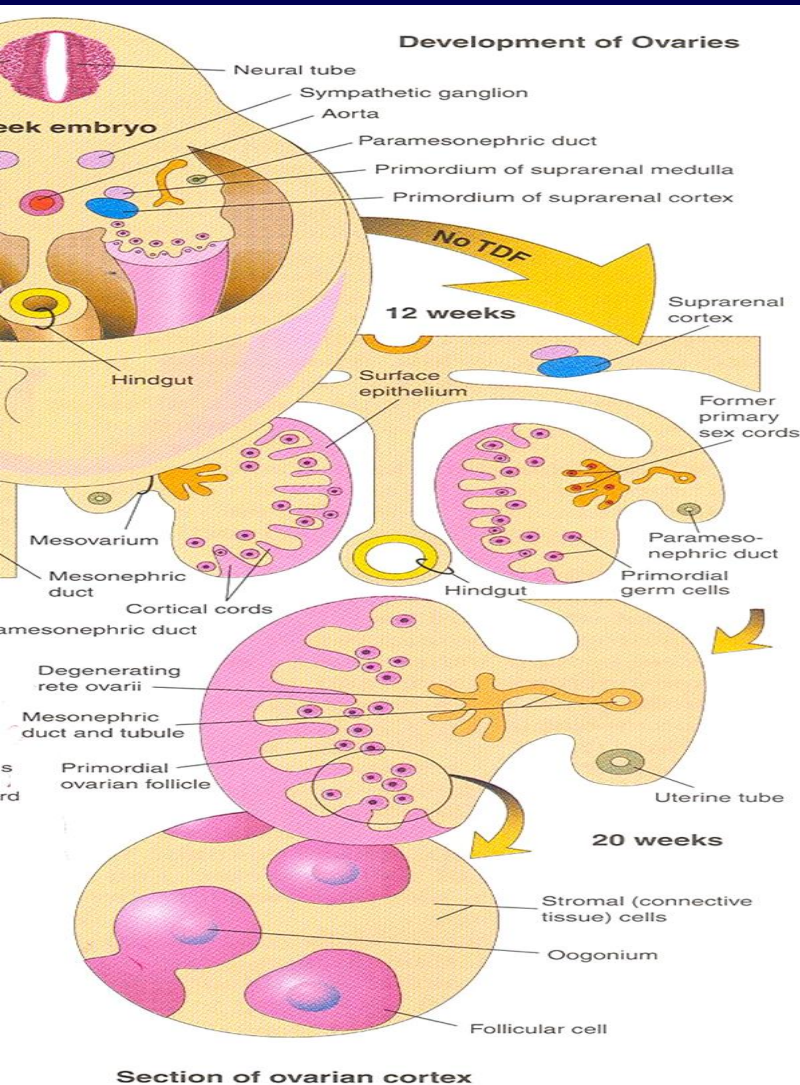
- *At the 10th week*
- *The Primary sex cords dissociate into irregular cell clusters (Rete ovarii), which extend into the medulla and form (Medullary Cords).*
- *Both the medullary cords and rete ovarii degenerate and disappear.*
- *Cortical (Secondary) Cords:*
- *Extend from the surface epithelium (mesothelium) into the underlying mesenchyme.*

Primary Oocytes



- *The primordial germ cells are incorporated in the cortical cords.*
- *At the 16 weeks the cortical cords break up into isolated cell clusters, (**primordial follicles**).*
- *The **primordial follicles** contain Oogonia; derived from the Primitive Germ Cells, and surrounded by a single layer of flattened Follicular Cells derived from the surface epithelium .*
- ***Active Mitosis of Oogonia produce thousands of primordial follicles***
- *(No new Oogonia are formed after birth).*
- *Many oogonia degenerate .*
- *Two million oogonia enlarge to become Primary Oocytes before birth .*

Changes of the Ovary After Birth



- 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.

