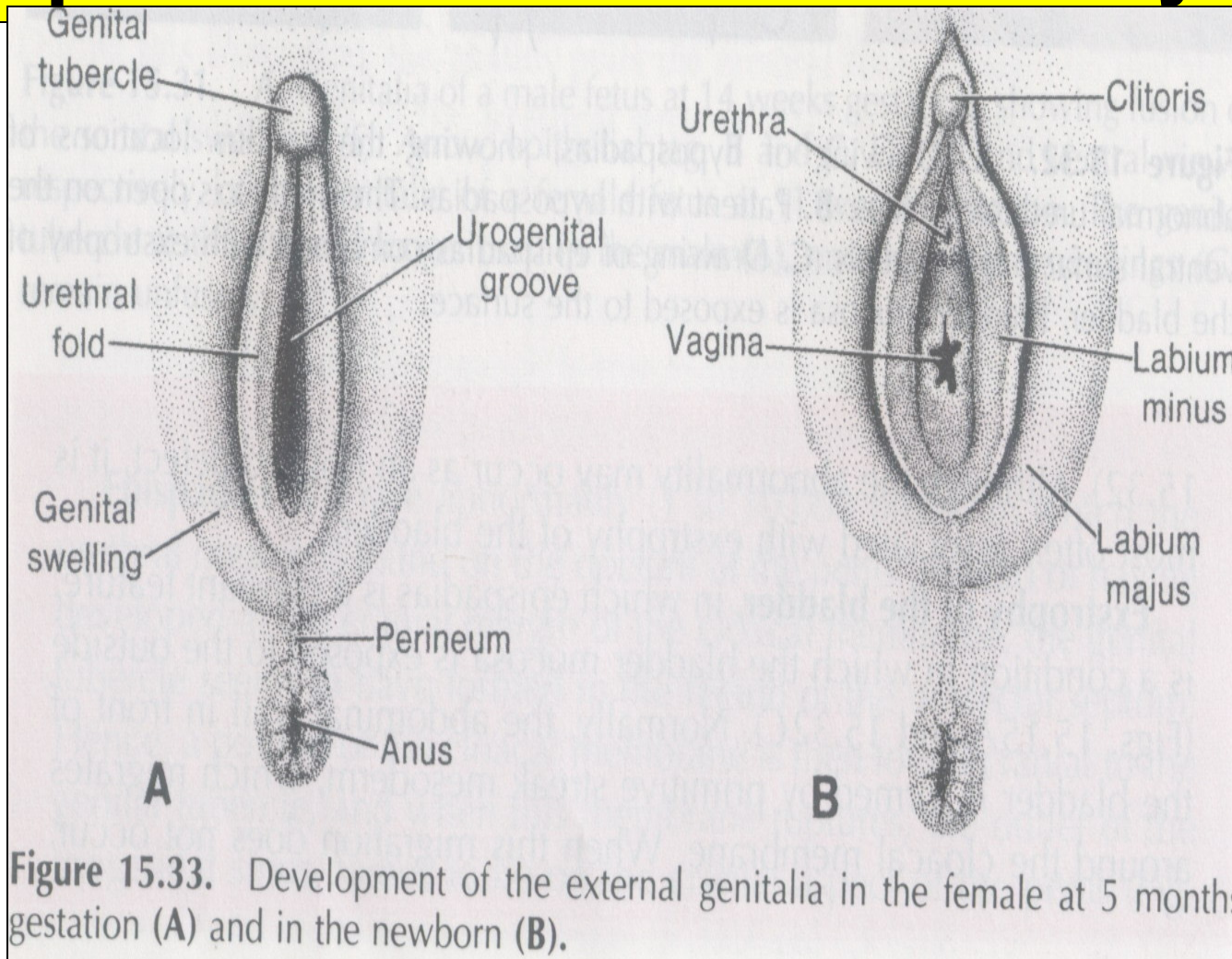


Development of Female Genital System



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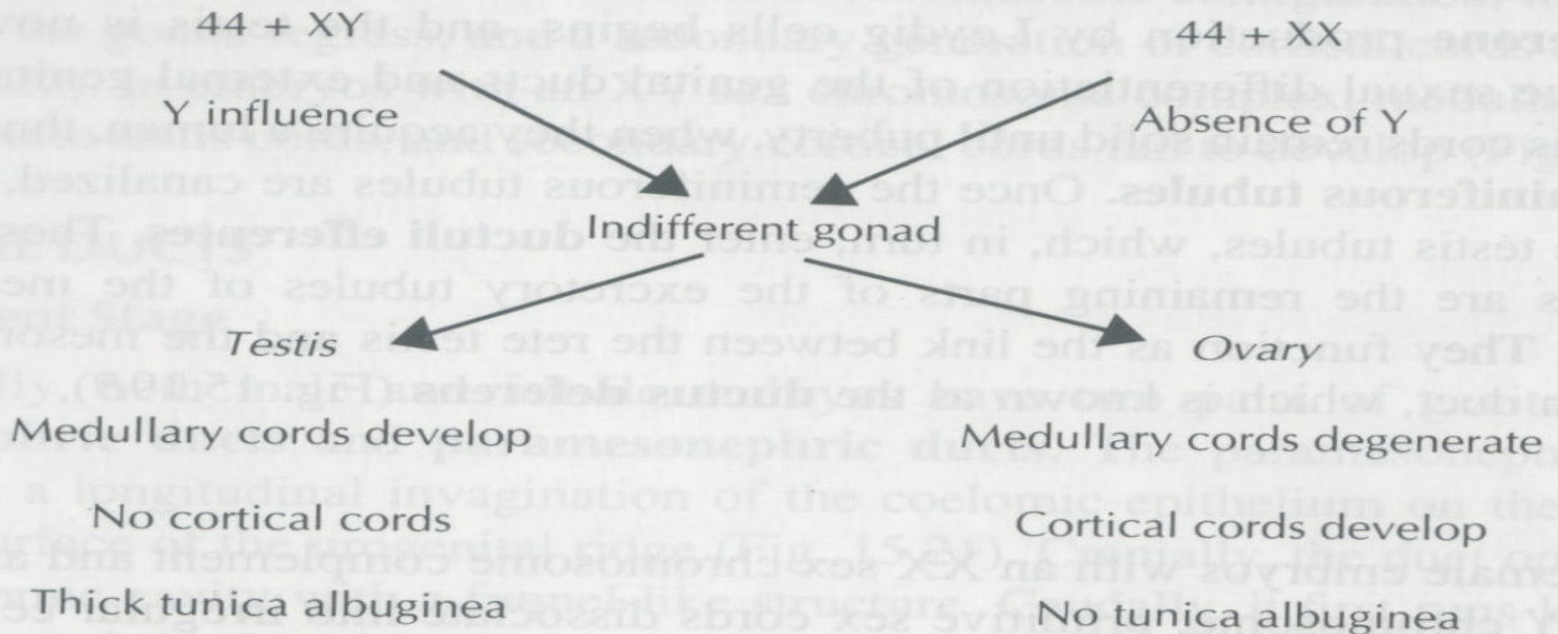
Objectives

- **By the end of the lecture, you should be able to:**
- Describe the development of gonads (indifferent & different).
- Describe the development of the female gonad (ovary) and the internal genital organs (uterus, uterine tubes and vagina).
- Describe the development of the external genitalia.
- List the main congenital anomalies of female genital system.

Development of Genital System

- Y chromosome.
- Testis-determining factor (TDF) gene.
- TDF = Male.
- No TDF = Female.

