SURG 203A

Embryology of the Male and Female Pelvic Structures

Pelvis

Pelvis Presley

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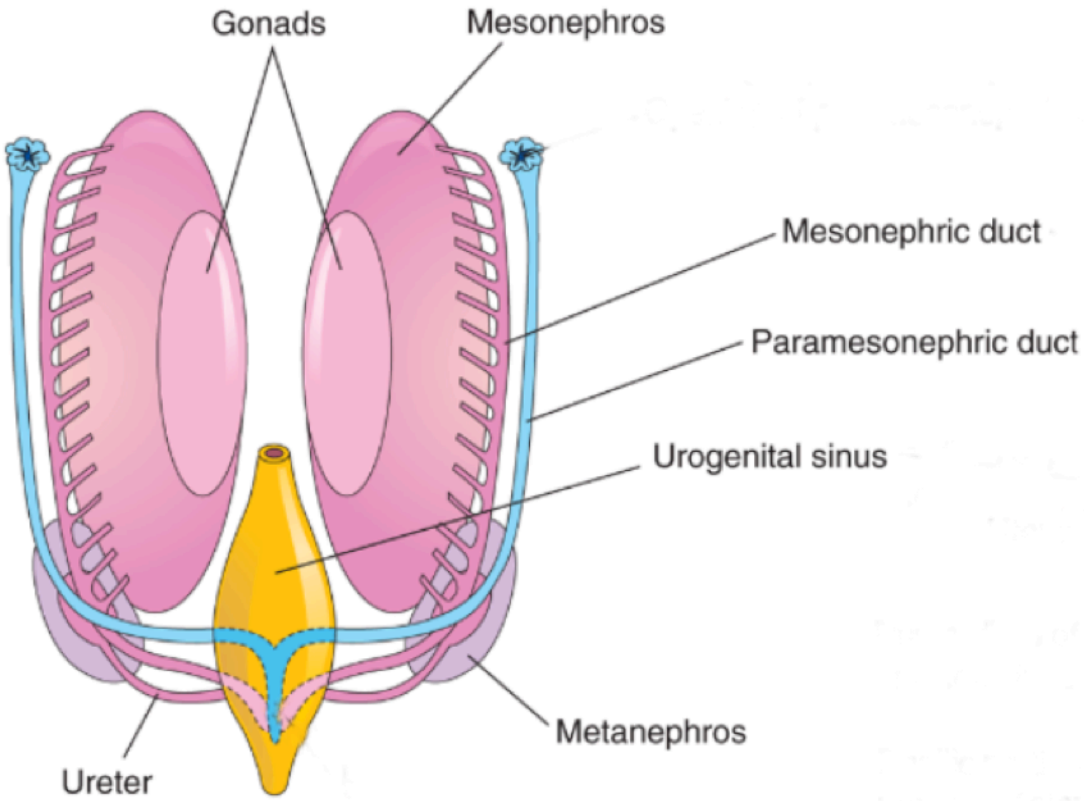
Genital ducts



Anterior view

- Mesonephric (aka Wolffian) ducts & paramesonephric (aka Mullerian) ducts
- Fetal testes secrete testosterone and MIS (Mullerian inhibiting substance)
  - Testosterone causes mesonephric ducts to form male reproductive structures
  - MIS causes paramesonephric ducts to regress

Formation of the Male Reproductive Ducts

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Formation of the Male Accessory Sex Glands

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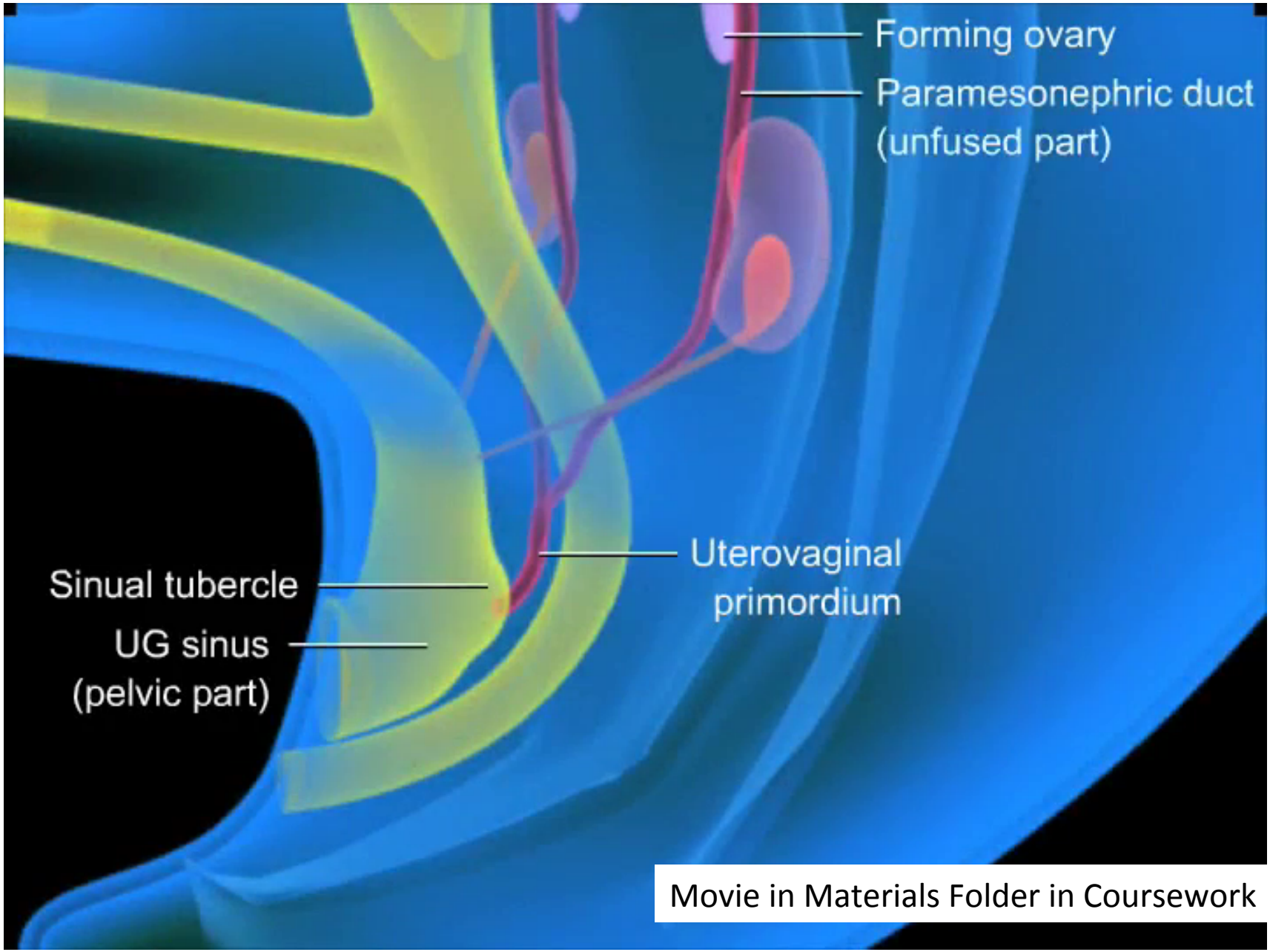