Development of the Duct system

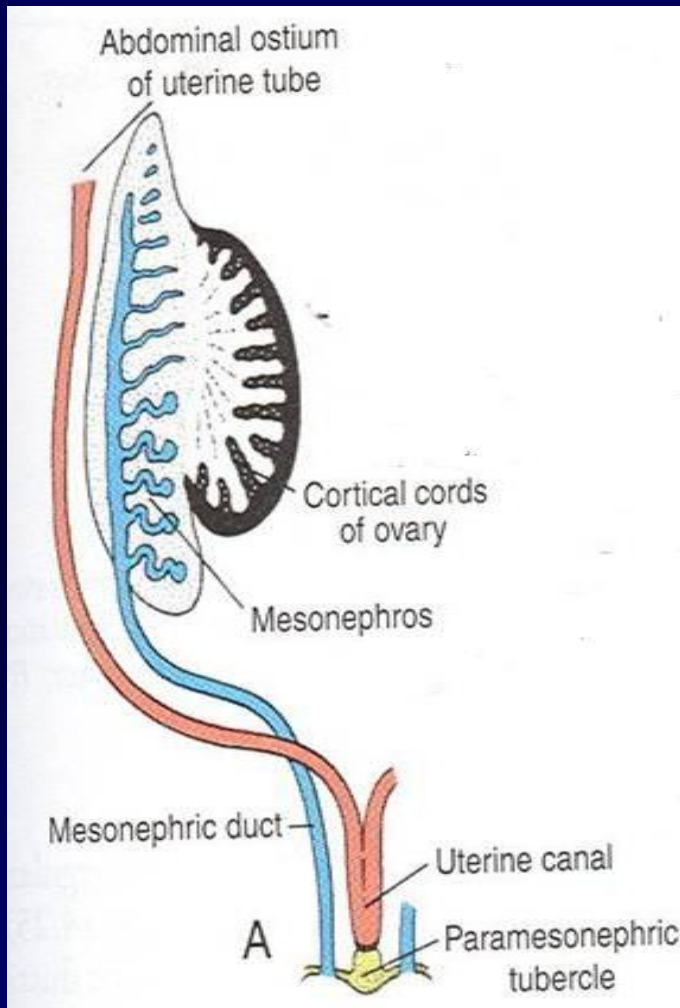
Indifferent stage

- *Both male and female embryo have two pair of genital ducts;*
- *The mesonephric (wolffian's ducts) for development of male reproductive system.*
- *The paramesonephric (Müllerian's ducts) for development of female reproductive system.*

Development of the Duct system

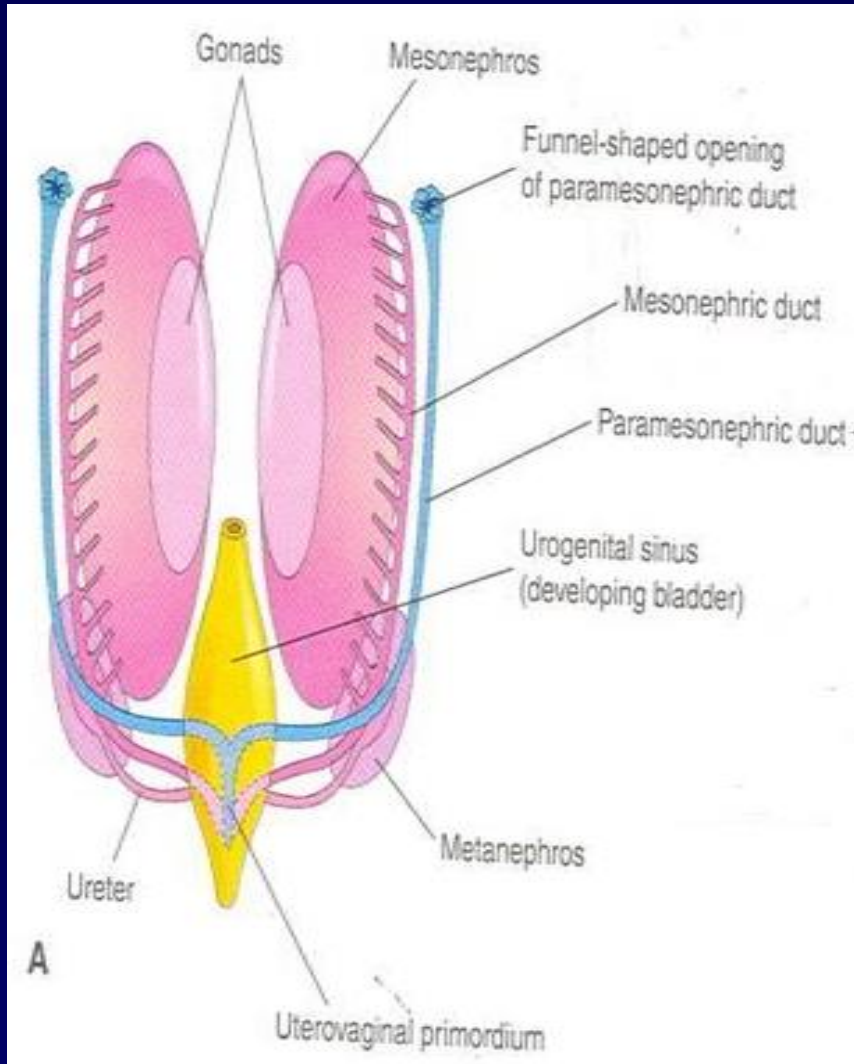
- *In female embryo the mesonephric ducts regress due to absence of the testosterone hormone.*
- *The paramesonephric ducts develop due to absence of MIS (müllerian inhibiting substance).*
- *They do not depend on ovaries or hormones*

