

# DEVELOPMENT OF FEMALE GENITAL TRACT



- Dr. Pooja Keshri
- MBBS , MS ObGY ,
- Senior Resident,
- ESIC Medical College,
- Sanathnagar,
- HYDERABAD.



Three main stages during development :

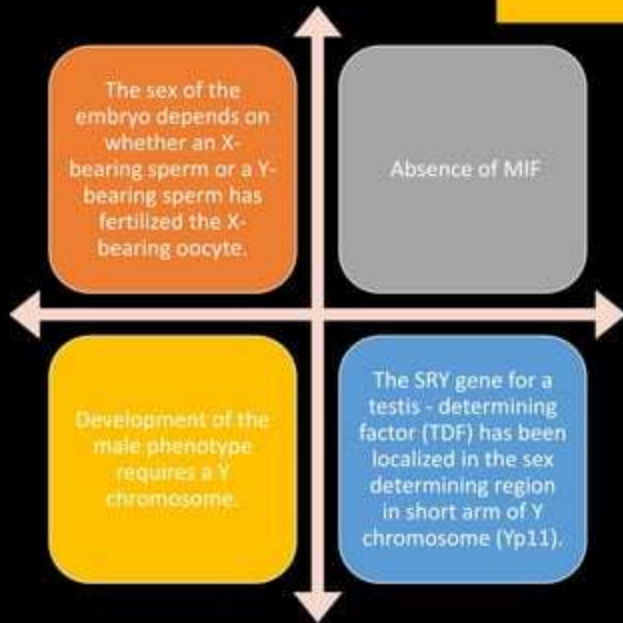
1. Differentiation of gonad (Sex determination)

2. Differentiation of internal genital organs

3. Differentiation of external genital organs

## SEX DETERMINATION

Before 7th week the appearance of the two gonads is identical



IN FEMALES

Absent  
Sertoli cells

Absent  
Leydig cells

No MIF/AMH

No  
Testosterone

Mullerian  
Duct grows

Wolffian  
duct  
regresses

No DHT

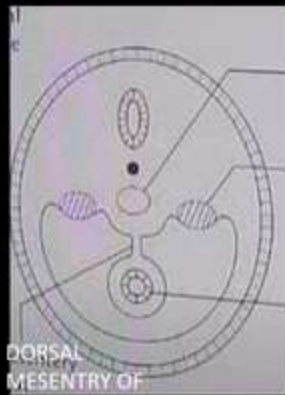
Female like  
genitalia



## DIFFERENTIATION OF INTERNAL GENITAL ORGANS

- **DEVELOPMENT OF GONADS**

- Sex is determined at the time of fertilization.
- But morphological characteristics appear only after 7<sup>th</sup> month .
- The gonads develop from three sources: the mesothelium (coelomic epithelium) lining the posterior abdominal wall, the underlying mesenchyme (intermediate mesoderm), and the primordial germ cells.
- Gonads initially appear as a pair of longitudinal ridges called as genital/gonadal ridges.