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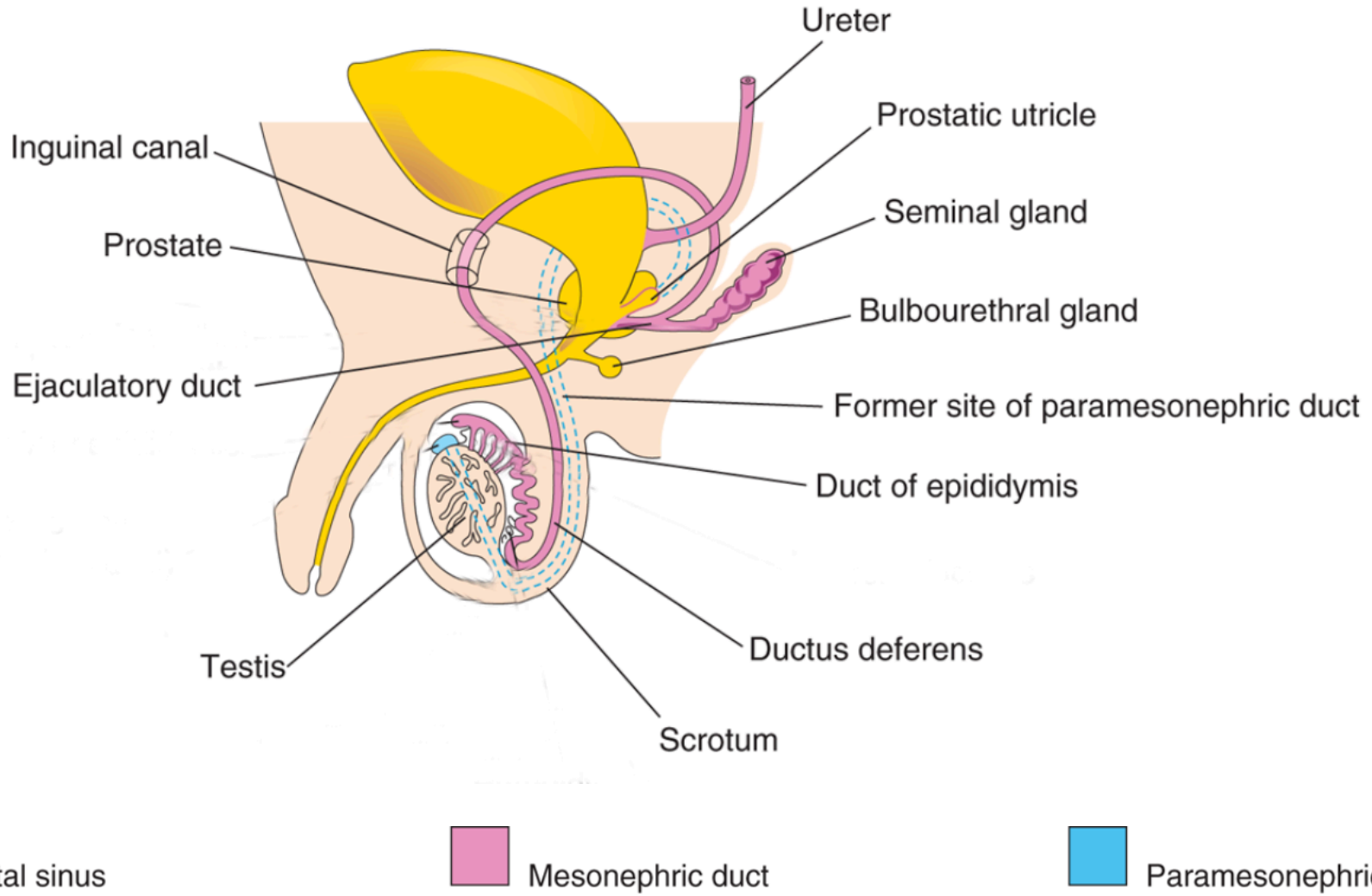
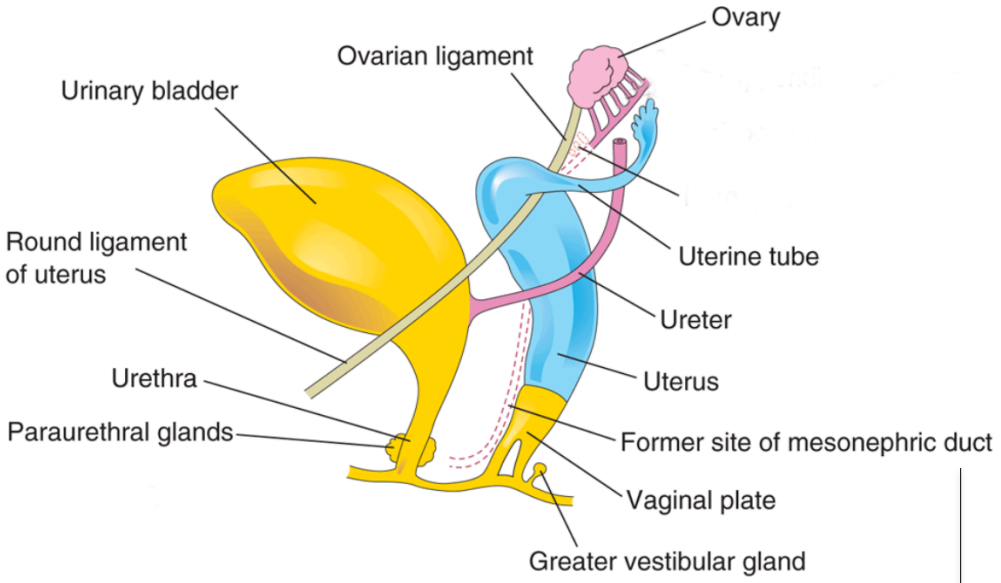
In males, the mesonephric ducts form the ductus (vas) deferens, seminal vesicles, epididymis
The urogenital sinus forms the prostate and bulbourethral glands



In females, the paramesonephric ducts form the uterine (fallopian) tubes, uterus, upper vagina
The urogenital sinus forms the lower vagina, paraurethral (Skene) glands, and greater vestibular (Bartholin) glands