The paramesonephric ducts



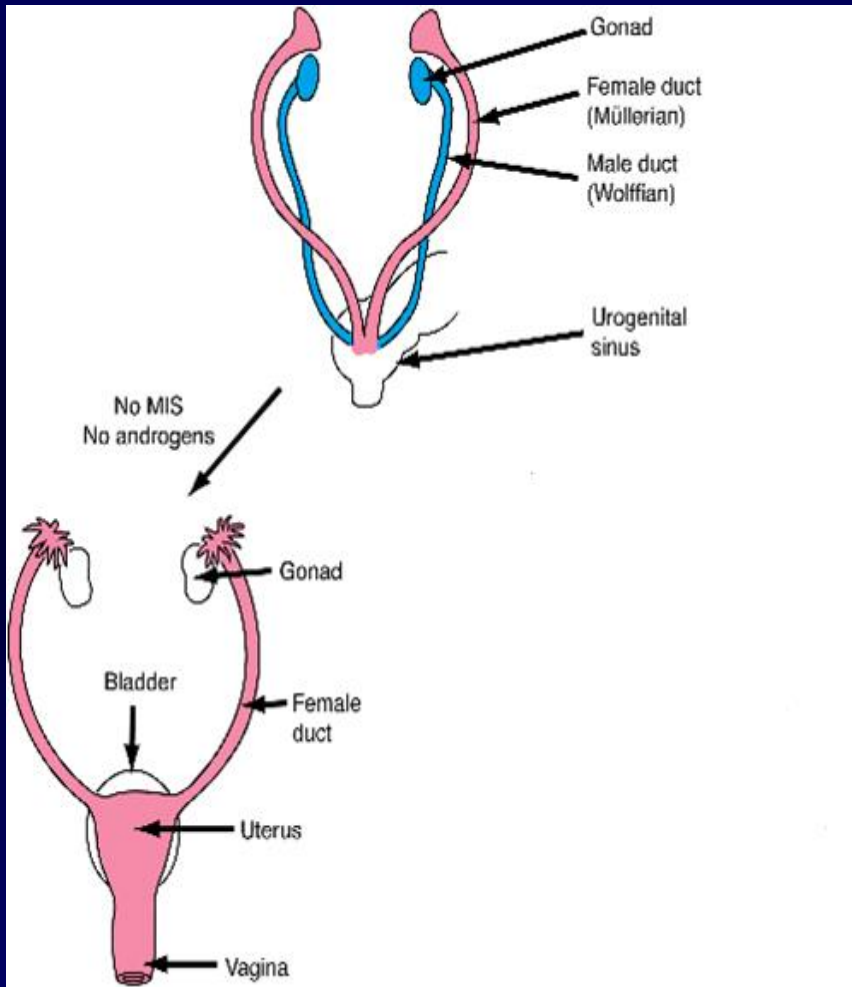
- *The paramesonephric ducts develop lateral to the gonads and mesonephric ducts.*
- *The funnel-shaped cranial end of these ducts open into the peritoneal cavity.*
- *They pass caudally parallel to mesonephric ducts to reach the future pelvic region.*
- *Cross ventral to the mesonephric ducts approaching each other in the median plane and fuse to form the Y shaped uterovaginal primordial.*
- *It projects into the dorsal wall of the urogenital sinus and produces the sinus (müllerian) tubercle.*

Derivatives Of Paramesonephric Ducts



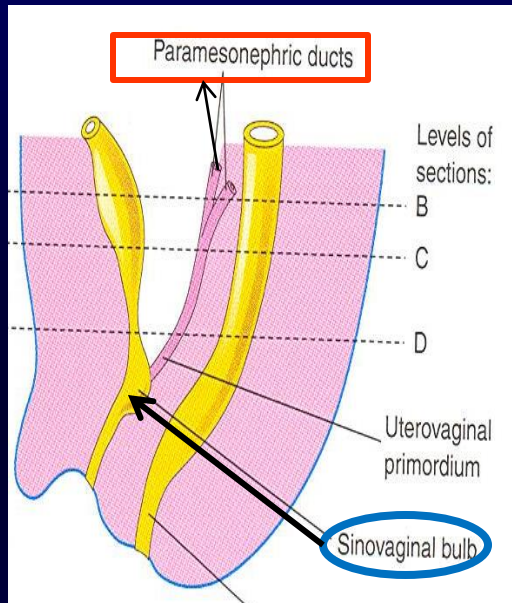
- *1. Uterine Tubes; develop from the cranial unfused parts of the ducts.*