Influence of Primordial Germ Cells on Indifferent Gonad

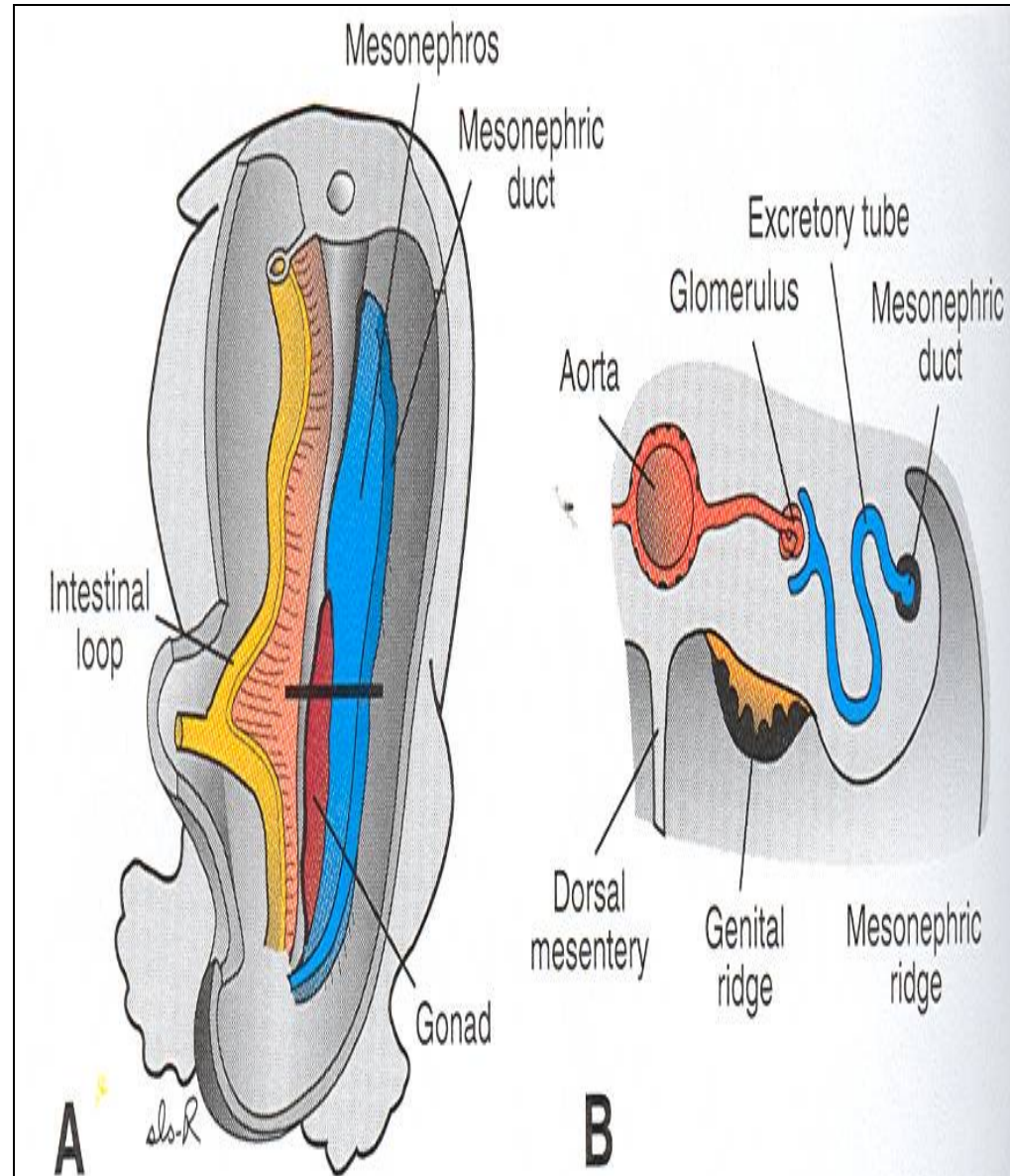


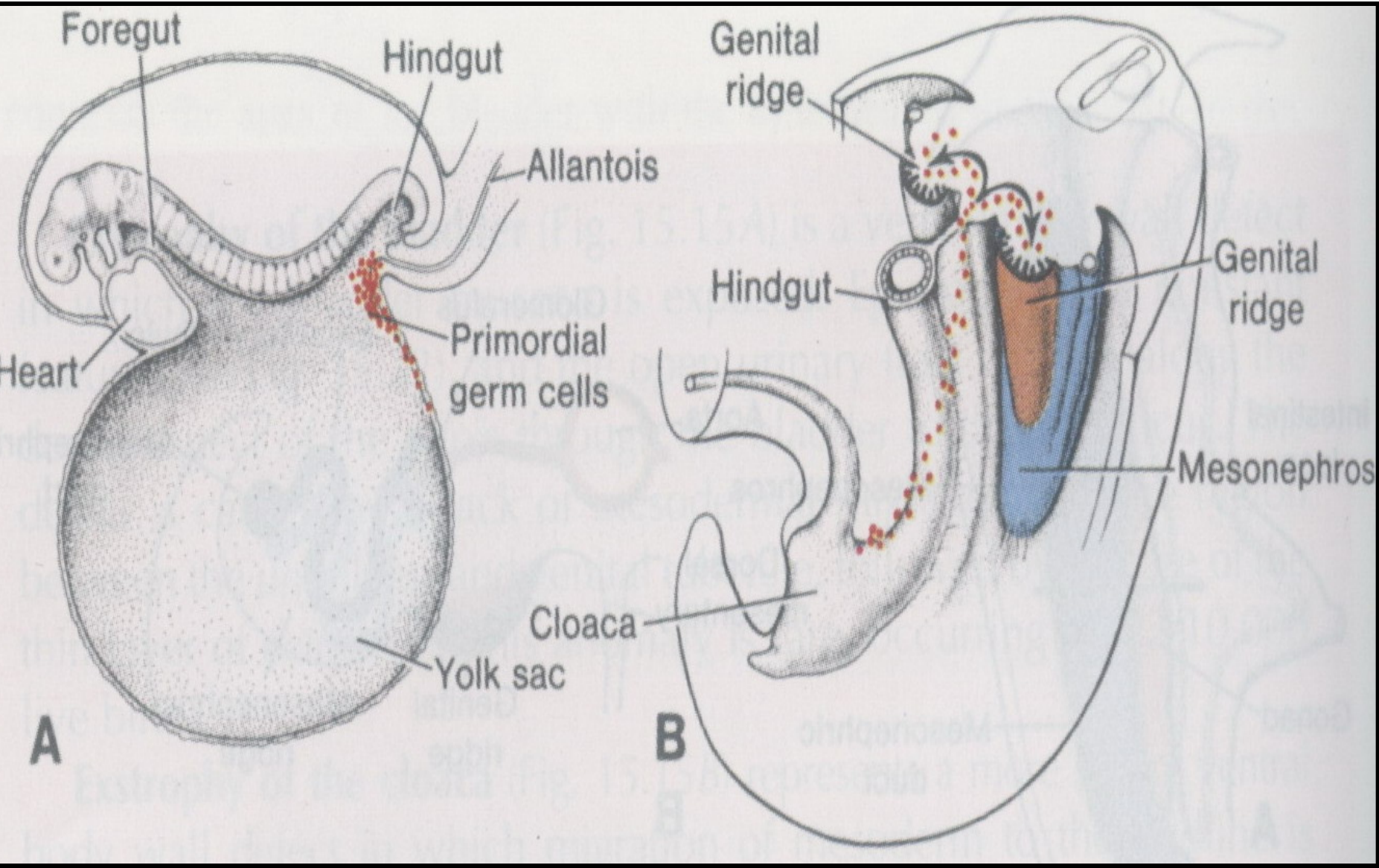
Gonads

- Sex of the embryo is determined genetically at the time of fertilization.
- Gonads do not acquire male or female morphological characteristics until the 7th week of development.

- Genital system are developed from two longitudinal ridges of mesoderm which run down the entire length of the dorsal body wall.
- These ridges are called urogenital ridges.
- The **medial region** of this ridge differentiates into the genital ridge where the gonads develop.

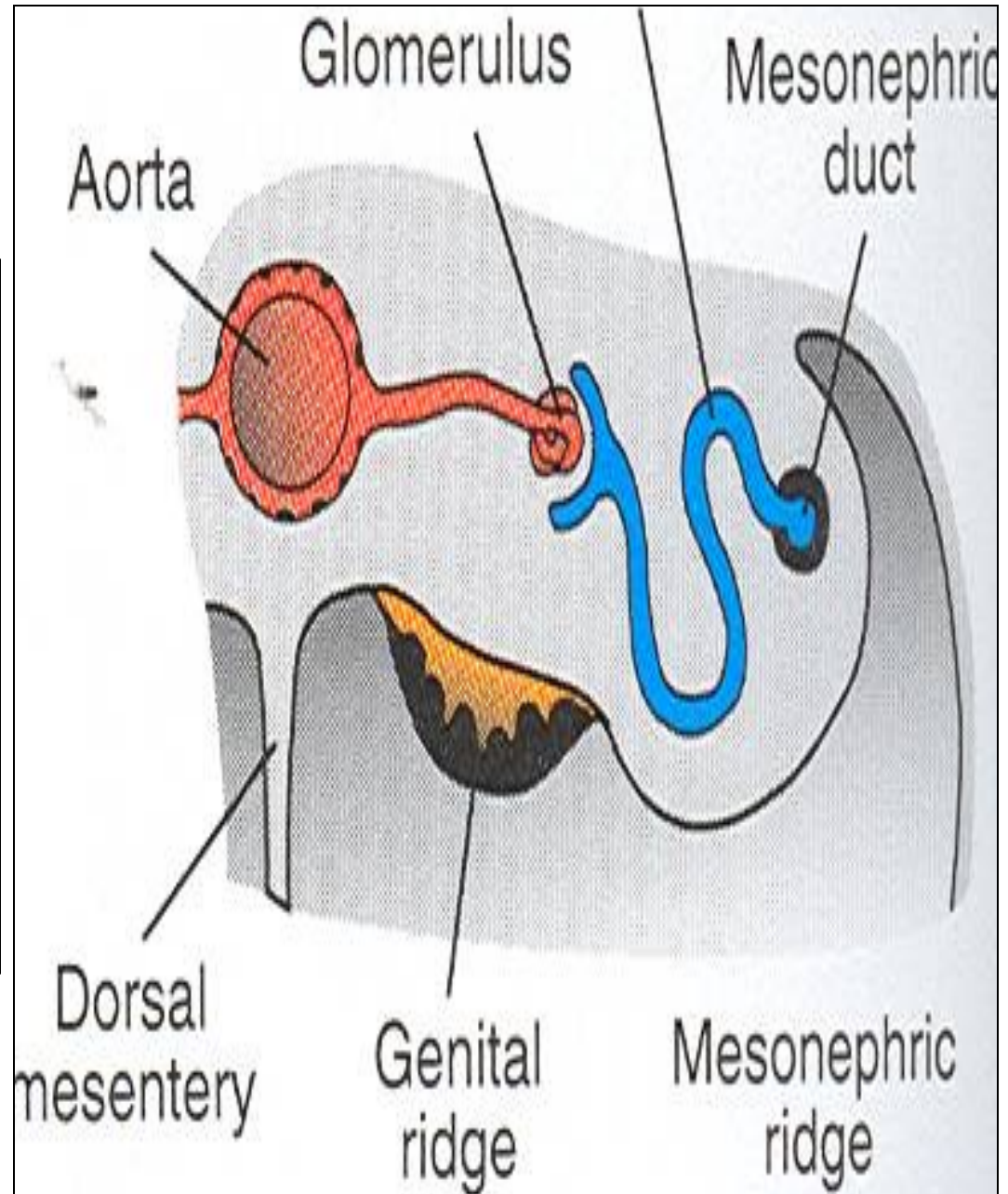
Gonads





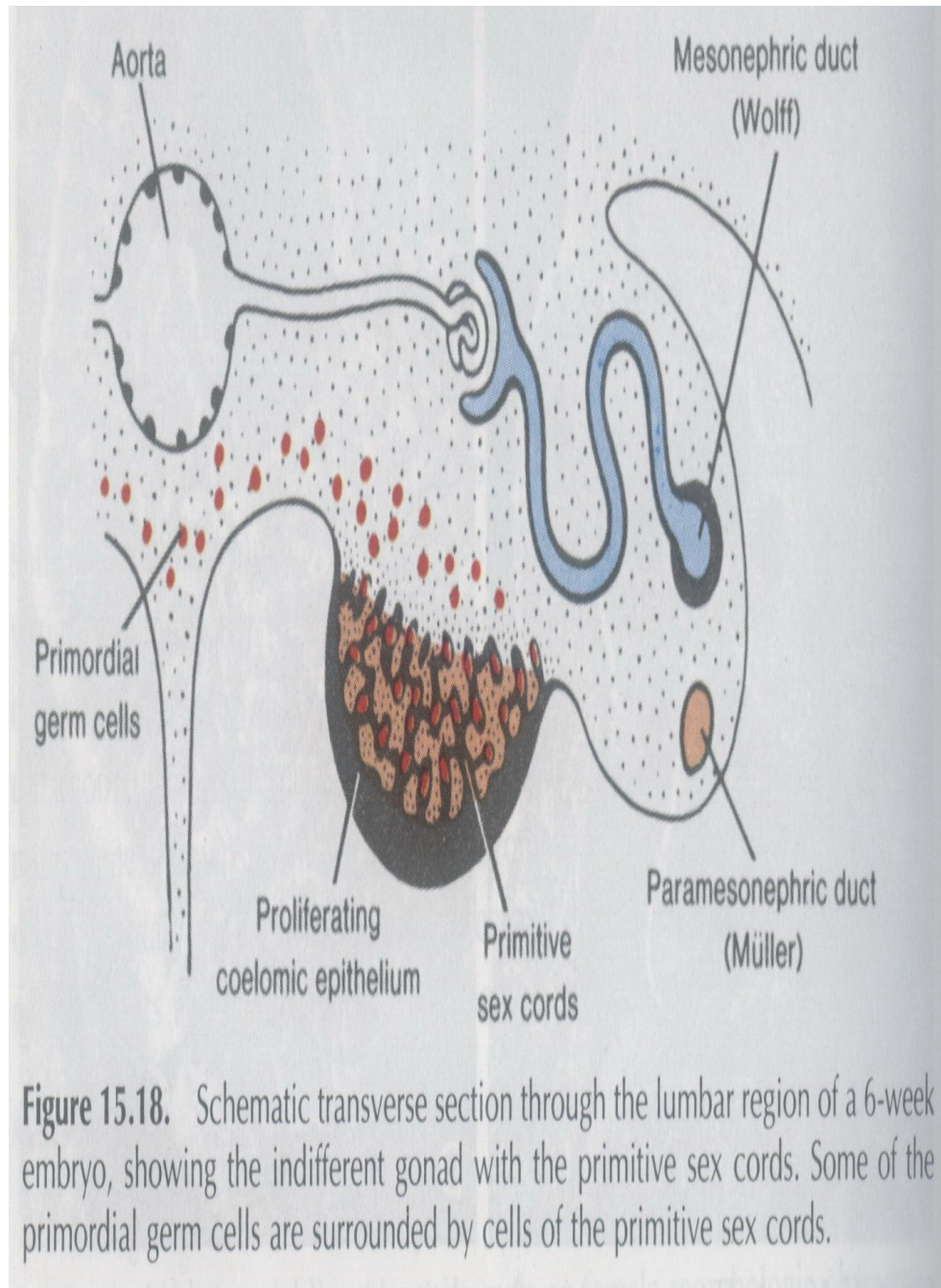
Gonads

- The gonads begin to develop during the **5th** week in the **genital ridge**.
- First the gonads are undifferentiated and have a cortex and a medulla.