Sagittal view

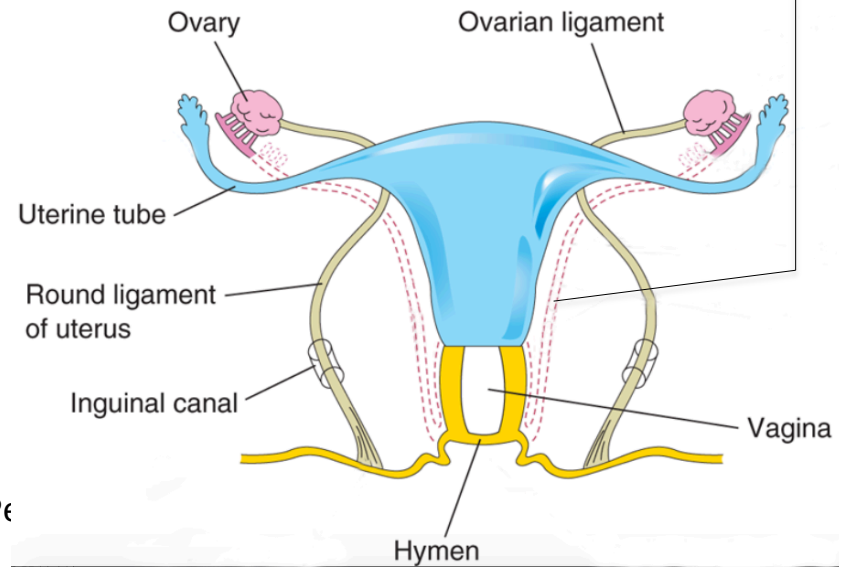


Urogenital sinus

Mesonephric duct

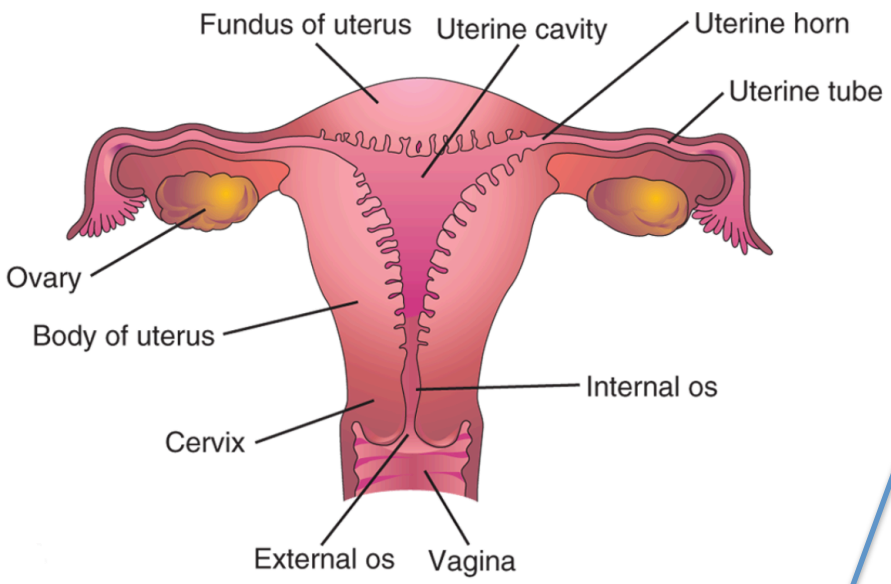
Paramesonephric duct

Coronal view

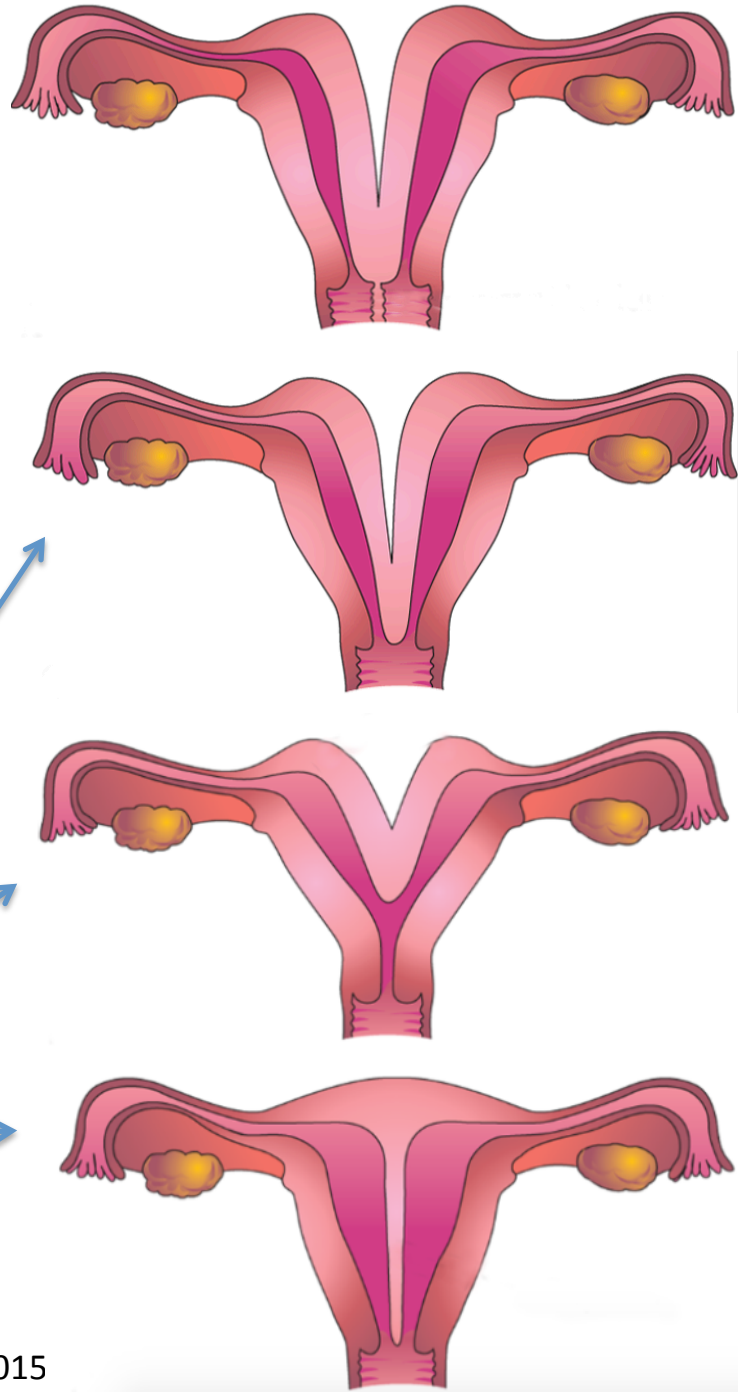


Bicornuate uterus

Normal uterus



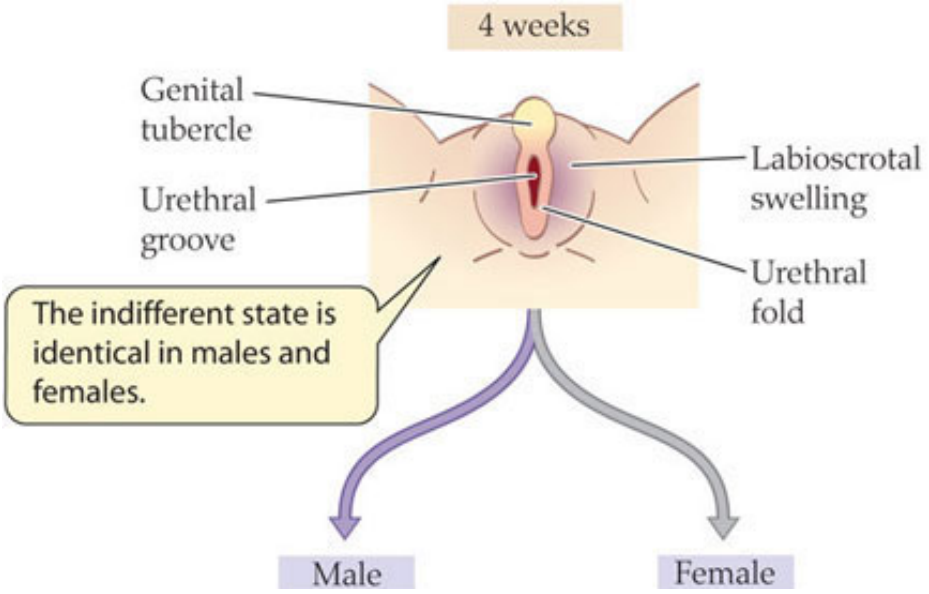
Failure of the paramesonephric ducts to completely fuse results in uterine abnormalities



External Genitalia

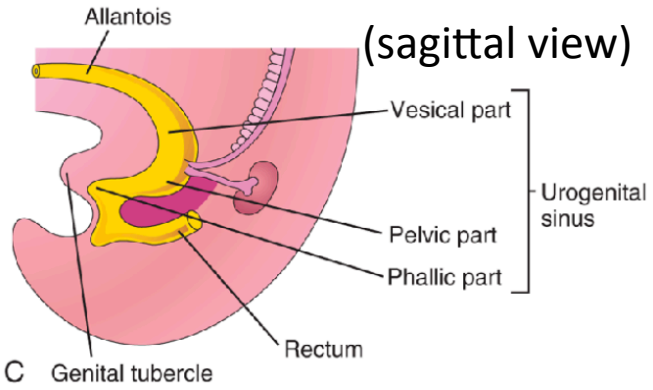
Sex Indifferent Stage

- External genitalia appear similar in both sexes for the first 7-8 weeks
- Male-female differentiation occurs between weeks 9-12

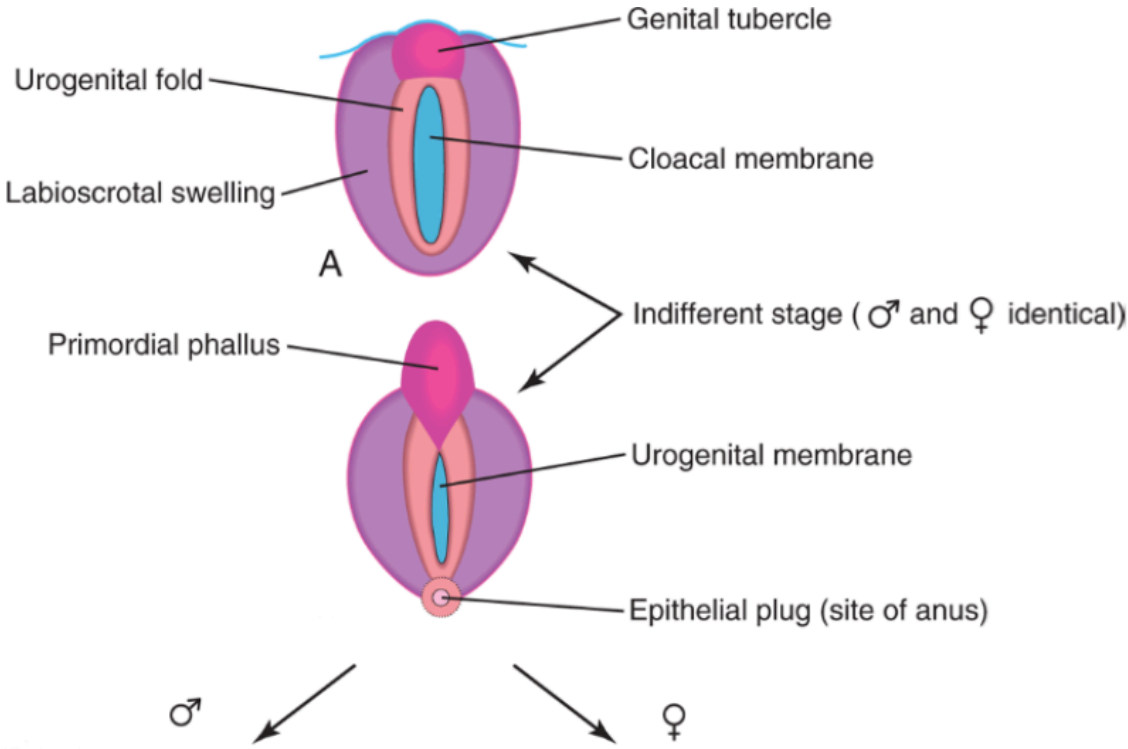


Hill, et al. Animal Physiology 3rd ed.

Sex Indifferent Stage

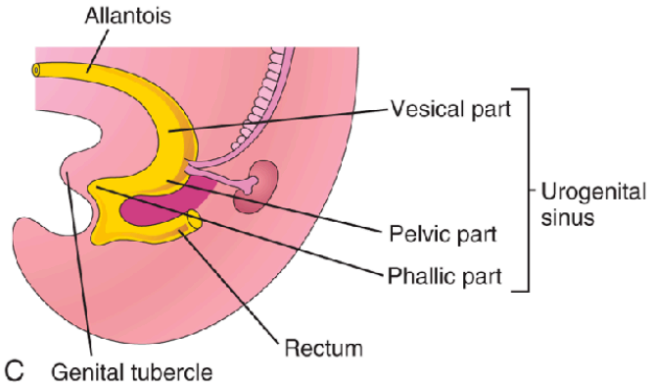


In week 4, the **genital tubercle, urethral (urogenital) folds,** and **labioscrotal swellings** form at the caudal end of the embryo

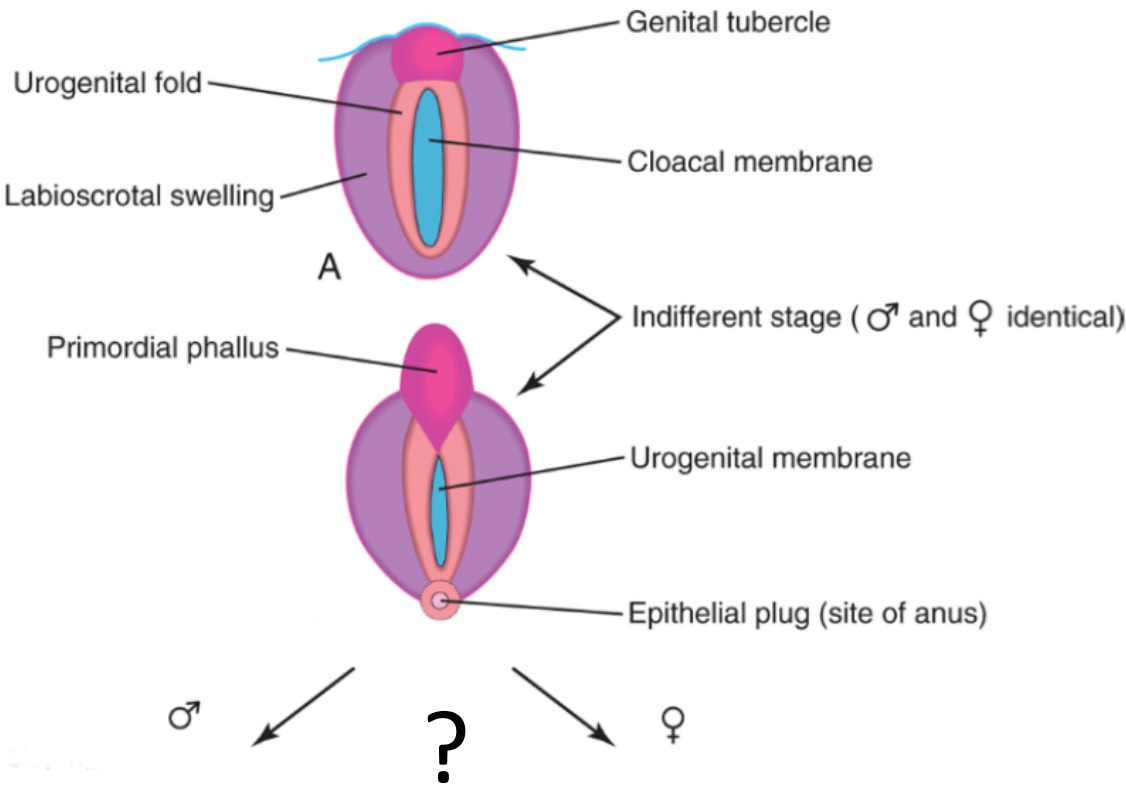


Moore KL, et al. *The Developing Human: Clinically Oriented Embryology*. 9th ed.