Derivatives Of Paramesonephric Ducts

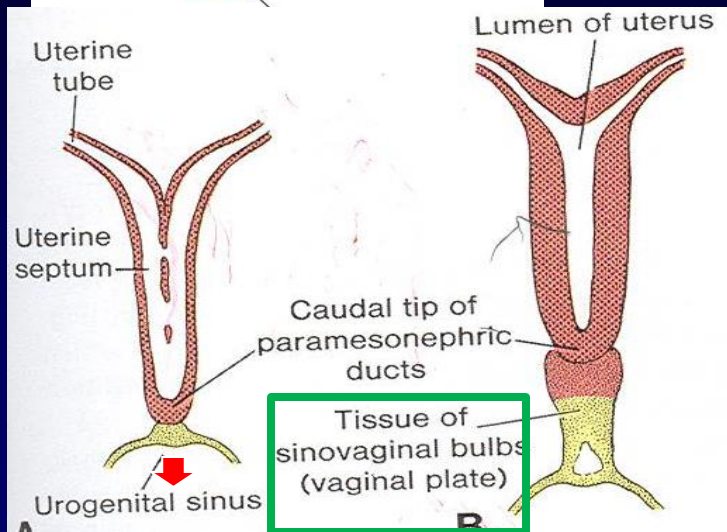


- **2. Uterovaginal Primordium;** It is Y- shaped, formed from the fused caudal portions of the paramesonephric ducts.
- It projects into the dorsal wall of the urogenital sinus and produces the sinus (müllerian) tubercle.
- It Differentiates into:
 - **Uterus** (body and cervix)
 - **Superior** portion of the vagina.
- The endometrial stroma and myometrium are derived from the splanchnic mesoderm.

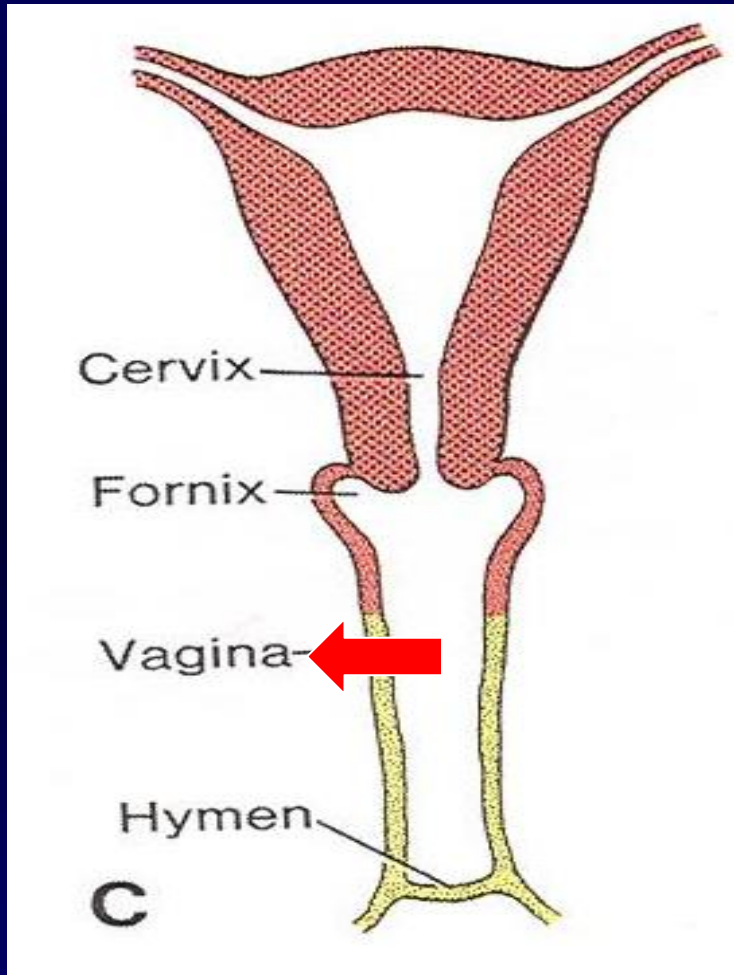
Lower Part Of Vagina



- Contact of the *uterovaginal primordium* with the *urogenital sinus* induces formation of *SinoVaginal Bulbs*.
- The bulbs proliferate and fuse to form a solid *Vaginal Plate*.



Differentiation of Vagina



- *The central cells of the vaginal plate break down to form the lumen of the vagina.*
- *The peripheral cells form the vaginal epithelium*
- *The lining of the entire vagina is derived from the Vaginal Plate (urogenital sinus).*
- *The lumen of vagina is separated from the urogenital sinus by the Hymen which remains as a thin fold of mucous membrane just within the vaginal orifice .*