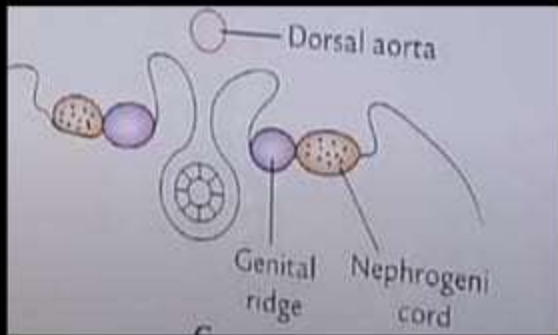


DORSAL  
AORTA

UROGENITAL  
RIDGE

GUT

DORSAL  
MESENTRY OF  
GUT

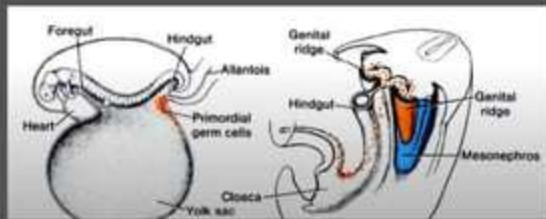


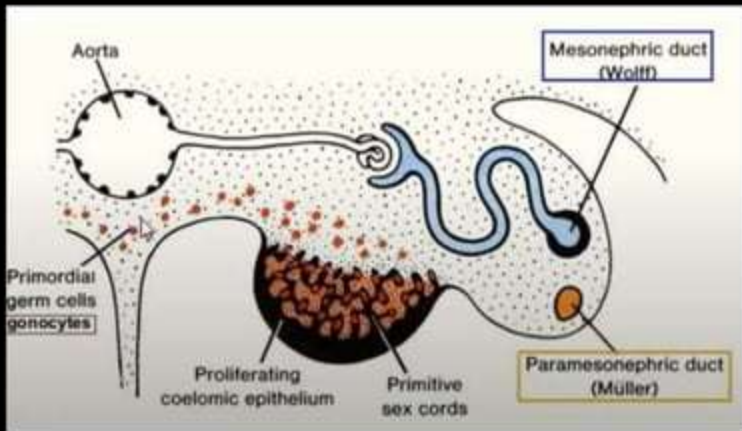
Dorsal aorta

Genital  
ridge

Nephrogeni  
cord

- - Primordial germ cells originate in epiblast.
- -Germ cells appear only after 6<sup>th</sup> week of gestation.
- -Migrate to endodermal cells in yolk sac to allantois at 3<sup>rd</sup> week.
- -Then migrate along the dorsal mesentery of Hind gut.
- -Finally arrive in primitive gonads at 5<sup>th</sup> week.
- -Invade genital ridge at 6<sup>th</sup> week.

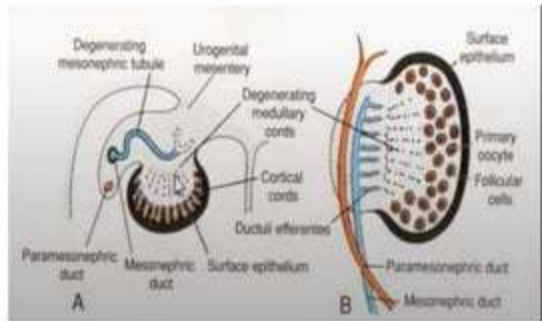




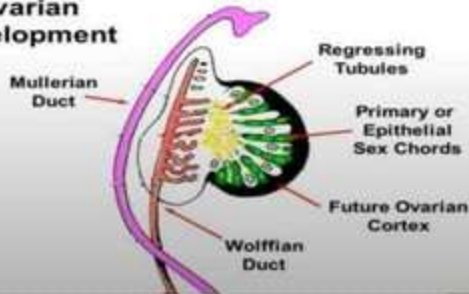
- -Epithelium of genital ridge proliferates and penetrate underlying mesenchyme just before the arrival of primordial germ cells.
- -Resulting in formation of irregularly shaped cords c/a SEX CORDS which are connected to the surface epithelium.
- - Still these are unable to differentiate into male/female gonads hence c/a INDIFFERENT GONADS.



- - Primitive sex cords then dissociate into clusters which occupy medullary part and later disappear and is replaced by vascular stroma and forms **OVARIAN MEDULLA**.
- - Surface epithelium continue to proliferate and in 7<sup>th</sup> week gives rise to second generation cords c/a **CORTICAL CORDS**.
- - At 3<sup>rd</sup> month these cords splits to clusters which proliferate and surround each oogonium with a layer of epithelial cells c/a **Follicular cells** finally forming the **PRIMORDIAL FOLLICLE**.

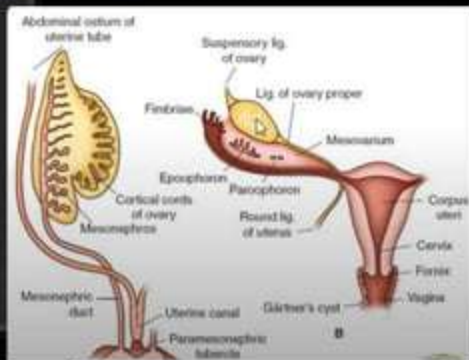
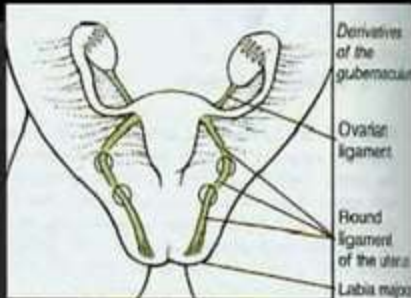