Sex Indifferent Stage



The presence or absence of masculinizing hormones (e.g. testosterone) will influence differentiation



Moore KL, et al. *The Developing Human: Clinically Oriented Embryology*. 9th ed.

The Indifferent Stage

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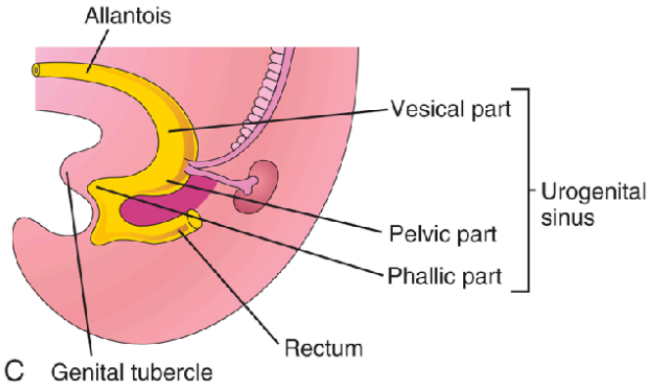
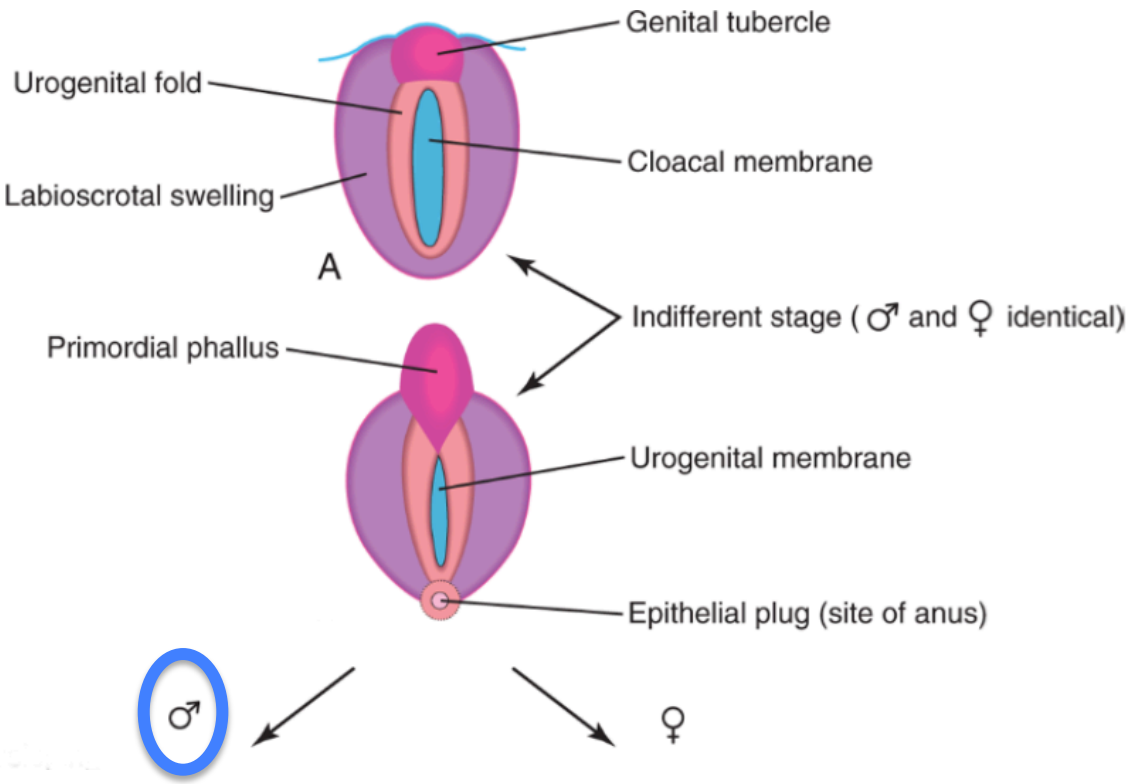
Moore KL, et al. *The Developing Human: Clinically Oriented Embryology*. 9th ed.

Sex Indifferent Stage



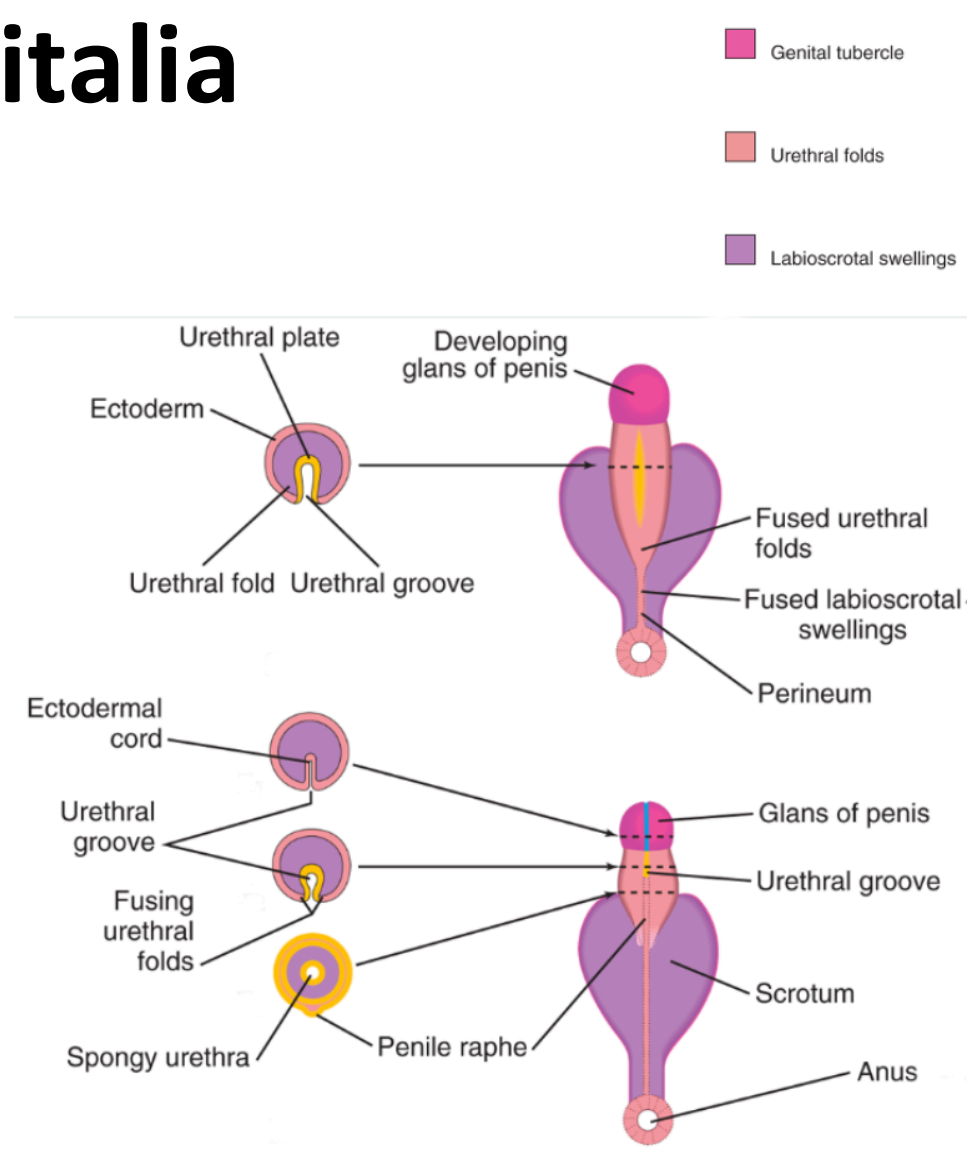
- The ***presence*** of masculinizing hormones (e.g. testosterone) will lead to male phenotypic differentiation



Moore KL, et al. *The Developing Human: Clinically Oriented Embryology*. 9th ed.