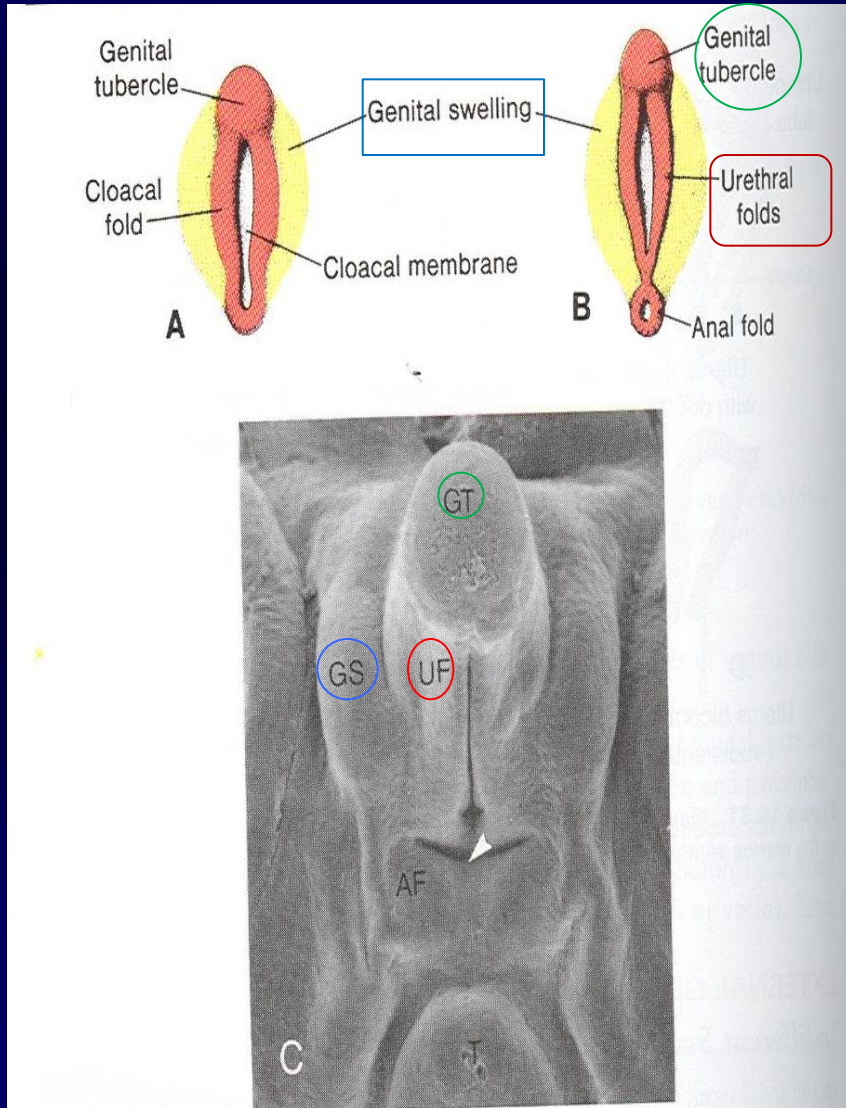
External Genitalia

Indifferent stage

They are *similar* in both sexes up to the 7th week.

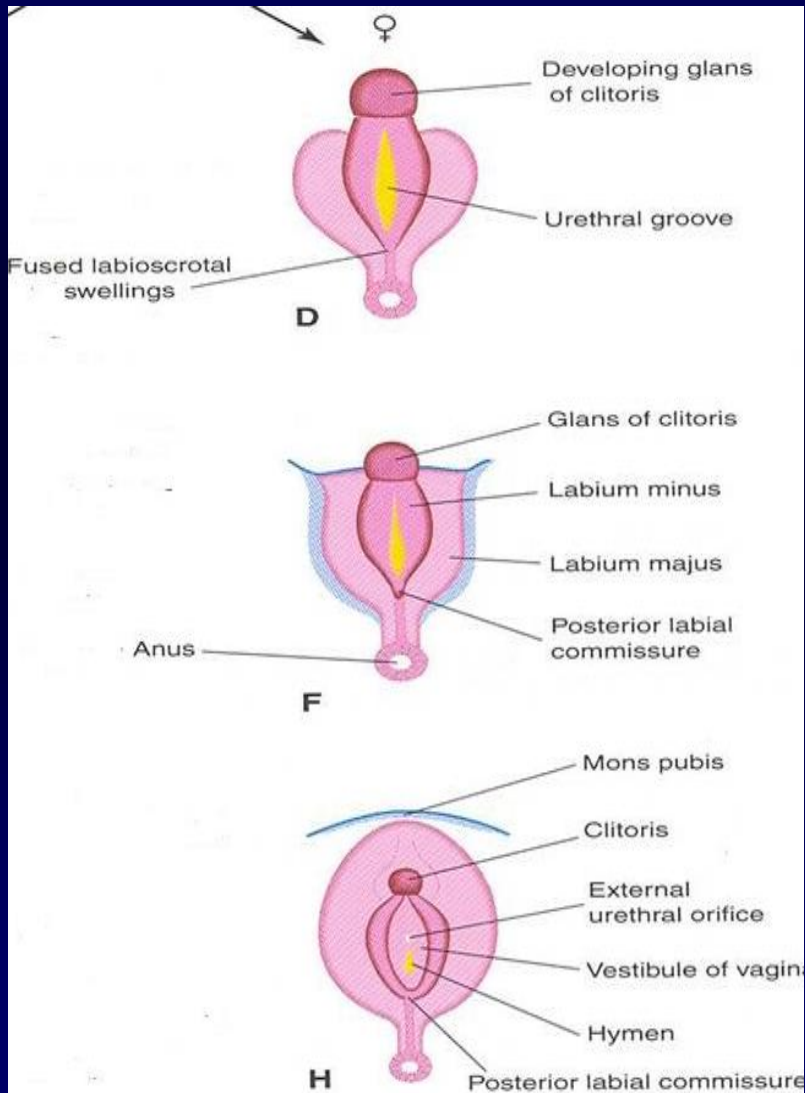
They *begin* to differentiate in the 9th week.