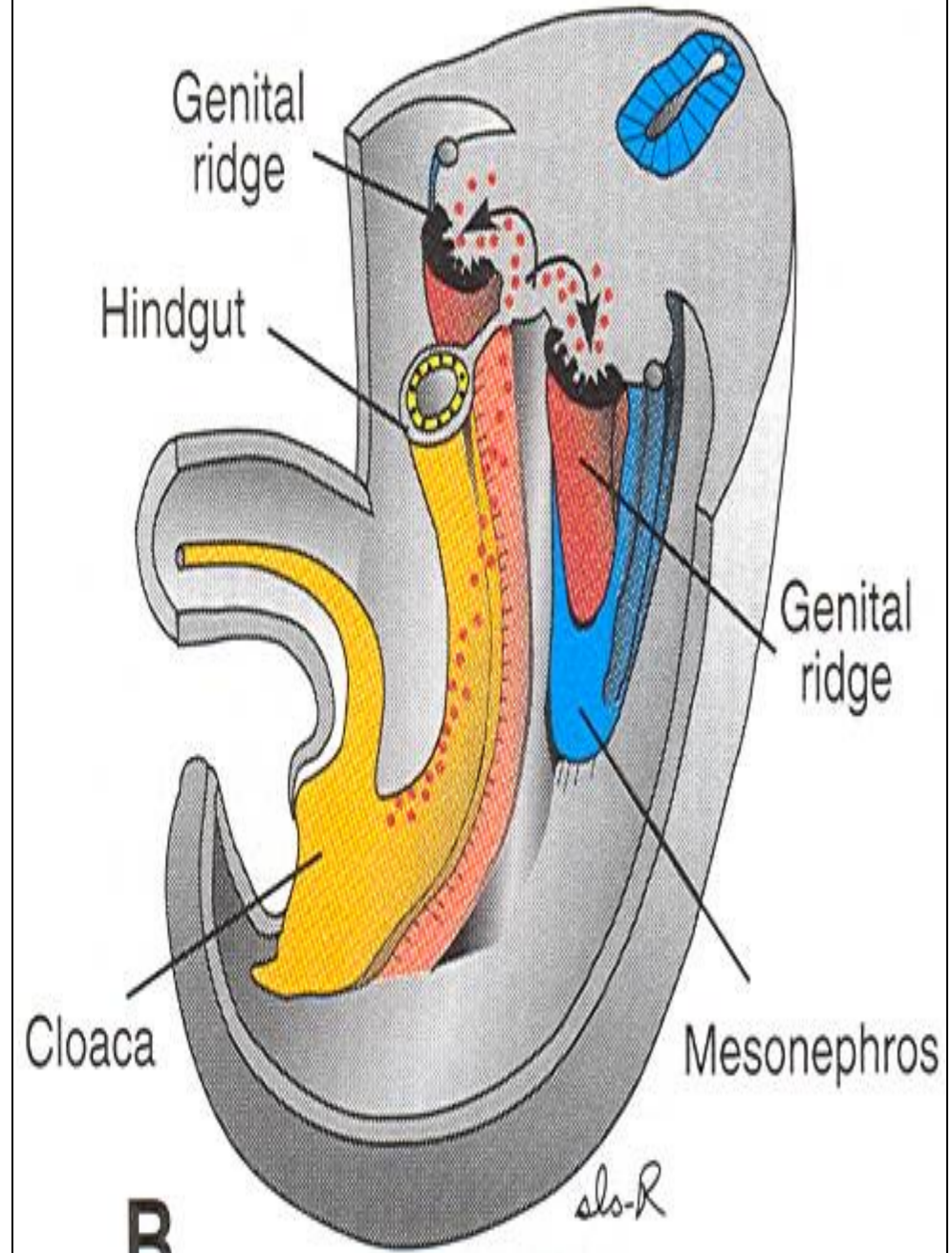
Gonads

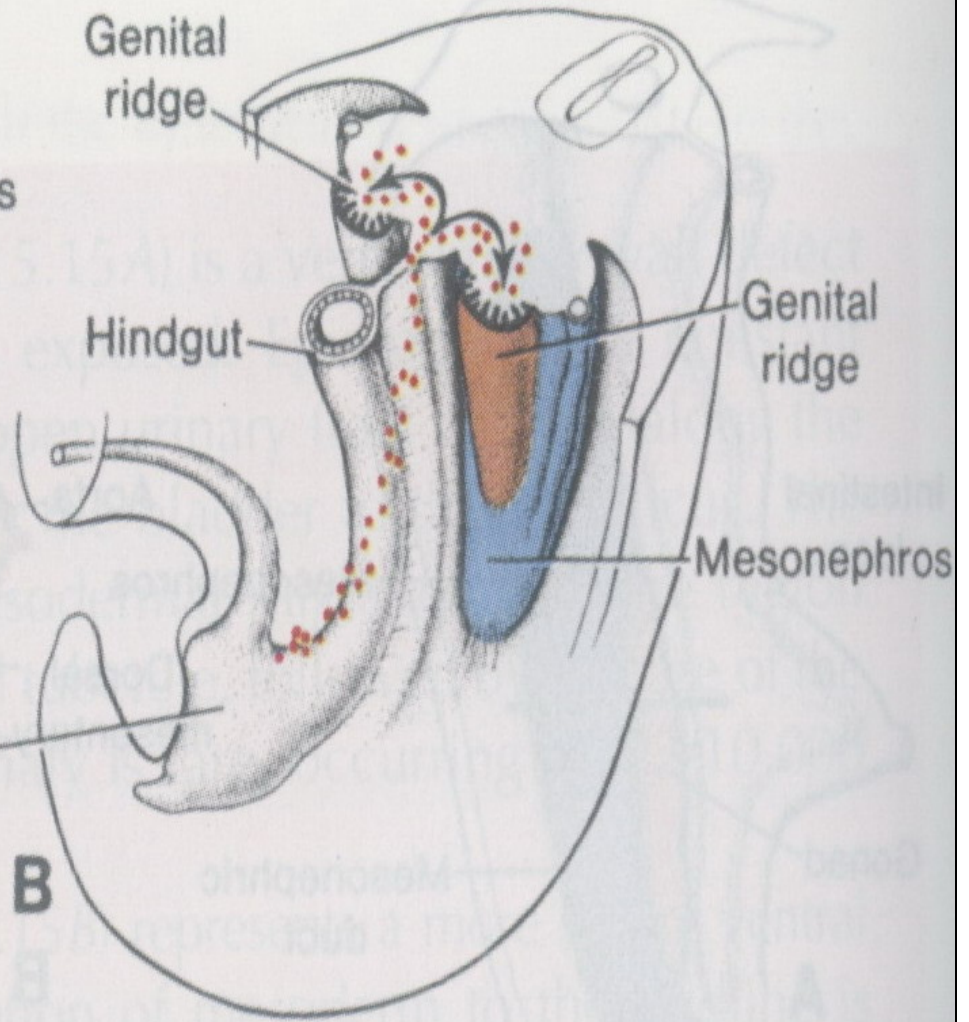
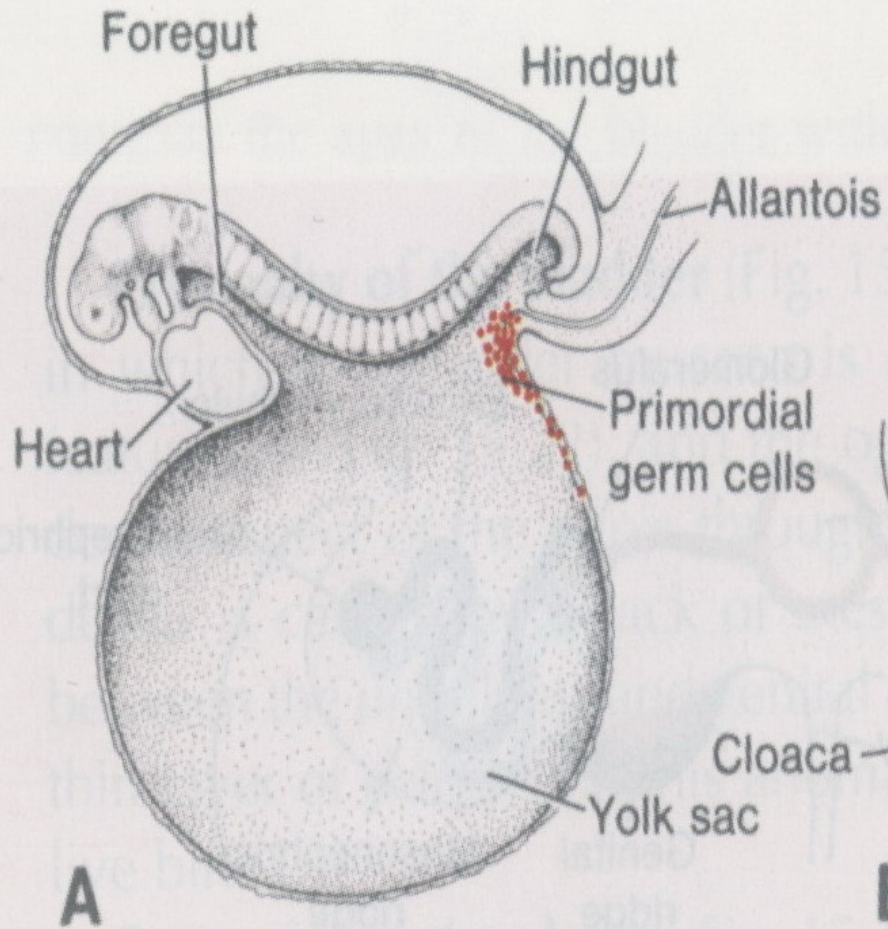
- In embryos with an **XX** chromosome complex, the **cortex** normally differentiates into an ovary, and the **medulla regresses**.
- In embryos with an **XY** complex, the medulla differentiates into a testis and the cortex regresses.



Gonads

- Large primitive cells, called **primordial sex cells** formed in the yolk sac during the **4th week**.
- They migrate along the dorsal mesentery of the hindgut to the genital ridges where they become incorporated into the developing gonads.





Gonads

- Germ Cells arrives at **5th week** & invades the genital ridge in the **6th week**.
- During arrival of Germ cells, the epithelium of the genital ridge proliferates, and epithelial cells penetrate the underlying mesenchyme
- Forming an irregular shaped cord primitive sex cord “**indifferent gonad**”

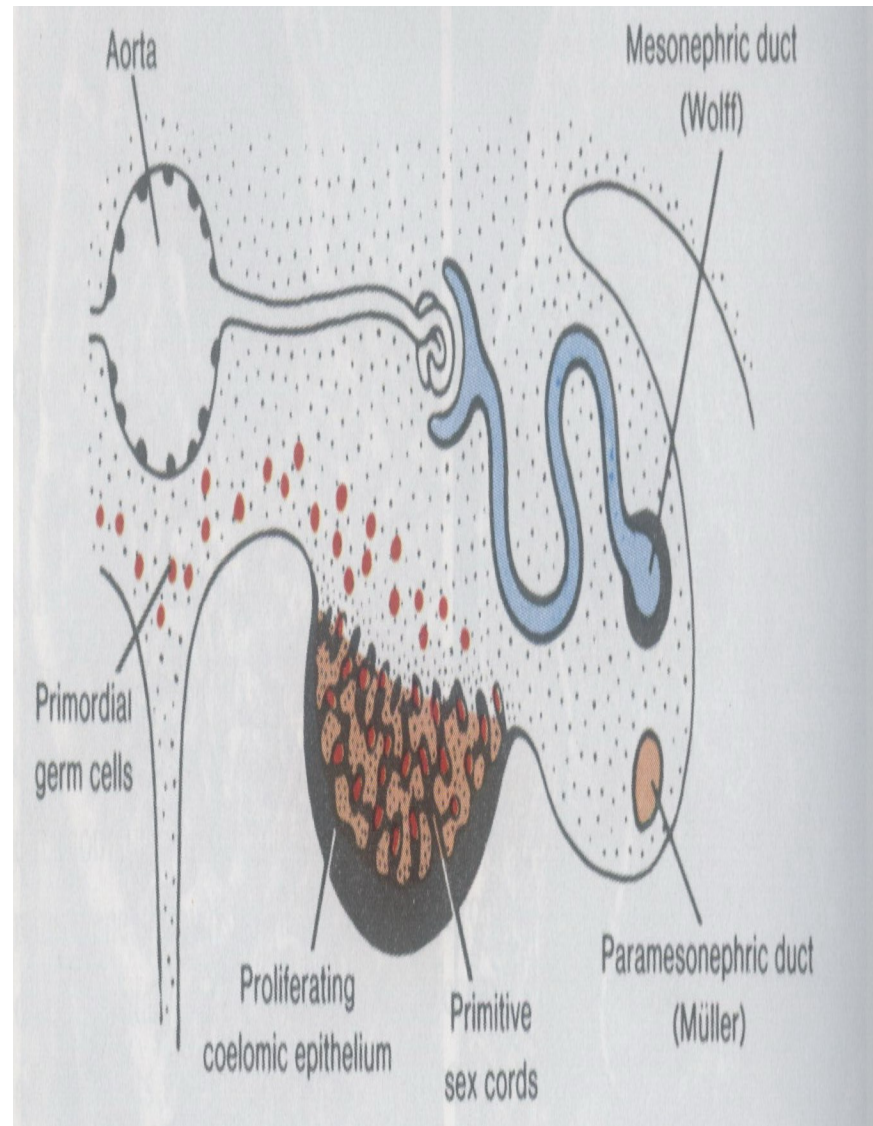


Figure 15.18. Schematic transverse section through the lumbar region of a 6-week embryo, showing the indifferent gonad with the primitive sex cords. Some of the primordial germ cells are surrounded by cells of the primitive sex cords.