Male External Genitalia

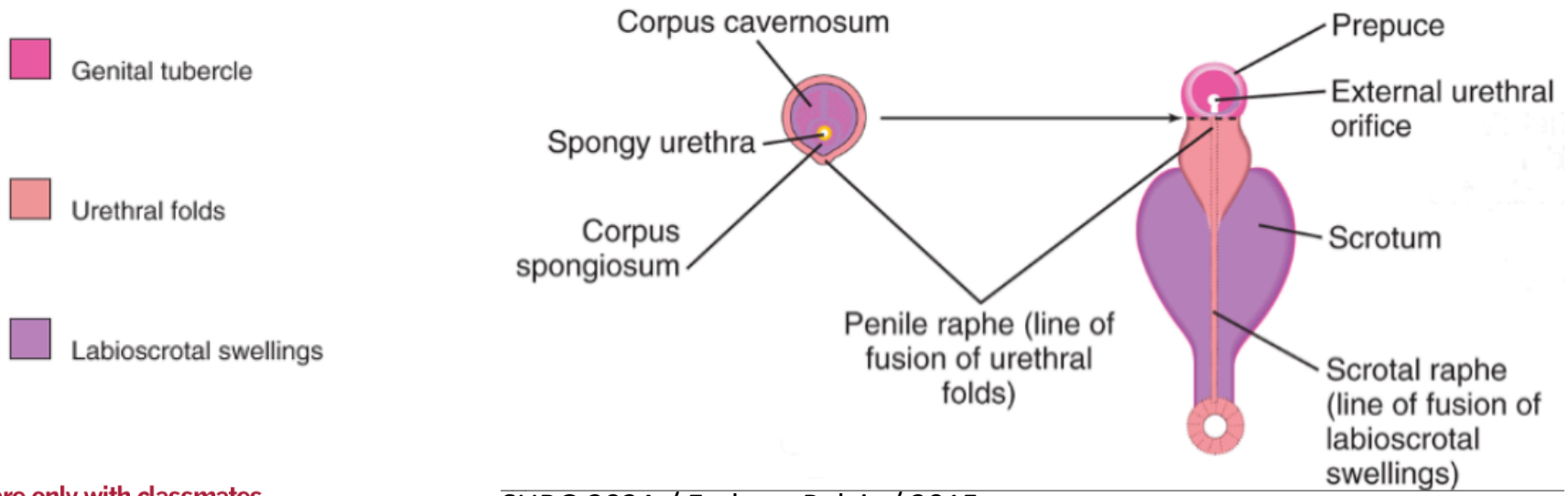
- The genital tubercle/ phallus elongates to form a developing penis
- Urethral (urogenital) folds along the ventral surface of the developing penis also elongate
- The urethral groove between these folds are lined with cells from the urogenital sinus and hence the developing spongy urethra is continuous with the developing bladder

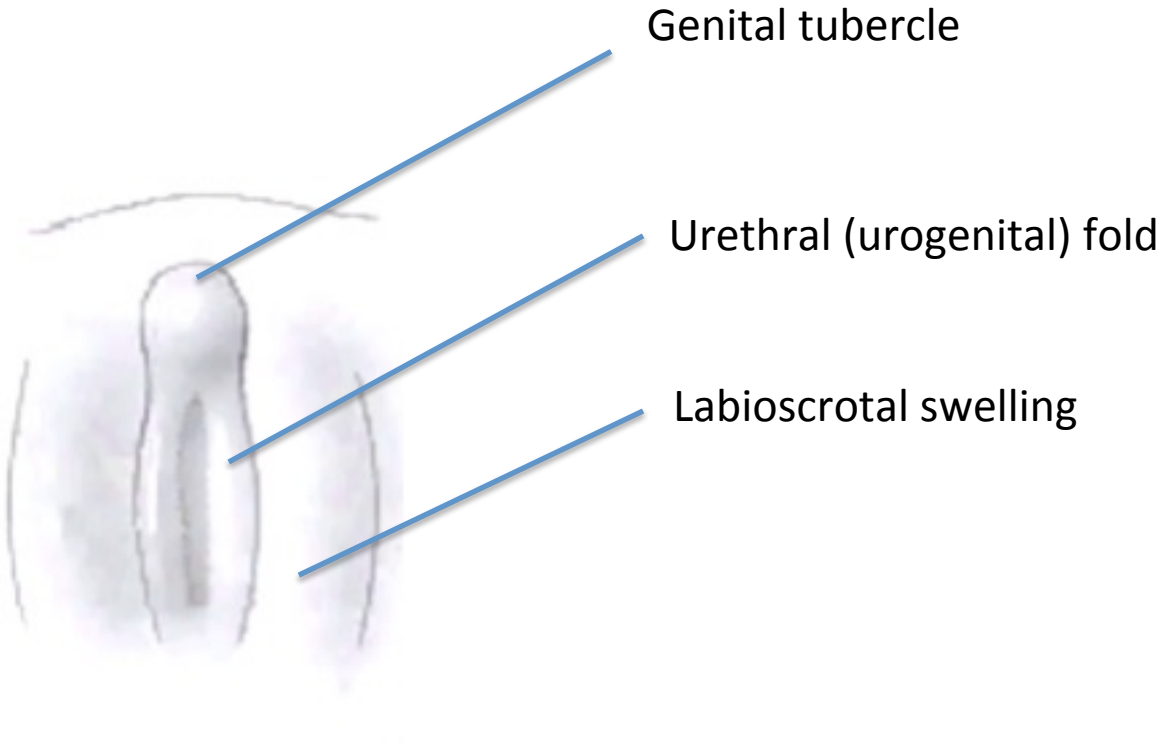


Moore KL, et al. *The Developing Human: Clinically Oriented Embryology*. 9th ed.

Male External Genitalia

- The urethral (urogenital) folds fuse to enclose the spongy urethra within the penis
- The labioscrotal swellings grow toward the midline and fuse to form the scrotum
- The lines of fusion are visibly identified as the penile raphe and scrotal raphe





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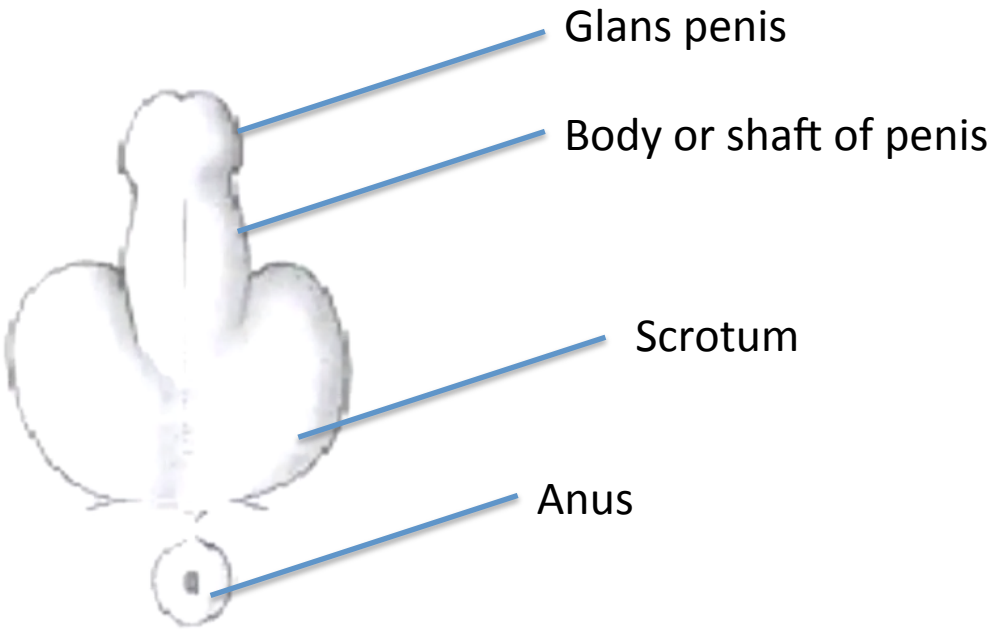
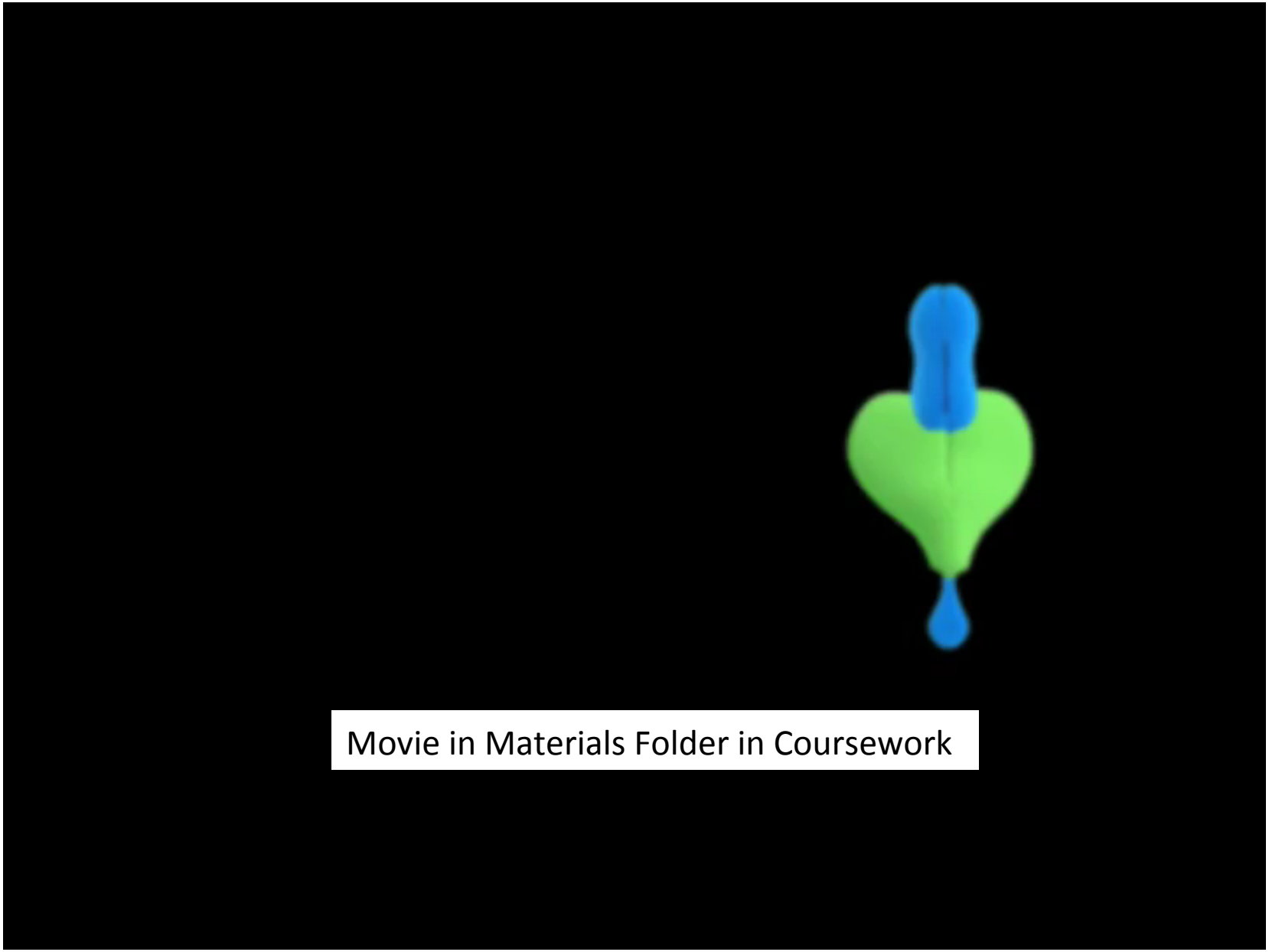