They are *fully* differentiated by the 12th week.



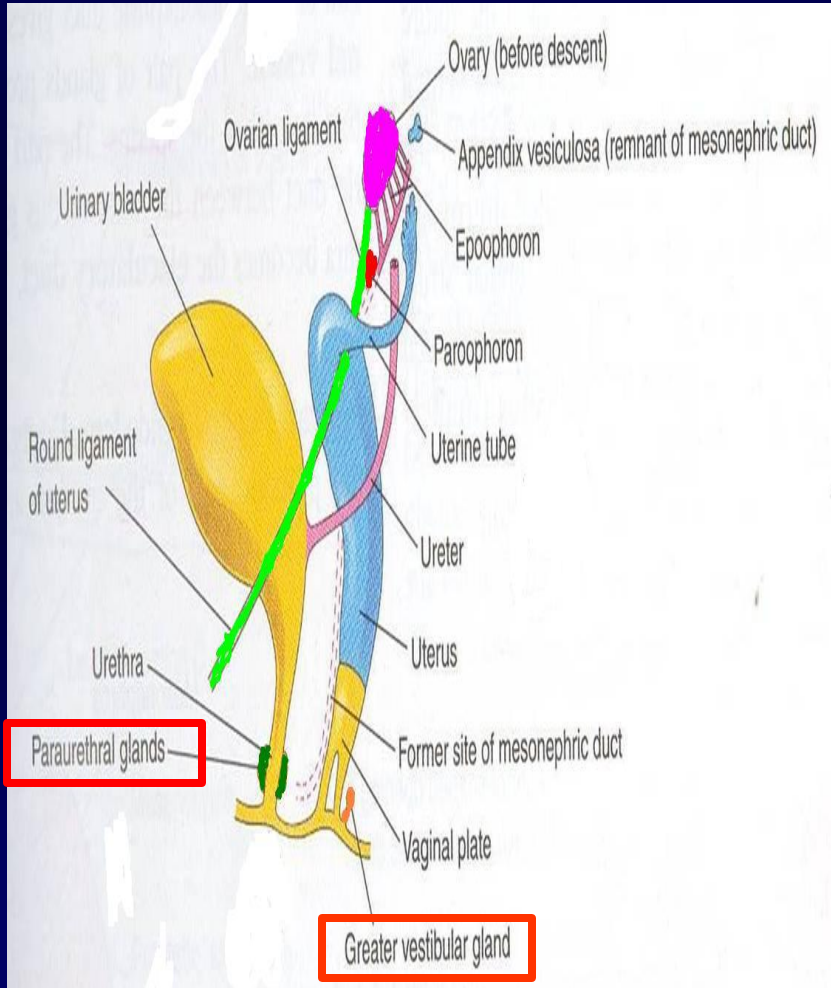
- Mesenchyme at the Cranial end of the cloacal membrane proliferates to form **Genital Tubercle; (GT)**
- **Genital Tubercle** proliferate to form a **primordial phallus**.
- **Urogenital Folds** (urethral folds); (UF) and **Labioscrotal swellings** (genital swellings); (GS) proliferate on Each Side of the cloacal membrane.
- The ventral part of the cloacal membrane; the **urogenital membrane** lies in a median cleft the urogenital groove, the **vestibule** and bounded by the urogenital folds

Differentiation of Female External Genitalia



- Estrogen produced by the placenta and the fetal ovaries have a role in feminization of the external genitalia.
- Genital tubercle (primordial phallus) elongates slightly to form the Clitoris.
- The Urethral Folds do not fuse and form the Labia Minora.
- The Labioscrotal Folds form the Labia Majora, they fuse to form the posterior & the anterior labial commissures.

Female Sex Glands



- *Urethral & Paraurethral Glands* grow as buds from the *urethra*, they are corresponding to the *Prostate Gland* of the male.
- *Greater Vestibular Glands;* are outgrowths of the *urogenital sinus*, they are corresponding to the *Bulbourethral Glands* of the male.

Summary of Development

OVARY

Urogenital sinus



Female external genitalia
• Lower part of vagina

Absence of androgen exposure

Mullerian ducts



Female internal genital Organs
• Most of upper vagina
• Cervix and uterus
• Fallopian tubes

Congenital Anomalies

- *Various types of anomalies can result due to:*
- *1. Arrest of development of the uterovaginal primordium during the 8th week.*
- *2. Incomplete development of the paramesonephric ducts.*
- *3. Incomplete fusion of the paramesonephric ducts.*
- *4. Failure of parts of one or both paramesonephric ducts to develop.*
- *5. Incomplete canalization.*

Uterine Malformations

❑ 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.