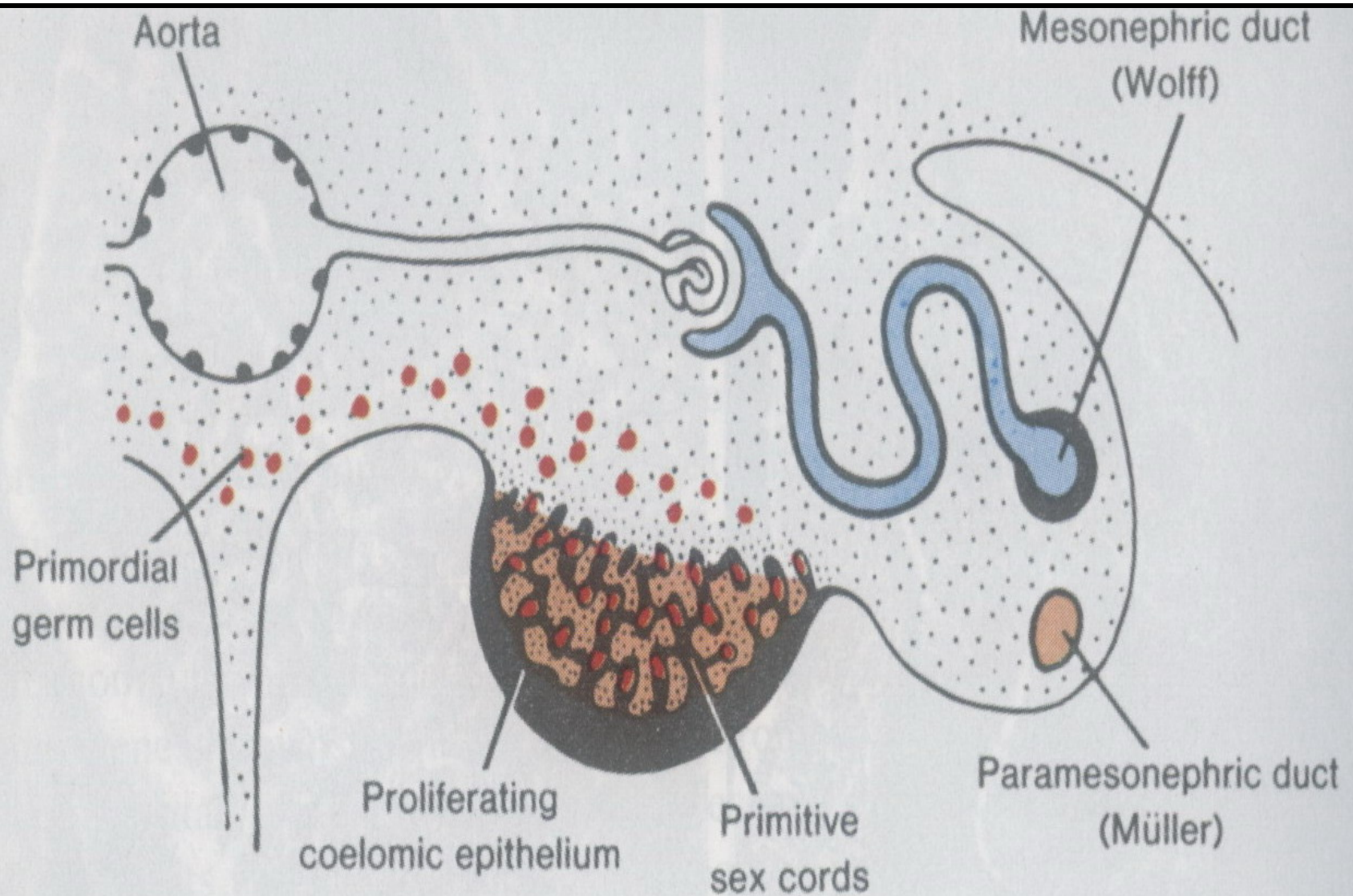
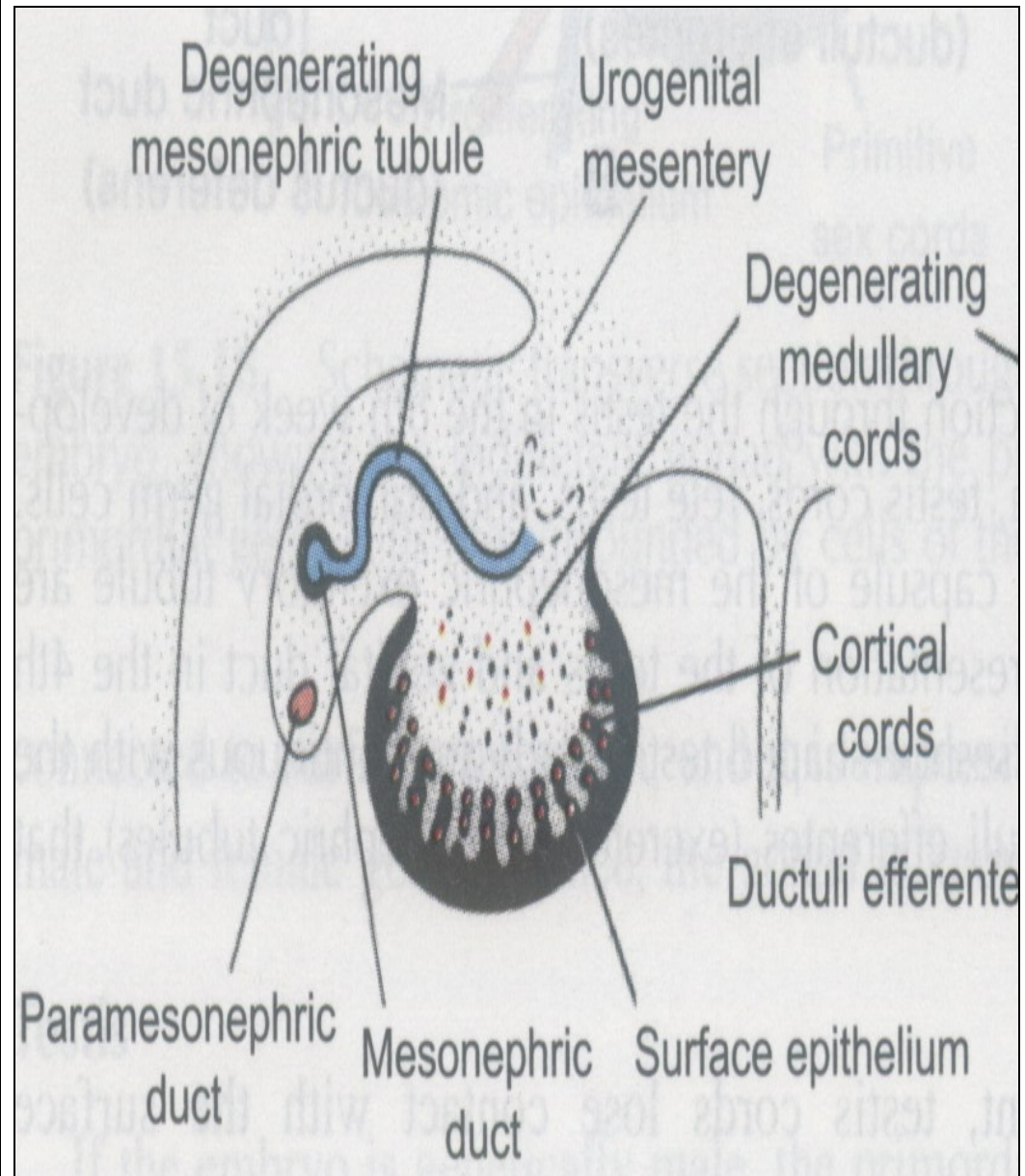


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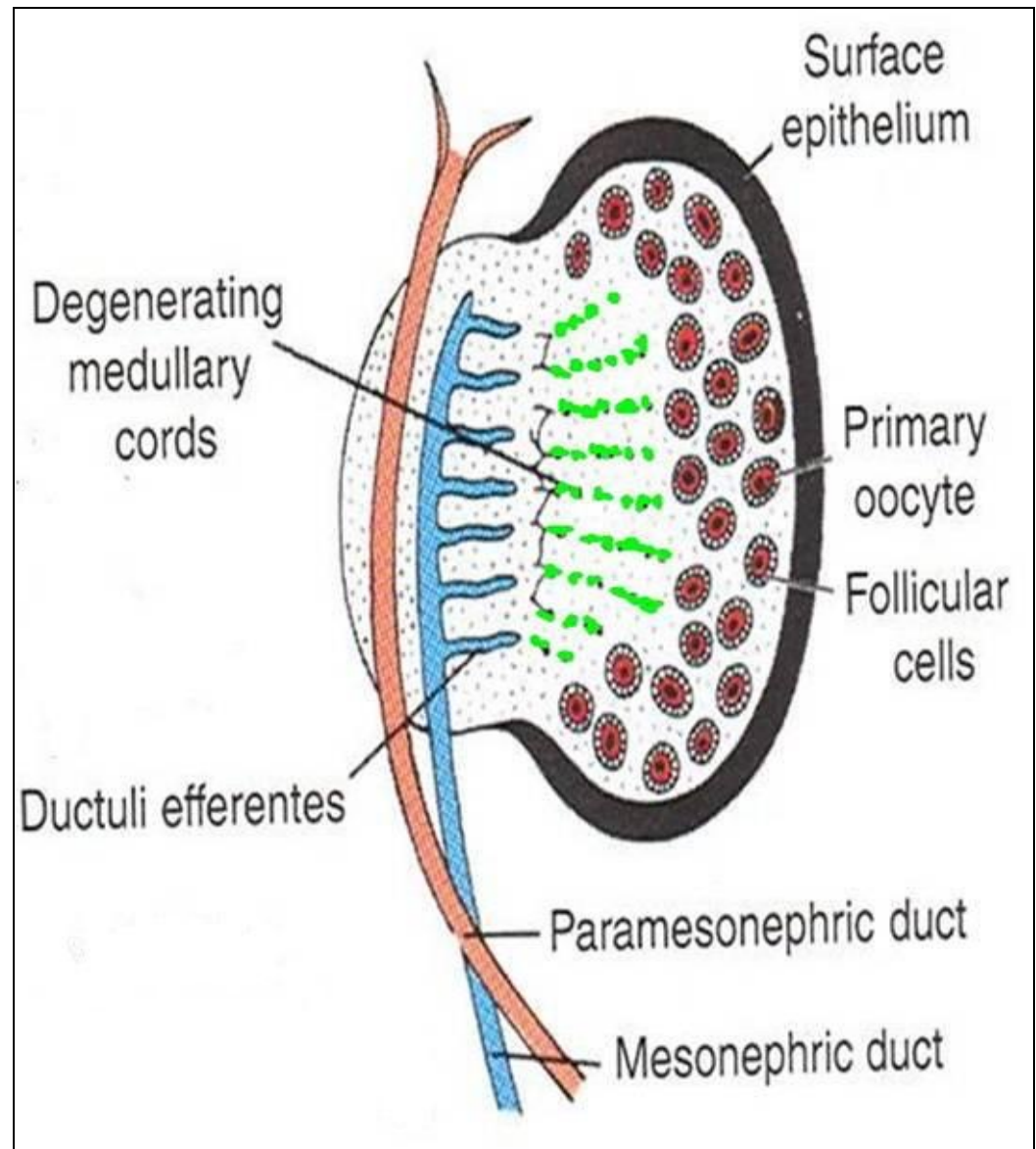
OVARY

- Primitive sex cords dissociate into irregular cell cluster.
- Later they will disappear and are replaced by **vascular stroma** forming ovarian **medulla**.
- Surface epithelium of the female gonad proliferates.
- In **7th** week they give rise to 2nd generation of cords called “cortical cords”.



- The cortical cords penetrate the underlying mesenchyme.
- In **4th month** these cords split into isolated cell clusters which surrounding one or more primitive germ cells, (**GC**).
- **GC** will develop into oogonia and the surrounding epithelial cells form the follicular cells.