Moore KL, et al. *The Developing Human: Clinically Oriented Embryology*. 9th ed.

Hypospadias

Common (0.7-1%), and incidence increasing

Failure of the urethral folds to properly fuse leads to an abnormal urethral opening on the ventral surface of the penis

Often the cause is unknown, but inadequate testosterone production by testes, inadequate androgen receptors, and excessive exposure to estrogens all are associated with hypospadias

(sagittal view)

(ventral view)

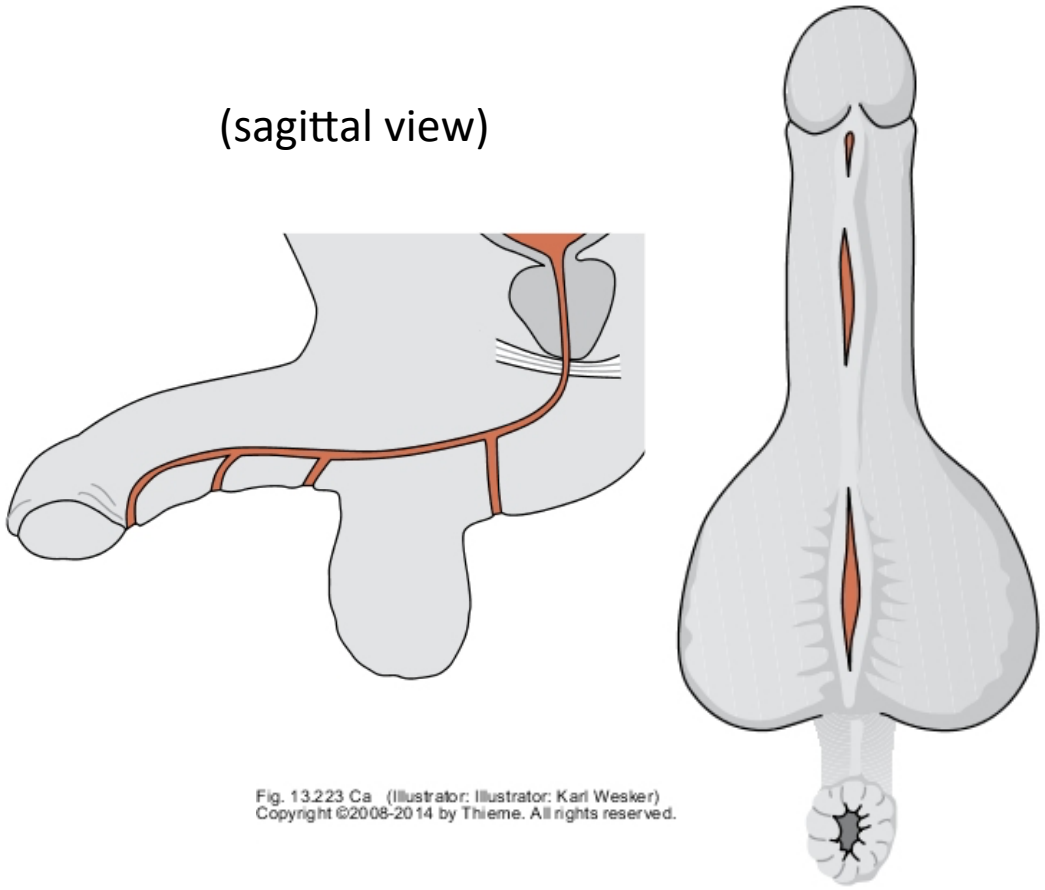
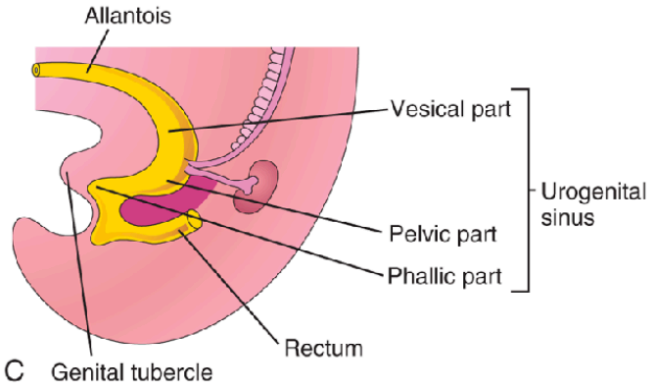


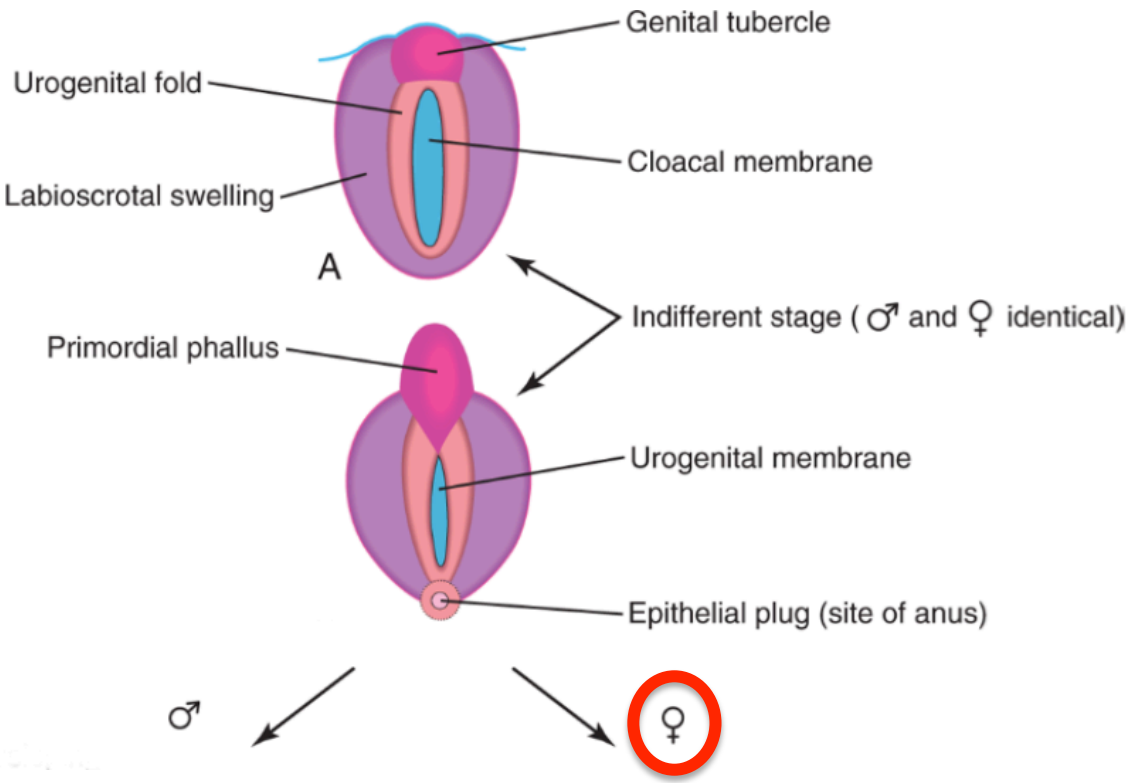
Fig. 13.223 Ca (Illustrator: Illustrator: Karl Wesker)

The opening can occur anywhere along the ventral surface, but most common site is close to glans