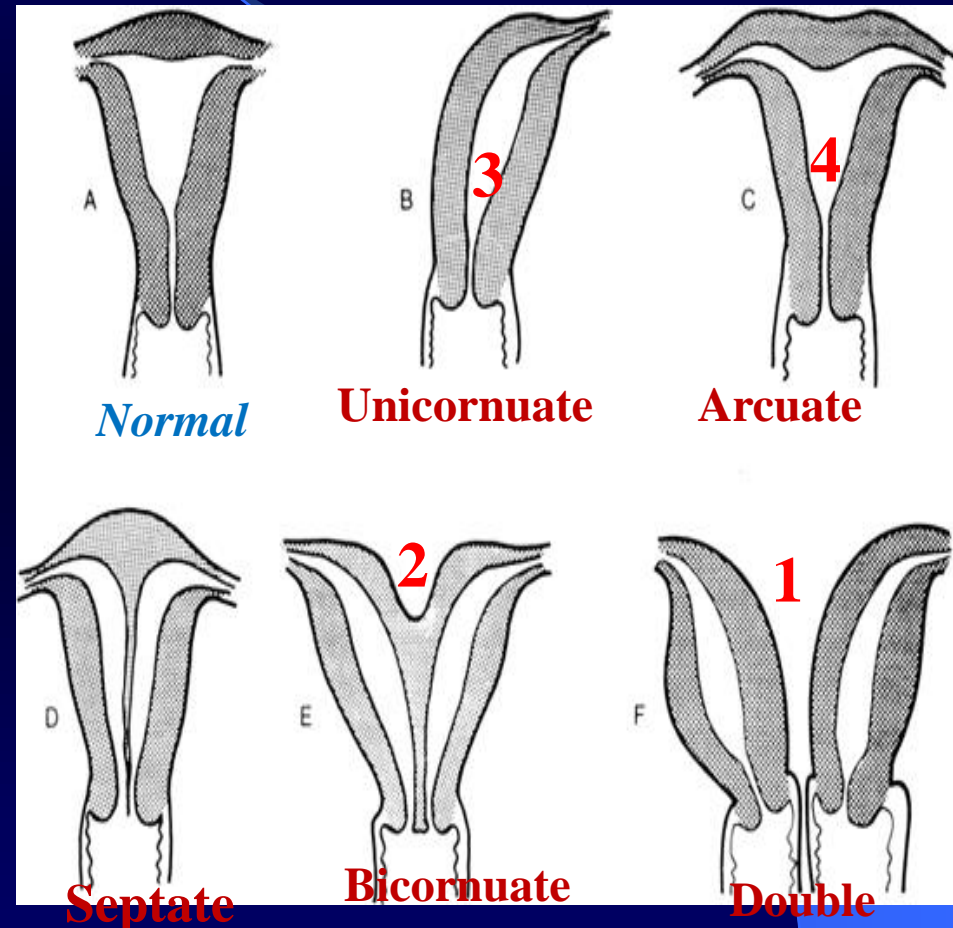
❑ 2. Bicornuate uterus:

- The duplication involves the superior segment.

❑ 3. Unicornuate Uterus:

- One paramesonephric duct fails to develop.

❑ 4. Arcuate Uterus.