OVARY



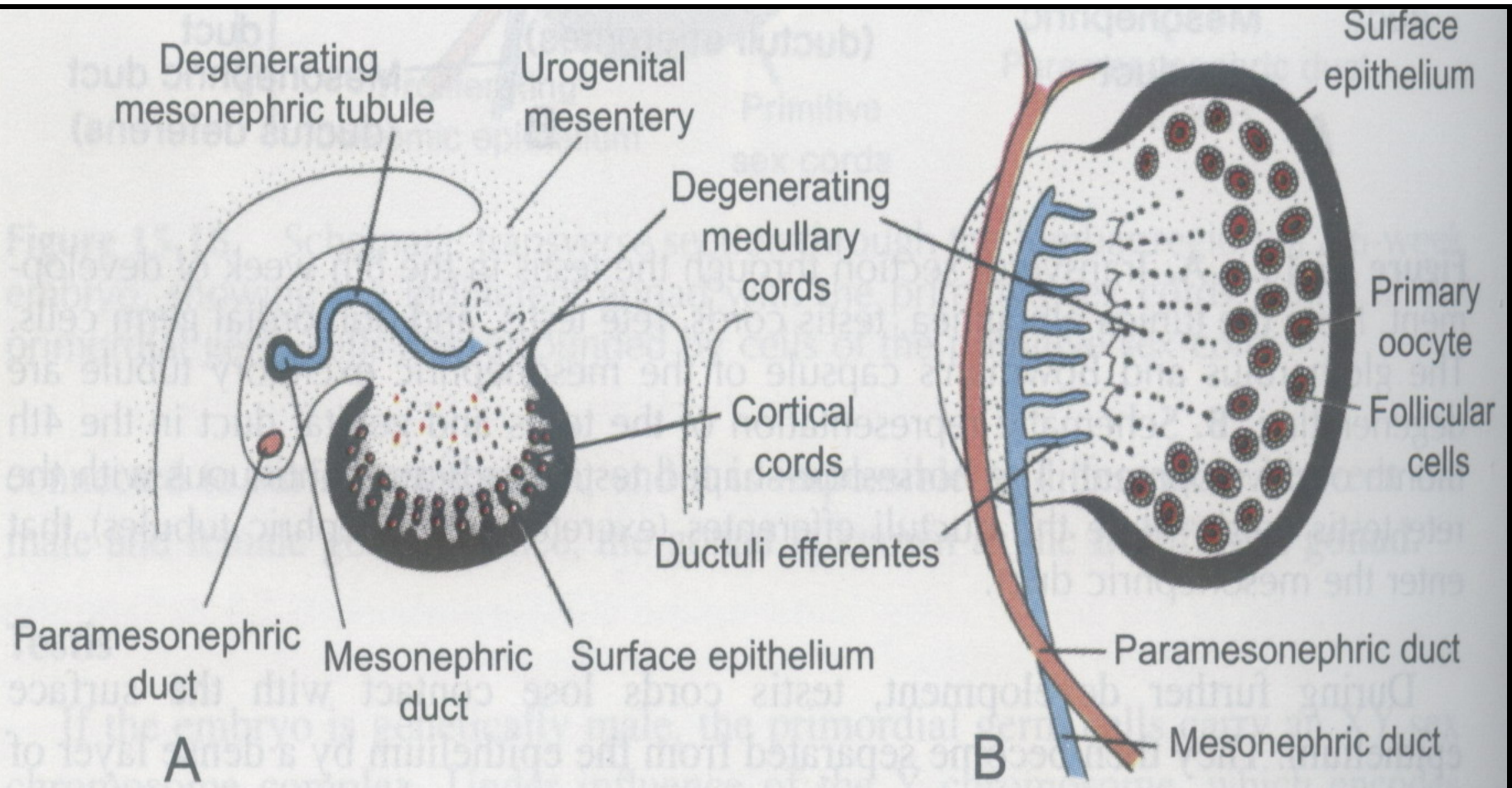


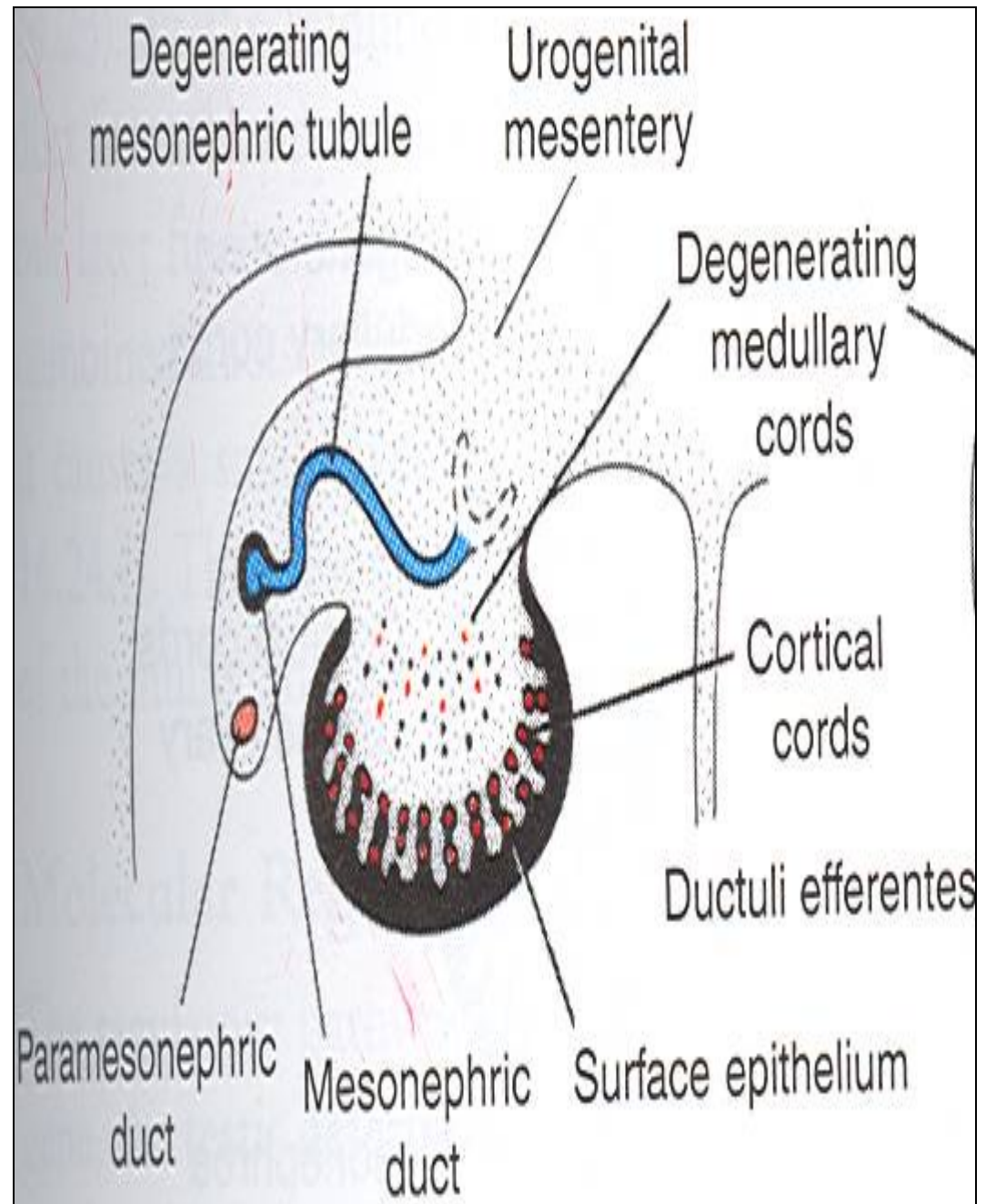
Figure 15.20. **A.** Transverse section of the ovary at the 7th week of development, showing degeneration of the primitive (medullary) sex cords and formation of the cortical cords. **B.** Drawing of the ovary and genital ducts in the 5th month of development. Note degeneration of the medullary cords. The excretory mesonephric tubules (efferent ductules) do not communicate with the rete. The cortical zone of the ovary contains groups of oogonia surrounded by follicular cells.

GENITAL DUCTS

- Two pairs of genital ducts develop in both sexes:

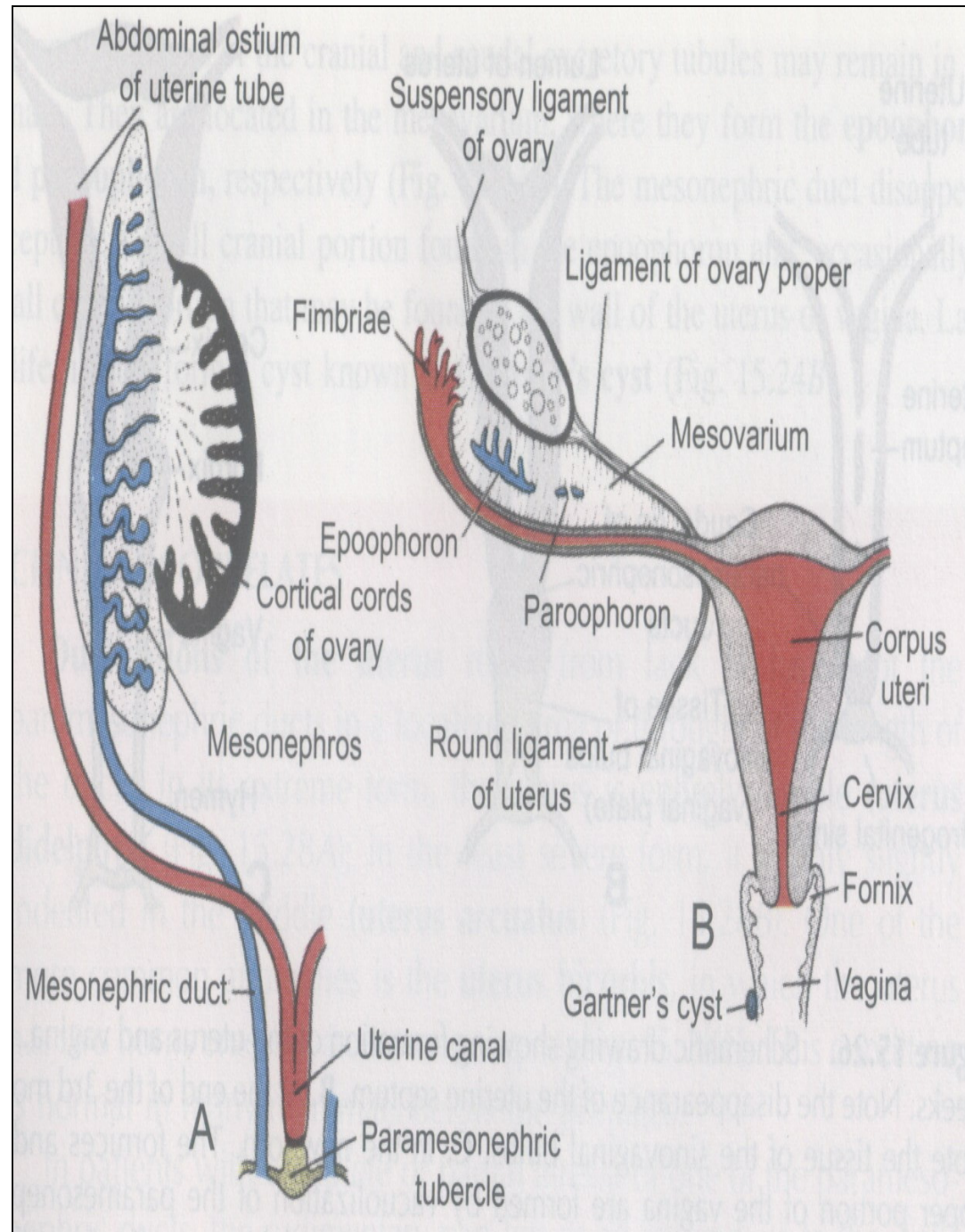
1. Mesonephric (Wolffian) ducts and

2. Paramesonephric (Mullerian) ducts.



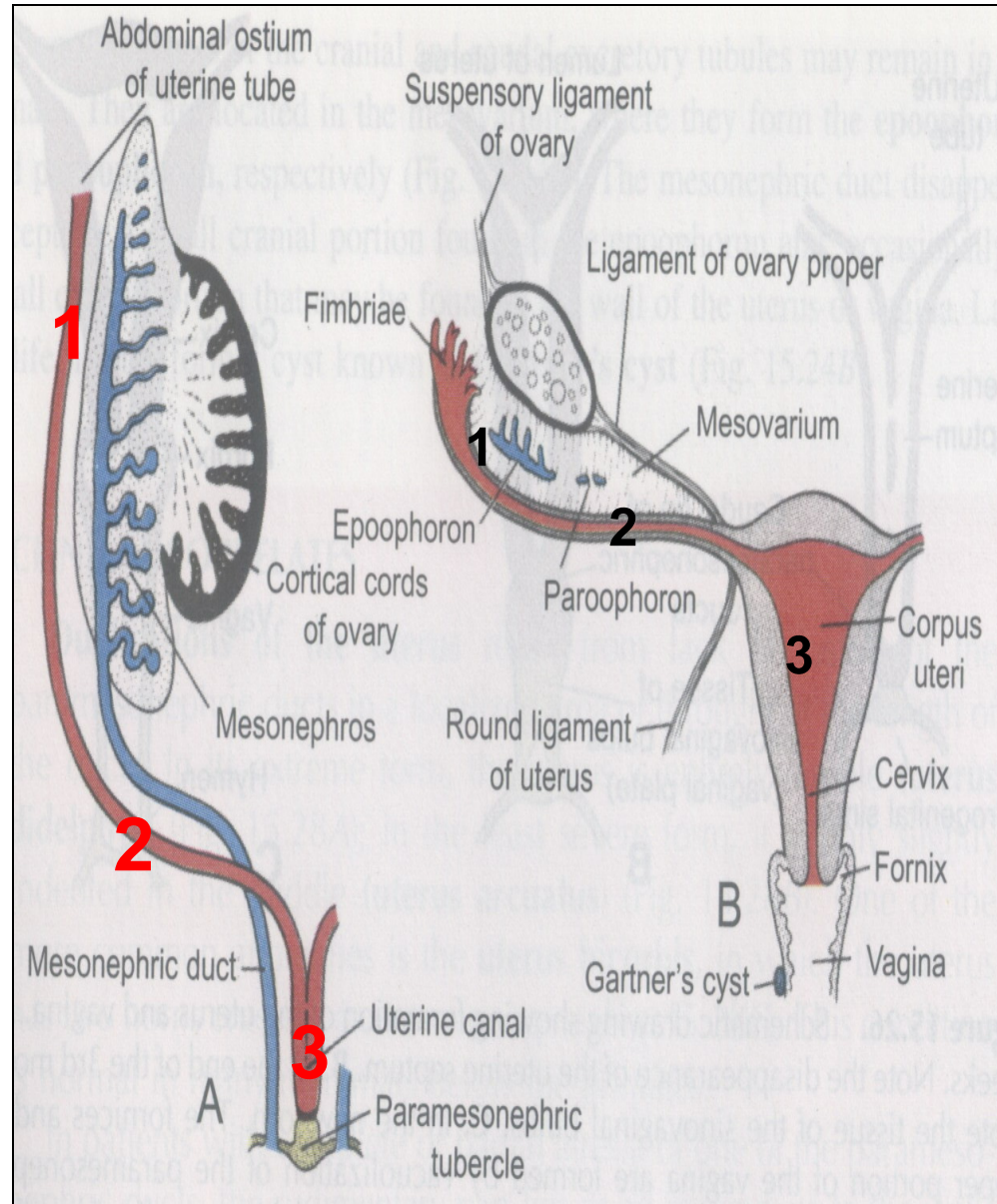
GENITAL DUCTS

- In female embryos, **mesonephric ducts** regress while the **paramesonephric ducts** develop into:
 - Uterus,
 - Uterine tubes and
 - Upper vagina.



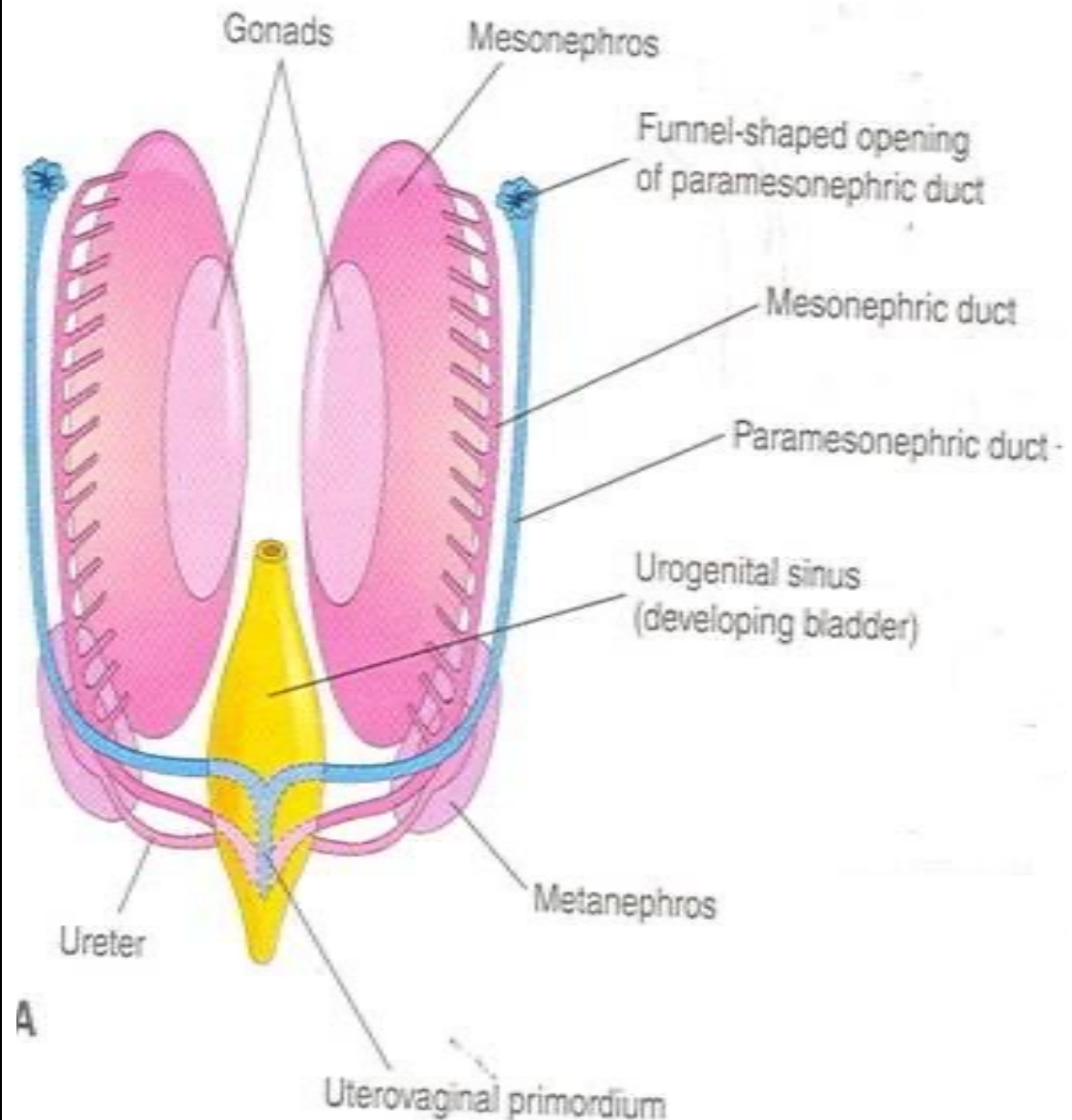
Genital duct in the female

- **Paramesonephric ducts** develop into the main genital ducts of the female.
- Initially, **3 parts** can be recognized in each duct:
- A vertical cranial portion **(1)** which opens into abdominal cavity.
- A horizontal part that crosses anterior to the mesonephric duct, **(2)**.
- A horizontal part that crosses anterior to the mesonephric duct, **(2)**.
- A horizontal part that crosses anterior to the mesonephric duct, **(2)**.



Genital duct in the female

- A caudal vertical (3) part that fuses with its partner from the opposite side.
- (1 & 2) develop into the uterine tubes.
- The fused parts (3) give rise to body and cervix of the uterus.
- Mesenchyme will form the myometrium & perimetrium of the uterus.



Vagina

- After solid tip of paramesonephric ducts reaches the urogenital sinus, 2 solid evagination grow out.
- These evagination (sinovaginal bulbs), proliferate and form vaginal plate.
- By the 5th week the outgrowth is entirely canalized.

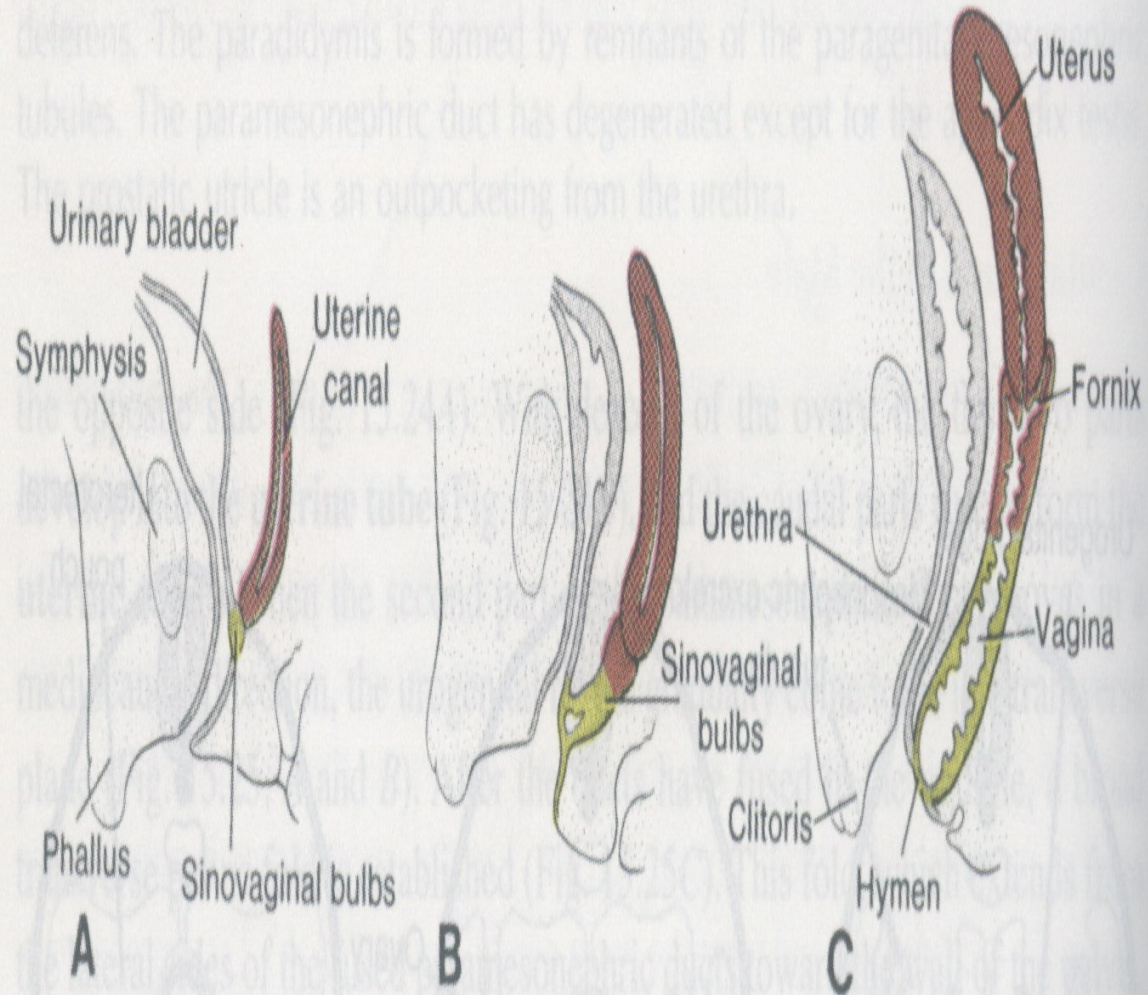
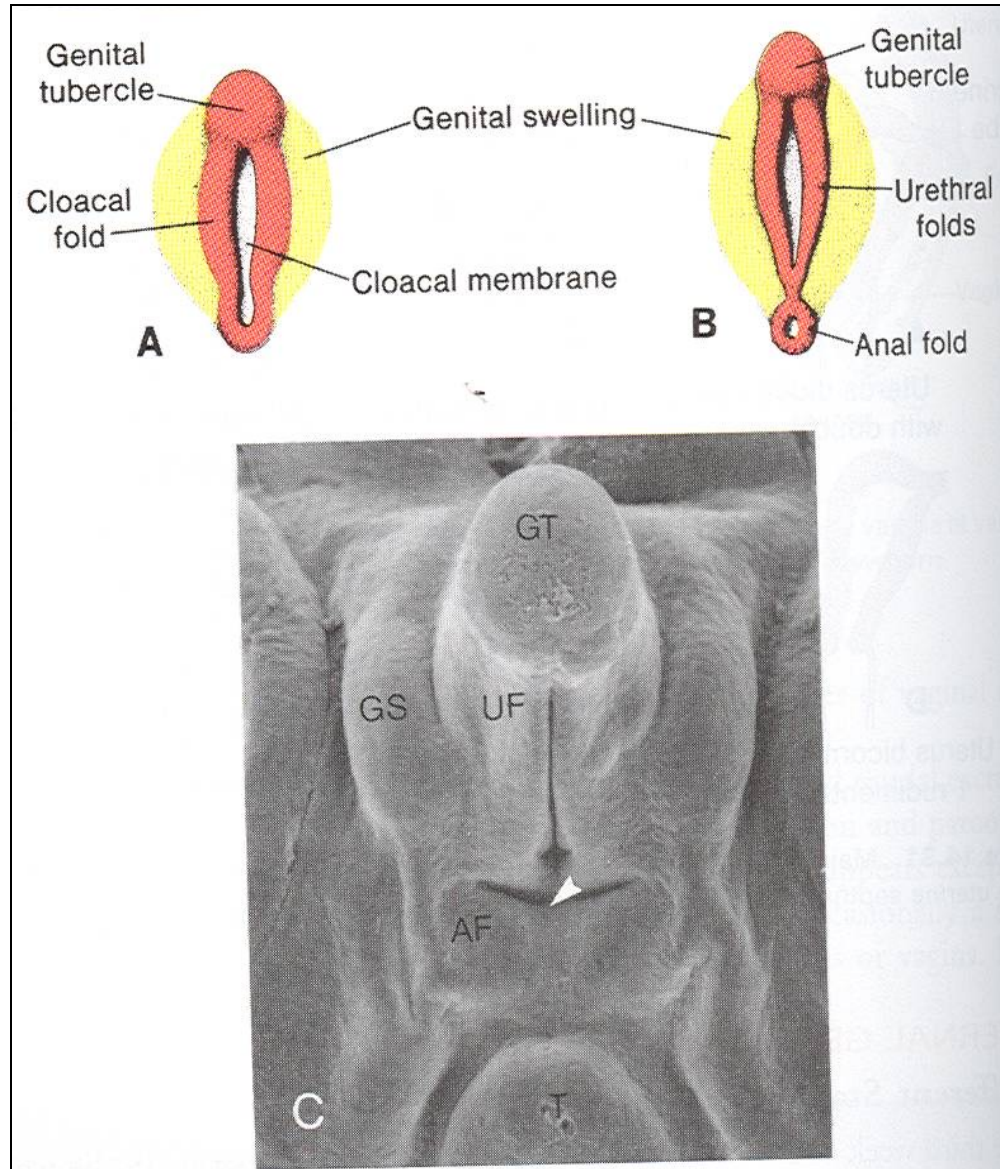


Figure 15.27. Schematic sagittal sections showing formation of the uterus and vagina at various stages of development.