### Ovarian Development



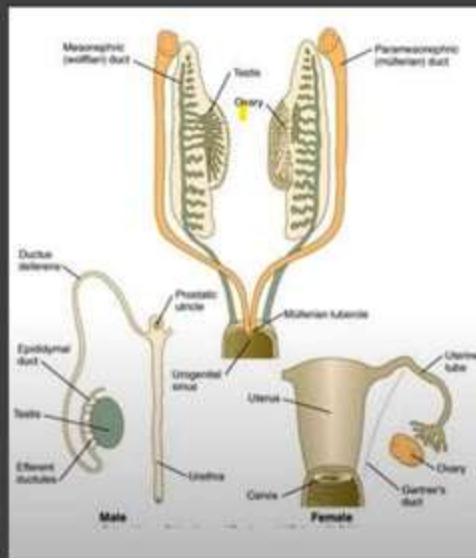
# DESCENT OF THE OVARY

- -The ovary develops in the abdomen .
- -It undergoes internal descent to reach the true pelvis.
- -More descent is arrested d/t attachment of the gubernaculum into the uterus.
- -The gubernaculum becomes ovarian ligament and round ligament of the ovary.
- -FINAL POSITION :Just below the rim of true pelvis.
- Cranial genital ligaments : Suspensory lig. Of ovary.
- Caudal genital ligament : Lig. Of ovary proper and Round ligament of uterus (extending to Labia Majora).

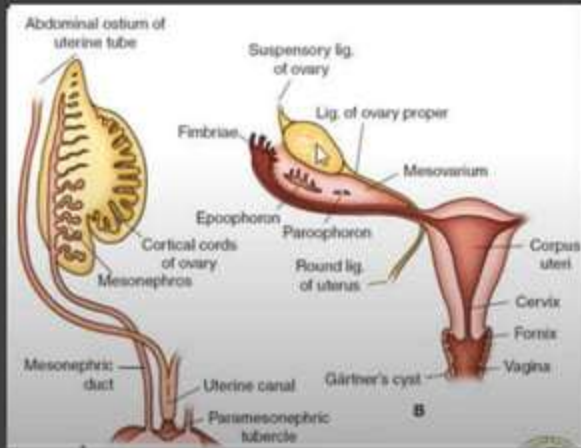


## DEVELOPMENT OF FALLOPIAN TUBE UTERUS AND CERVIX

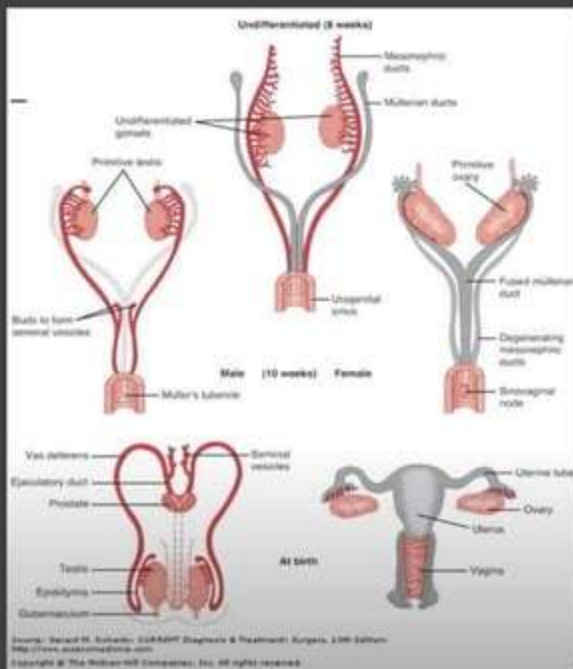
- Genital Ducts : 2 pairs
- -Mesonephric (Wolffian) Duct
- -Paramesonephric (Mullerian) Duct
  
- Paramesonephric duct is the duct of female reproductive organs which gives rise to fallopian tube, uterus, cervix and upper 2/3<sup>rd</sup> of vagina.
  
- It develops as a longitudinal invagination of epithelium of urogenital ridge.