□ **Cervical Atresia:**

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

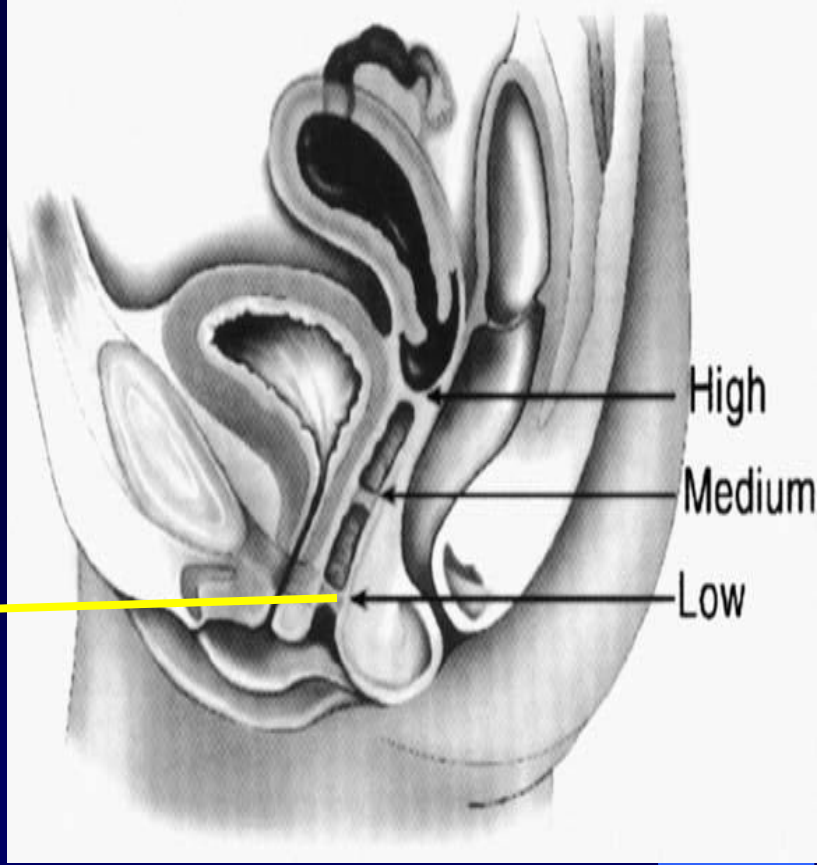
□ **Vaginal Anomalies:**

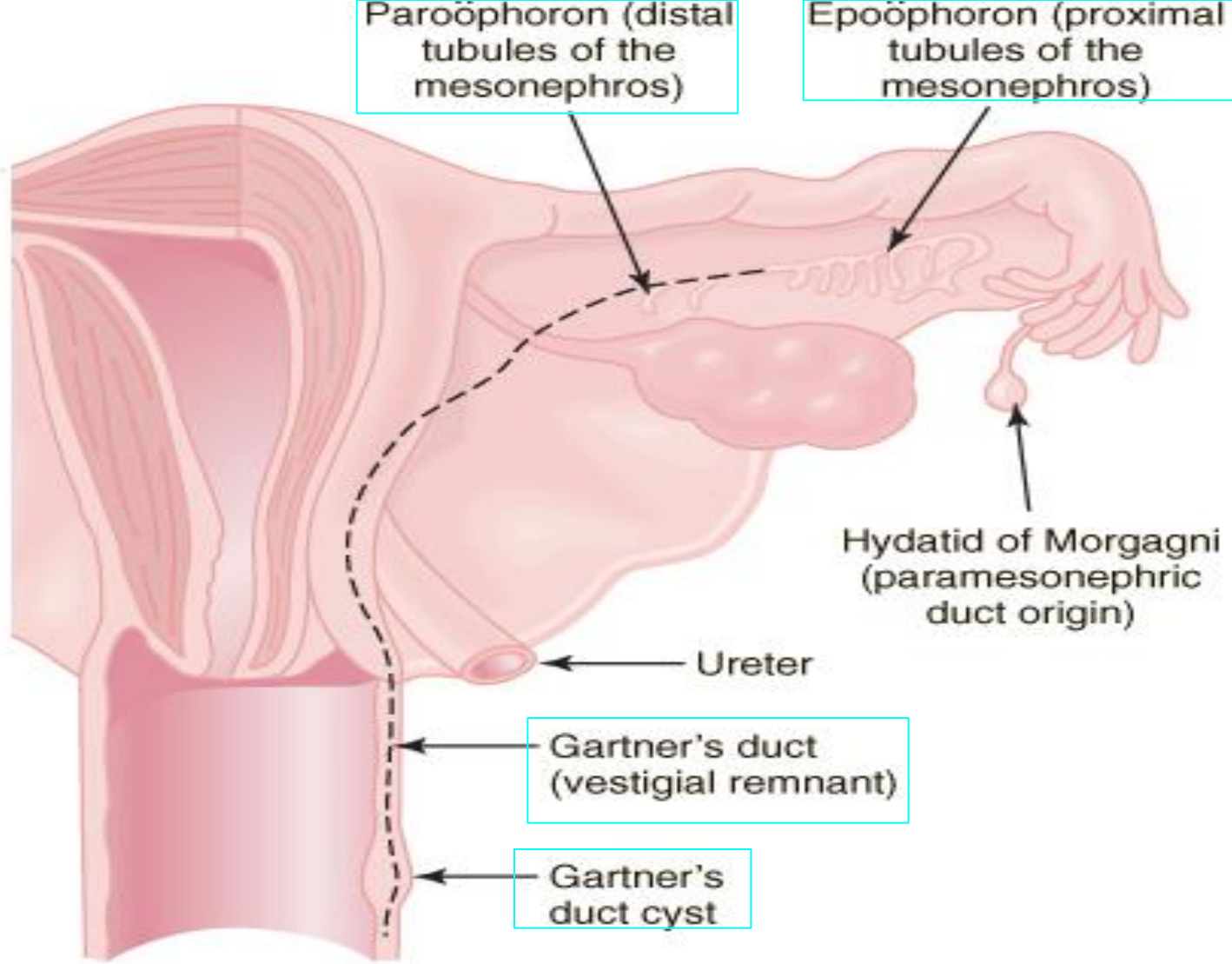
▪ **Atresia** (Partial or complete).

□ **Double vagina.**

□ **Transversely septate vagina:**

▪ Results from faulty canalization of the fused müllerian ducts.





Remnants of the mesonephric (wolffian) ducts that may persist in the anterolateral vagina or adjacent to the uterus within the broad ligament or mesosalpinx.

Thank You