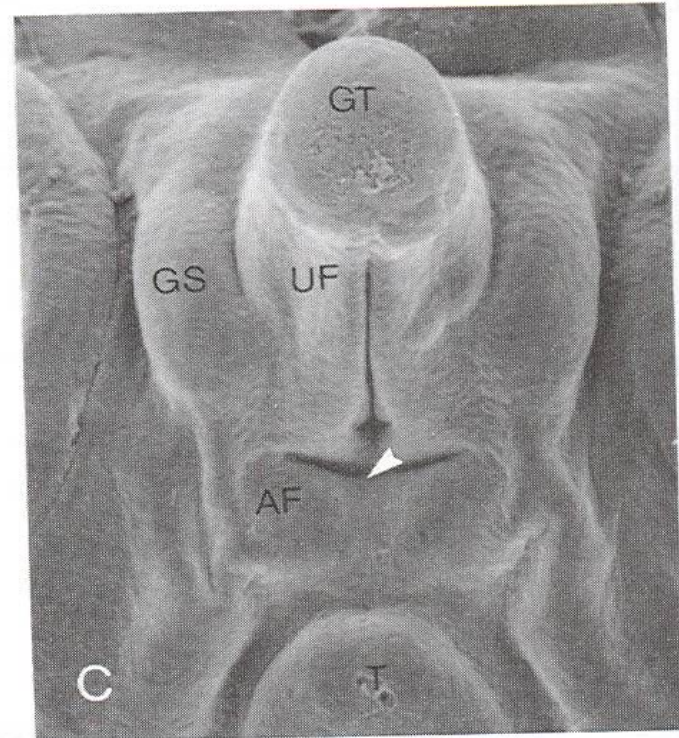
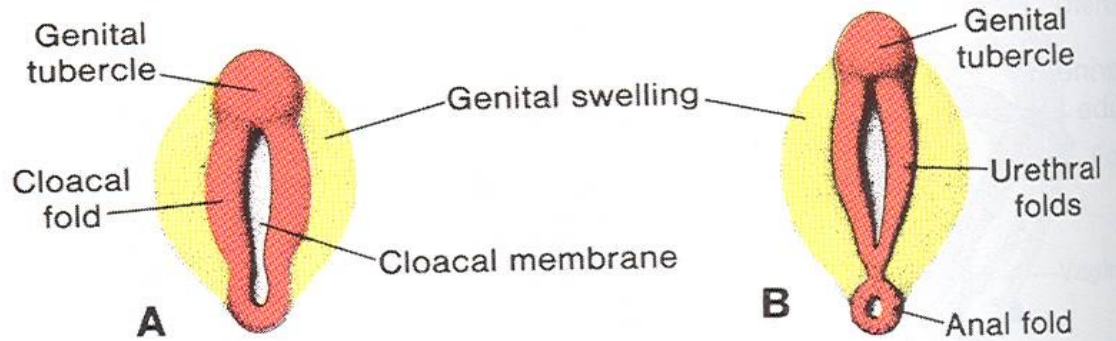
External genitalia

- By the 3rd week, mesenchymal cells migrate around the cloacal membrane to form a pair of cloacal folds.
- Cranial to the cloacal membrane the folds unite to form the genital tubercle, (GT).
- Caudally the folds are subdivided into urethral folds anteriorly, (UF) and anal folds posteriorly, (AF).



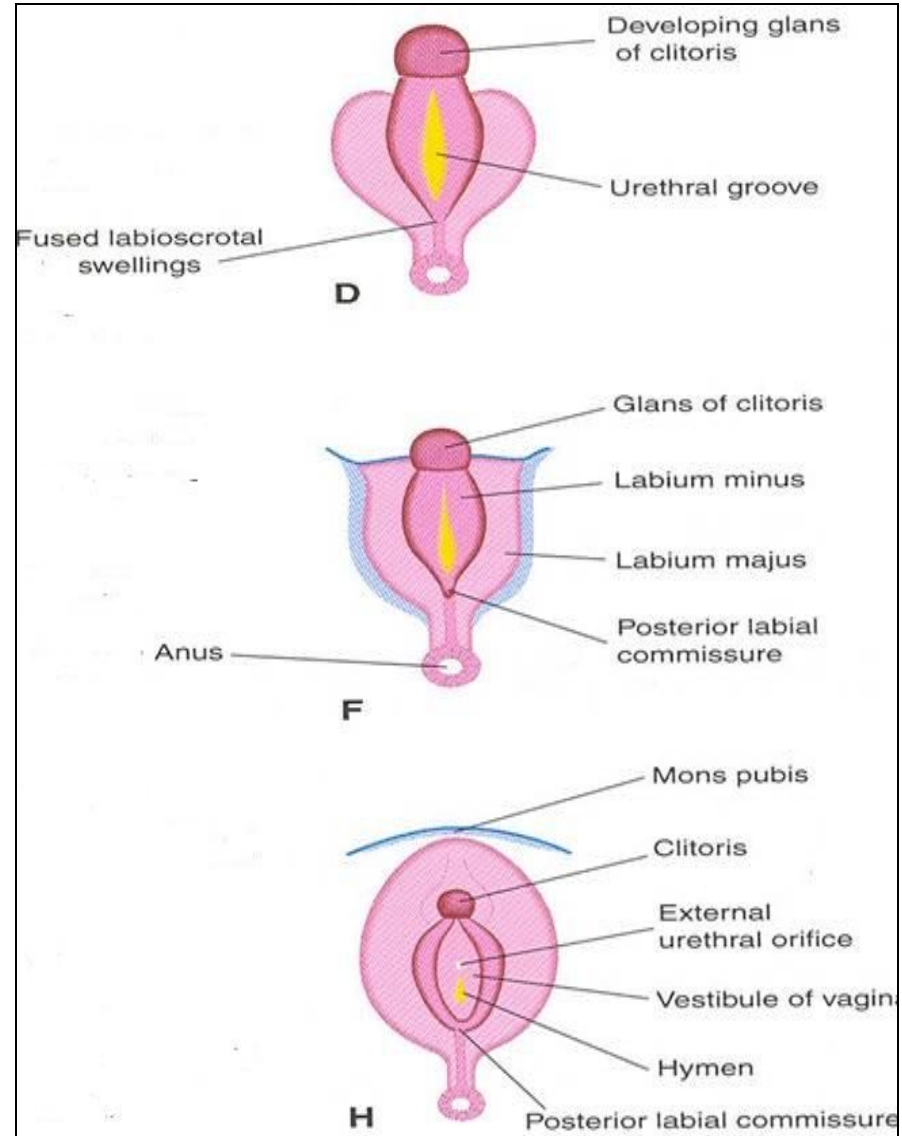
Development of Female External Genitalia

- Proliferation of Mesenchyme at the cranial end and sides of the cloacal membrane, **will** forms:
 - **1. Genital Tubercle, (GT).**
 - **2. Urogenital Folds or Urethral Folds, (UF).**
 - **3. Labioscrotal swellings or Genital Swellings, (GS).**



Feminization of External Genitalia

- **Estrogen** produced by both placenta and fetal ovaries has a role in feminization of the external genitalia.
- **Genital Tubercle** proliferates to form the primordial **Phallus** which elongates slightly to form the Clitoris.
- Urethral Folds do not fuse and form the Labia Minora.
- Labioscrotal Folds form the Labia Majora, they fuse to form posterior and anterior Labial Commissures.



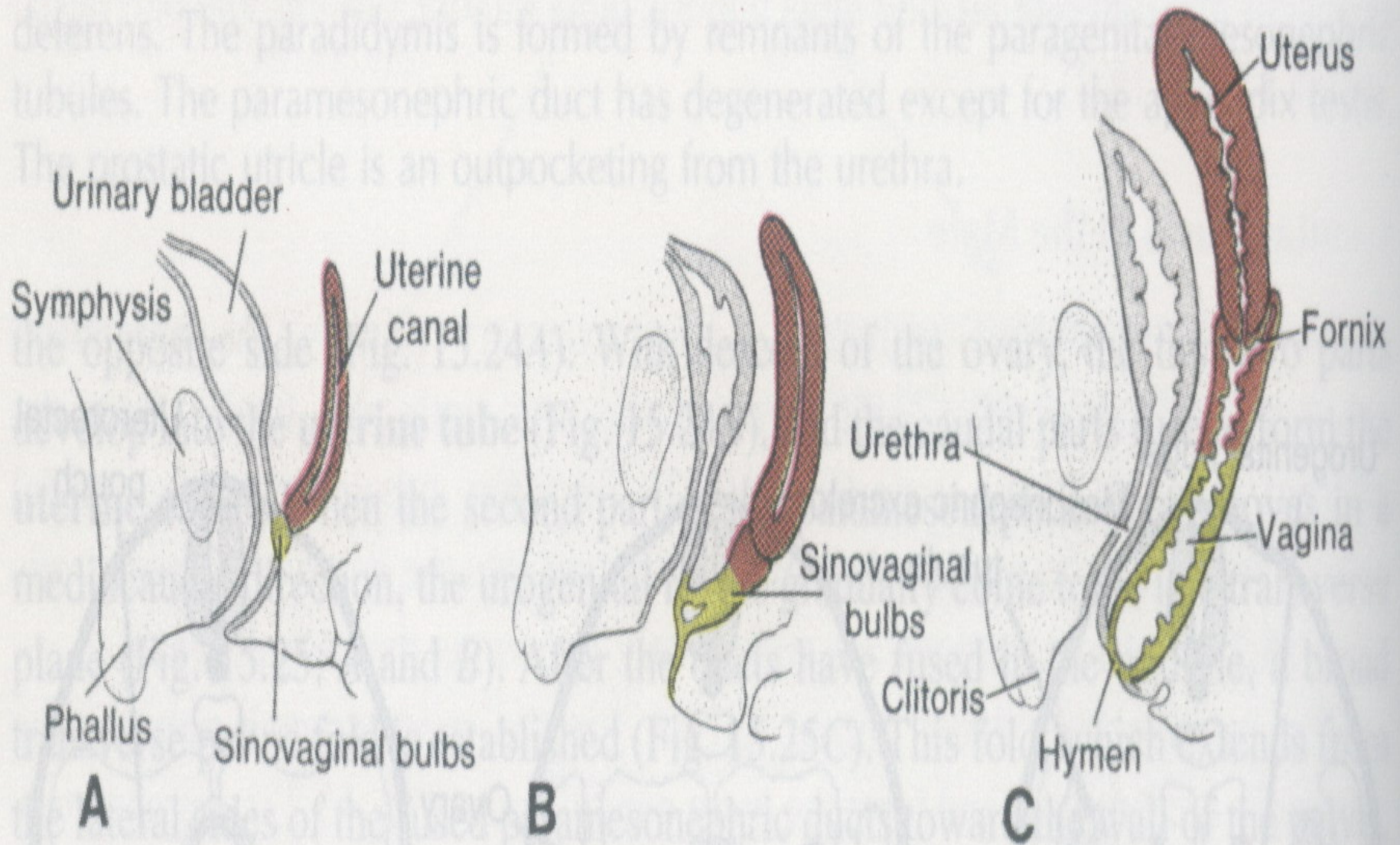


Figure 15.27. Schematic sagittal sections showing formation of the uterus and vagina at various stages of development.