Sex Indifferent Stage



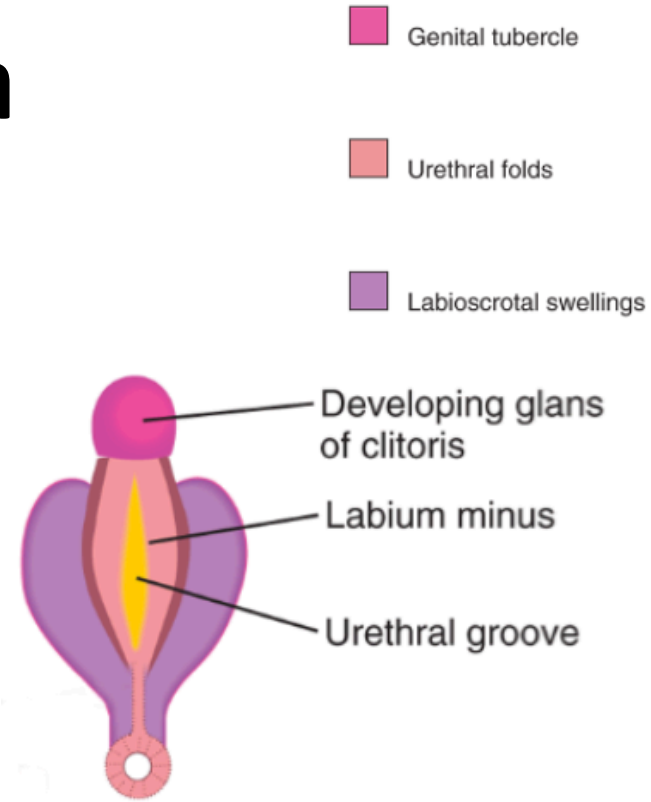
- The ***absence*** of masculinizing hormones (e.g. testosterone) will lead to female phenotypic differentiation



Moore KL, et al. *The Developing Human: Clinically Oriented Embryology*. 9th ed.

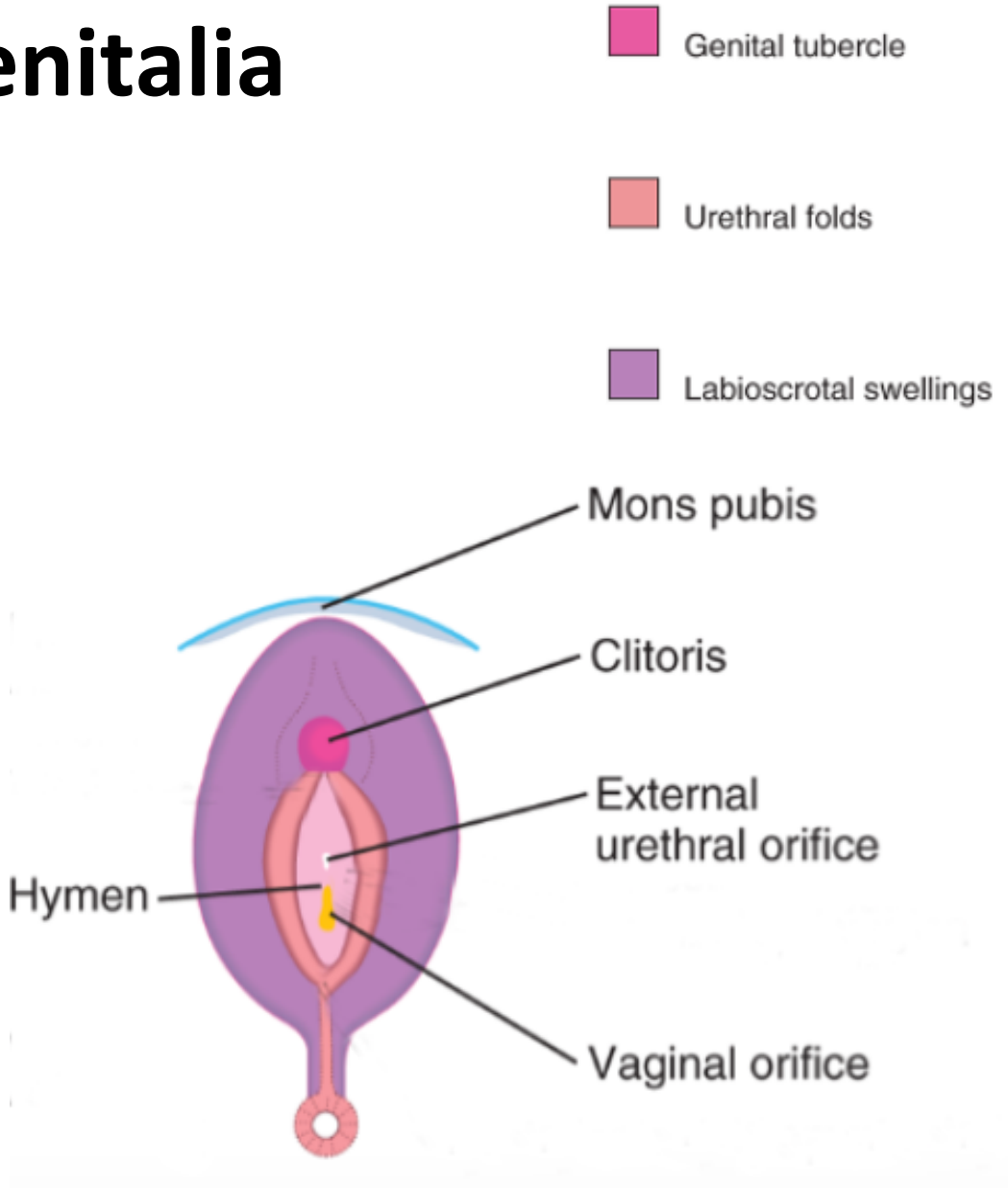
Female External Genitalia

- The genital tubercle/phallus in the female becomes the clitoris
- The urethral (urogenital) folds remain mostly unfused to become the labia minora
- The region between the unfused labia minora becomes the vulval vestibule into which the urethra, vagina, greater vestibular (Bartholin) glands, and paraurethral (Skene) glands open



Female External Genitalia

- The labioscrotal swellings fuse anteriorly to form the mons pubis
- However, most of the labioscrotal swellings remain unfused to become the labia majora



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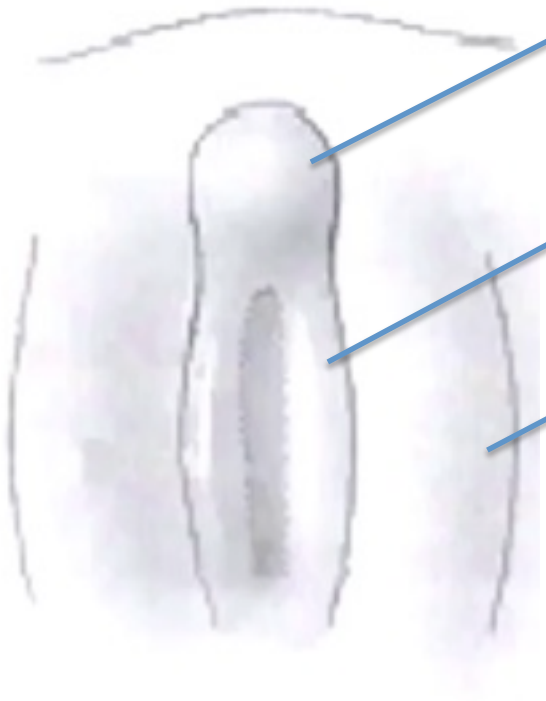

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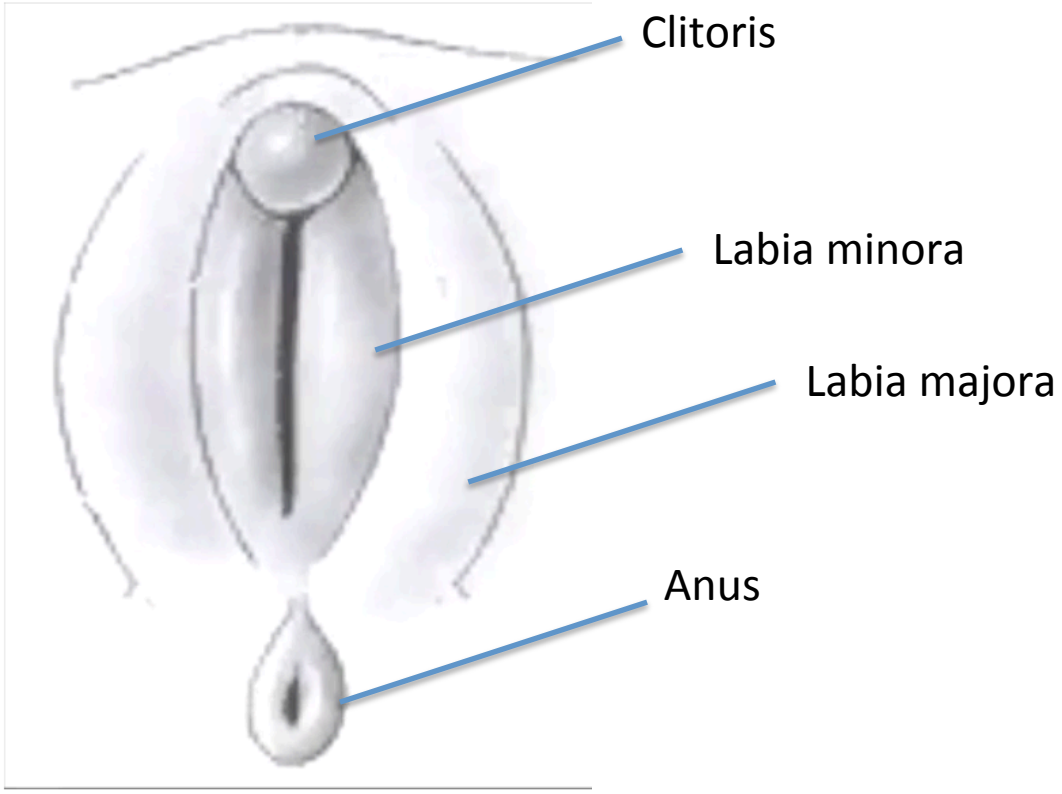