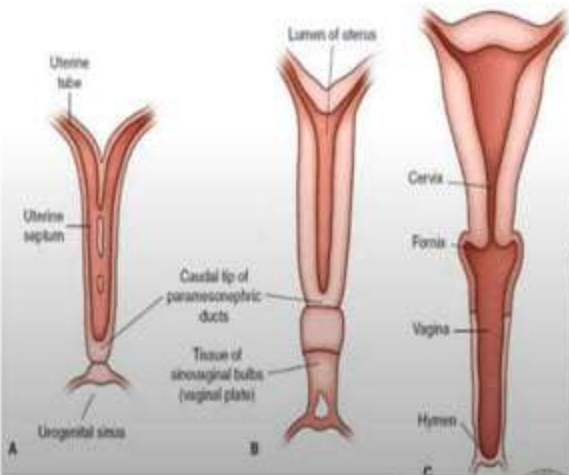
- Cranial part forms the **INFUNDIBULUM** and opens into abdominal cavity.
- Caudal part runs lateral to mesonephric duct, then crosses it and becomes medial.
- Distally it fuses with the opposite paramesonephric duct and forms **UTERINE CANAL**.
- Distal tip projects into the posterior wall of urogenital sinus, where there is development of small swellings, **PARAMESONEPHRIC/MULLERIAN TUBERCLE**.



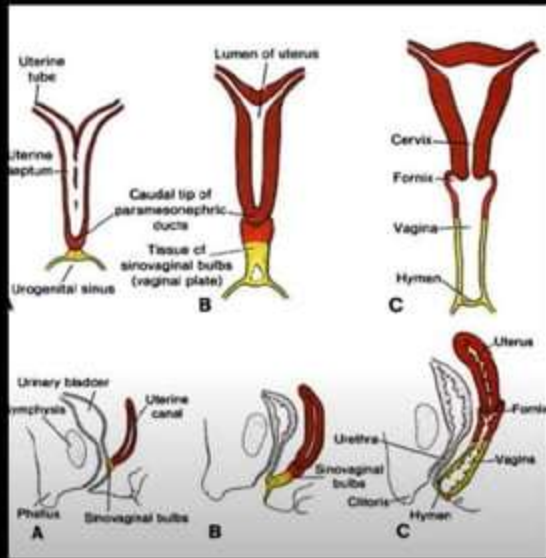
- Caudal portion develops into – UTERINE TUBES.
- Caudal fused portion develops into – UTERINE CANAL (CORPUS AND CERVIX OF UTERUS) , also responsible for formation of ENDOMETRIUM.
- It is surrounded by a layer of mesenchyme that develops into – MYOMETRIUM.
- Its peritoneal covering forms – PERIMETRIUM.
- Abroad transverse pelvic fold on lateral side of fused paramesonephric ducts to the wall of pelvis develops into – BROAD LIGAMENT OF UTERUS.



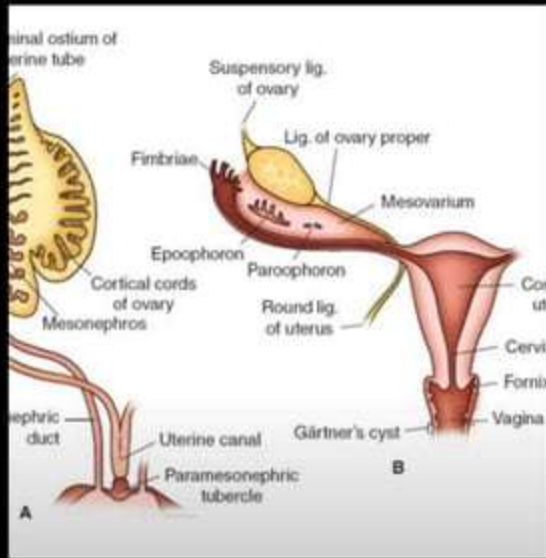
# DEVELOPMENT OF VAGINA



- When distal tip of paramesonephric ducts reaches urogenital sinus, there is development of two solid evaginations from the sinus c/a **SINOVAGINAL BULBS** which then proliferates to form a solid **VAGINAL PLATE**.
- Vaginal plate increases distally between the uterus and urogenital sinus.
- At 5<sup>th</sup> month it gets canalized to form **VAGINA**.
- Expansion of vagina around uterus leads to development of **VAGINAL FORNICES** which are paramesonephric origin.