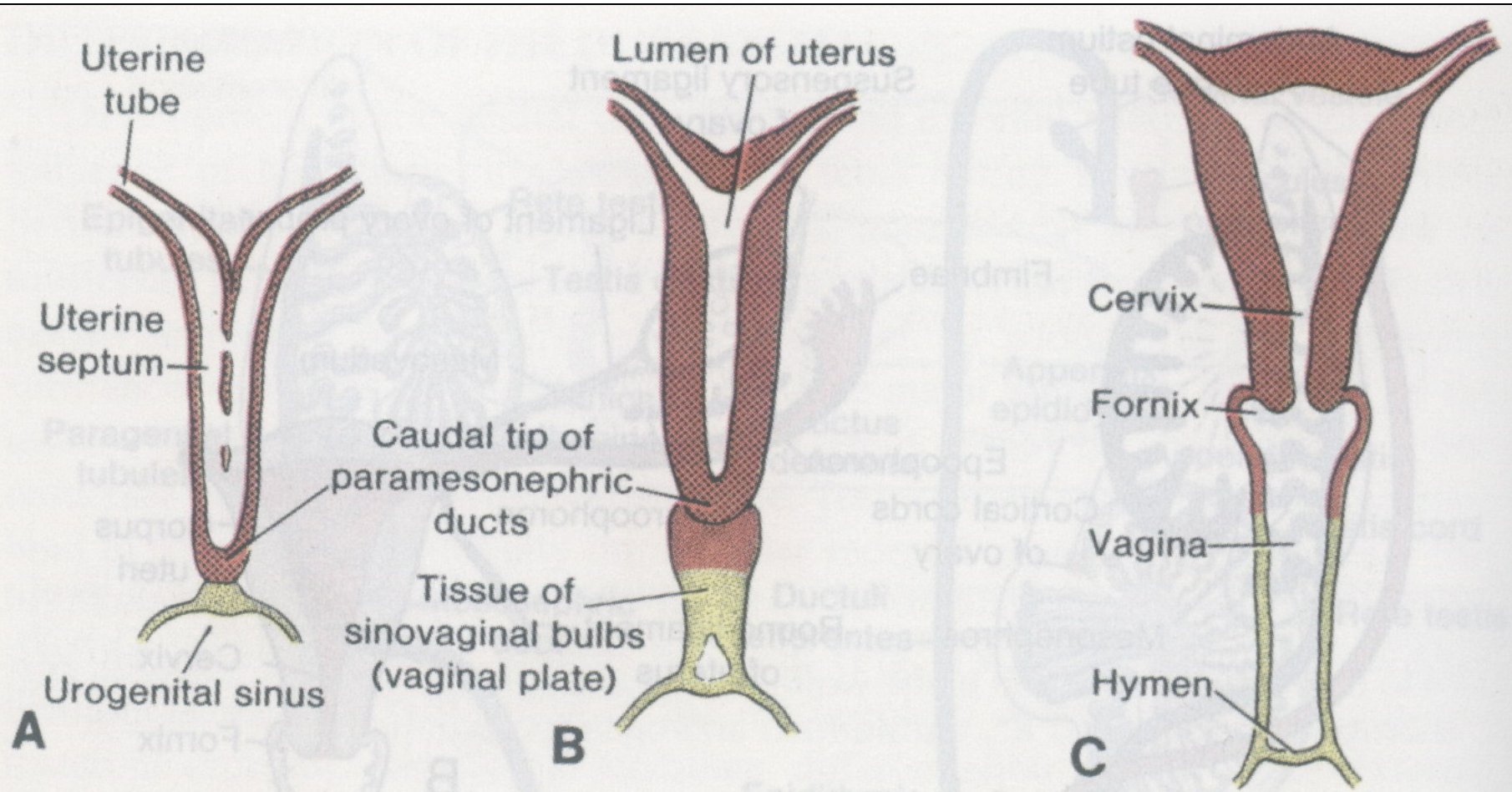
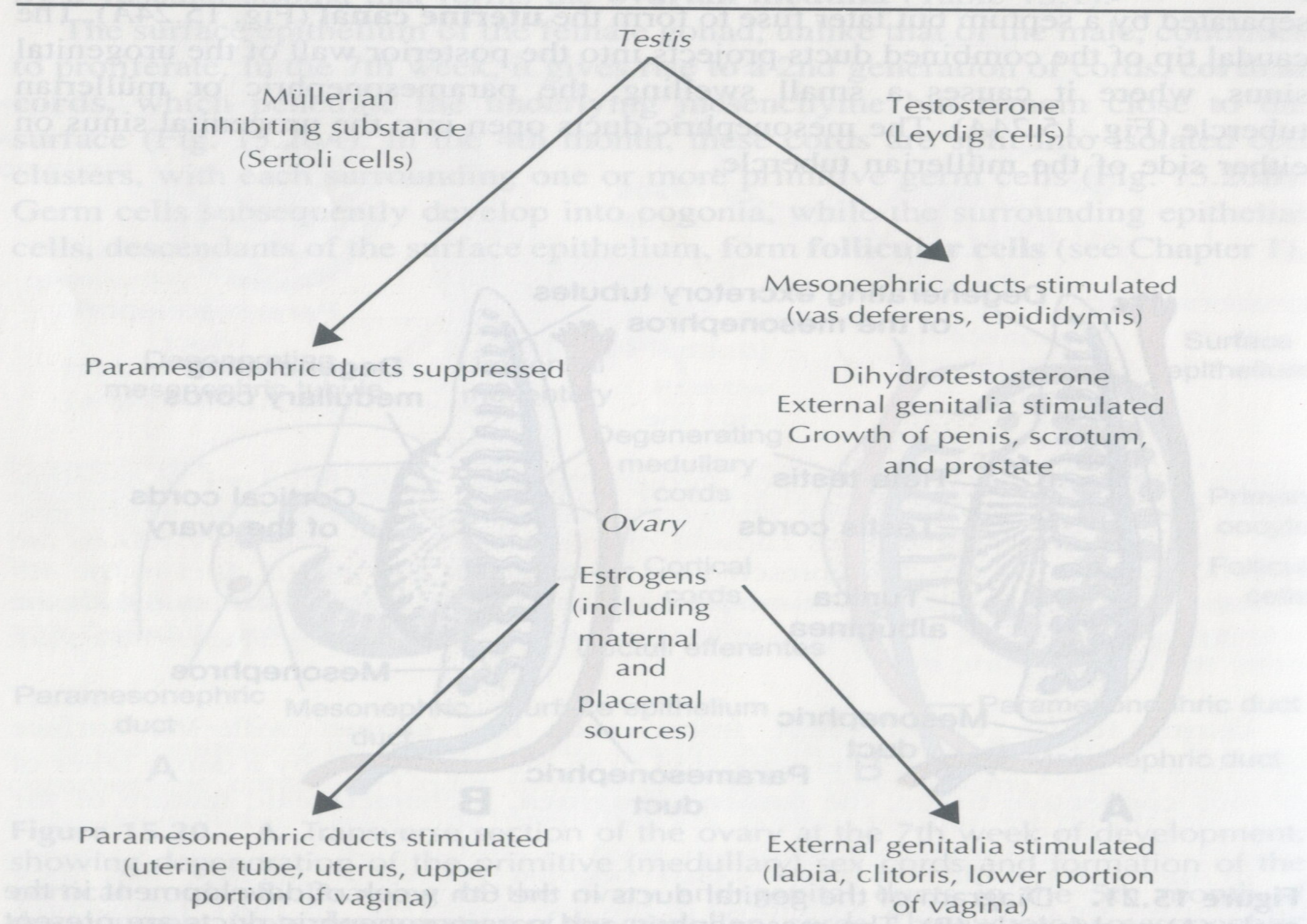


Figure 15.26. Schematic drawing showing formation of the uterus and vagina. **A.** 9 weeks. Note the disappearance of the uterine septum. **B.** At the end of the 3rd month. Note the tissue of the sinovaginal bulbs. **C.** In the newborn. The fornices and the upper portion of the vagina are formed by vacuolization of the paramesonephric tissue, and the lower portion of the vagina is formed by vacuolization of the sinovaginal bulbs.

Influence of the Sex Glands on Further Sex Differentiation



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.

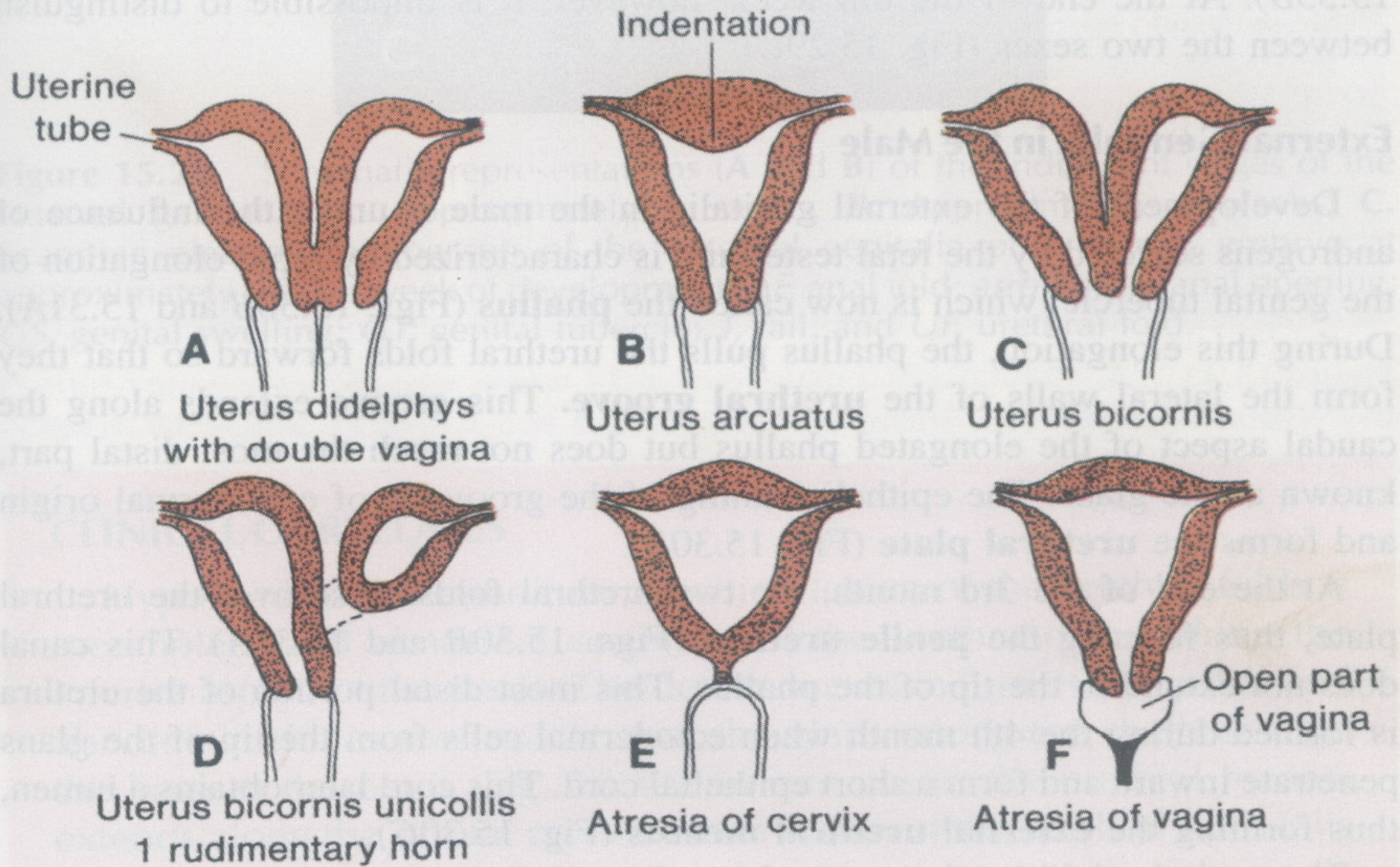


Figure 15.28. Schematic representation of the main abnormalities of the uterus and vagina, caused by persistence of the uterine septum or obliteration of the lumen of the uterine canal.

□ Cervical Atresia:

- It 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.