- Vagina has dual origin :
  - Upper part develops from Uterine Canal.
  - Lower part from Urogenital Sinus.
- -Lumen of vaginal is separated from urogenital sinus by a thin tissue plate c/a HYMEN.
- -Hymen is composed of epithelial lining of urogenital sinus and thin layer of vaginal cells.
- -Hymen develops a small opening during perinatal life.



- Mesonephric duct completely regresses in females, except a small cranial portion found as EPOOPHORON and PAROOPHORON.

- This disappeared mesonephric duct is c/a GARTNER'S DUCT.

- A small caudal portion of this duct is found in wall of uterus/ vagina, forming GARTNER'S CYSTS.





## DIFFERENTIATION OF EXTERNAL GENITALIA

External genitalia in females is under the influence of Estrogen.

At 3<sup>rd</sup> week, mesenchymal cells originate in primitive streak and migrate around cloacal membrane to form a pair of elevated folds c/a CLOACAL FOLDS.

Cranially cloacal folds unite to form GENITAL TUBERCLE.

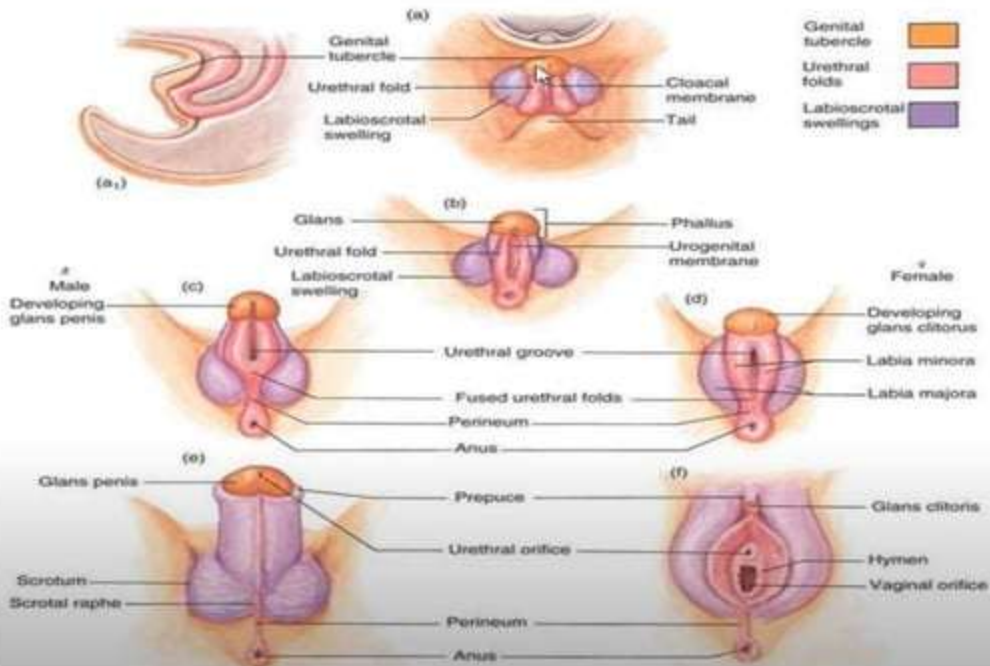
These tubercle slightly elongates to form CLITORIS.

Caudally cloacal folds are subdivided into ant – URETHRAL FOLDS and post.- ANAL FOLDS

Urethral folds develops into LABIA MINORA.

Genital swellings are folds of connective tissue developed around urethral folds – which forms LABIA MINORA in females.

Urogenital groove is open in females and forms VESTIBULE.



## Derivatives of Mesonephric duct & Paramesonephric duct in males & females



Structure	Male Derivative	Female Derivatives
Paramesonephric duct	Appendix of testis	Uterine tube
	Utricle of prostate	Uterus
		Upper vagina
Mesonephric duct	Appendix of epididymis	Appendix of ovary
	Epididymis	Gartner's duct
	Ductus deferens	
	Ejaculatory duct	
	Seminal vesicle	



## References

1. Langman's Medical Embryology, 12<sup>th</sup> edition
2. Essentials of Human Embryology, by A.K. Datta, 5<sup>th</sup> edition
3. Before we are born, by More & Persuad
4. Internet websites (especially for pictures)

**THANK YOU**