Formation of the Female External Genitalia

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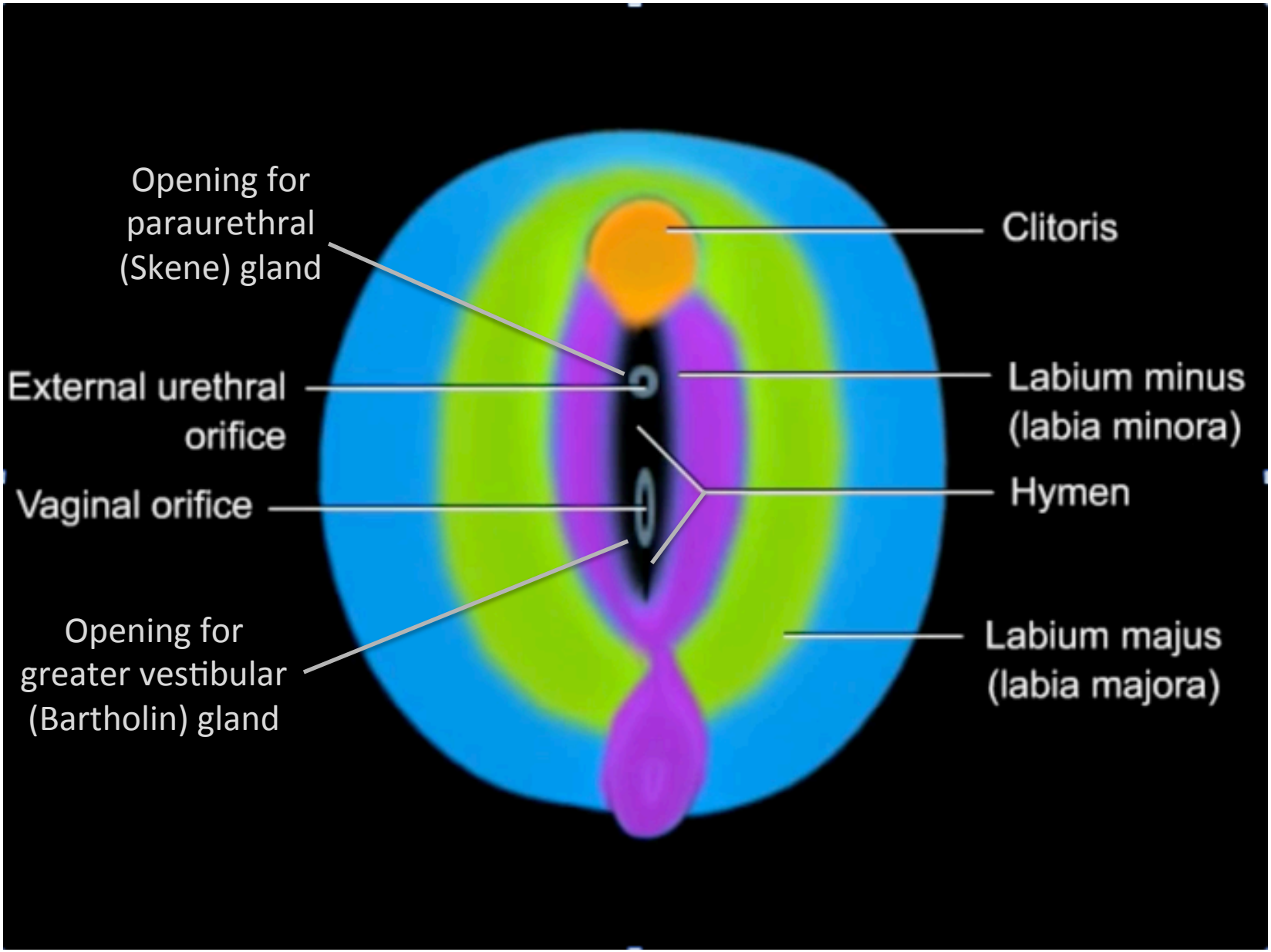

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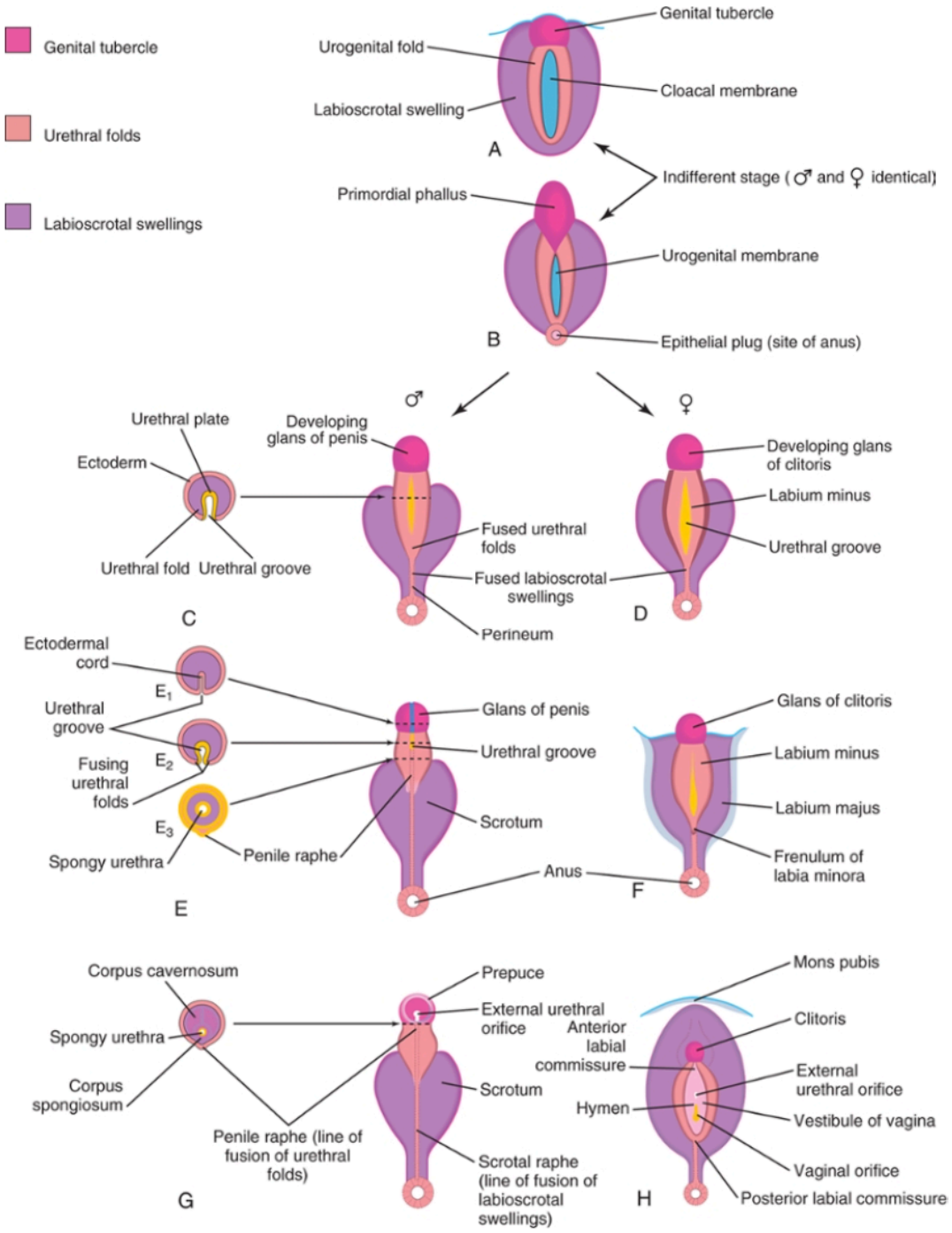
Summary

- There is an initial indifferent stage of sexual development
  - The presence or absence of testes determines subsequent development due to the presence or absence of masculinizing hormones (testosterone, MIS)
- Mesonephric (Wolffian) ducts → epididymis, vas deferens, seminal vesicles
- Paramesonephric (Mullerian) ducts → fallopian tubes, uterus, upper vagina [urogenital sinus → lower vagina]
  - Bicornuate uterus = abnormal split/divided uterus from failure of the paramesonephric ducts to fuse
- Sex-indifferent primordial phallus → penis & clitoris
- Labioscrotal swellings → scrotum, mons pubis & labia majora
- Urethral (urogenital) folds → labia minora
  - Hypospadias = abnormal urethral opening on ventral surface of penis from failure of urethral folds to fuse

Summary of what gives rise to what

Structure	Derivative structures
Mesonephric (Wolffian) ducts	Ureteric bud, bladder trigone, epididymis, vas deferens, seminal vesicles
Paramesonephric (Mullerian) ducts	Fallopian (uterine) tubes, uterus, upper vagina
Urogenital sinus	Bladder (except trigone), lower vagina, greater vestibular (Bartholin) glands, paraurethral (Skene) glands, bulbourethral glands, prostate glands
Labioscrotal swellings	Labia majora, mons pubis, scrotum
Urethral (urogenital) folds	Labia minora
Genital tubercle/phallus	Clitoris, penis



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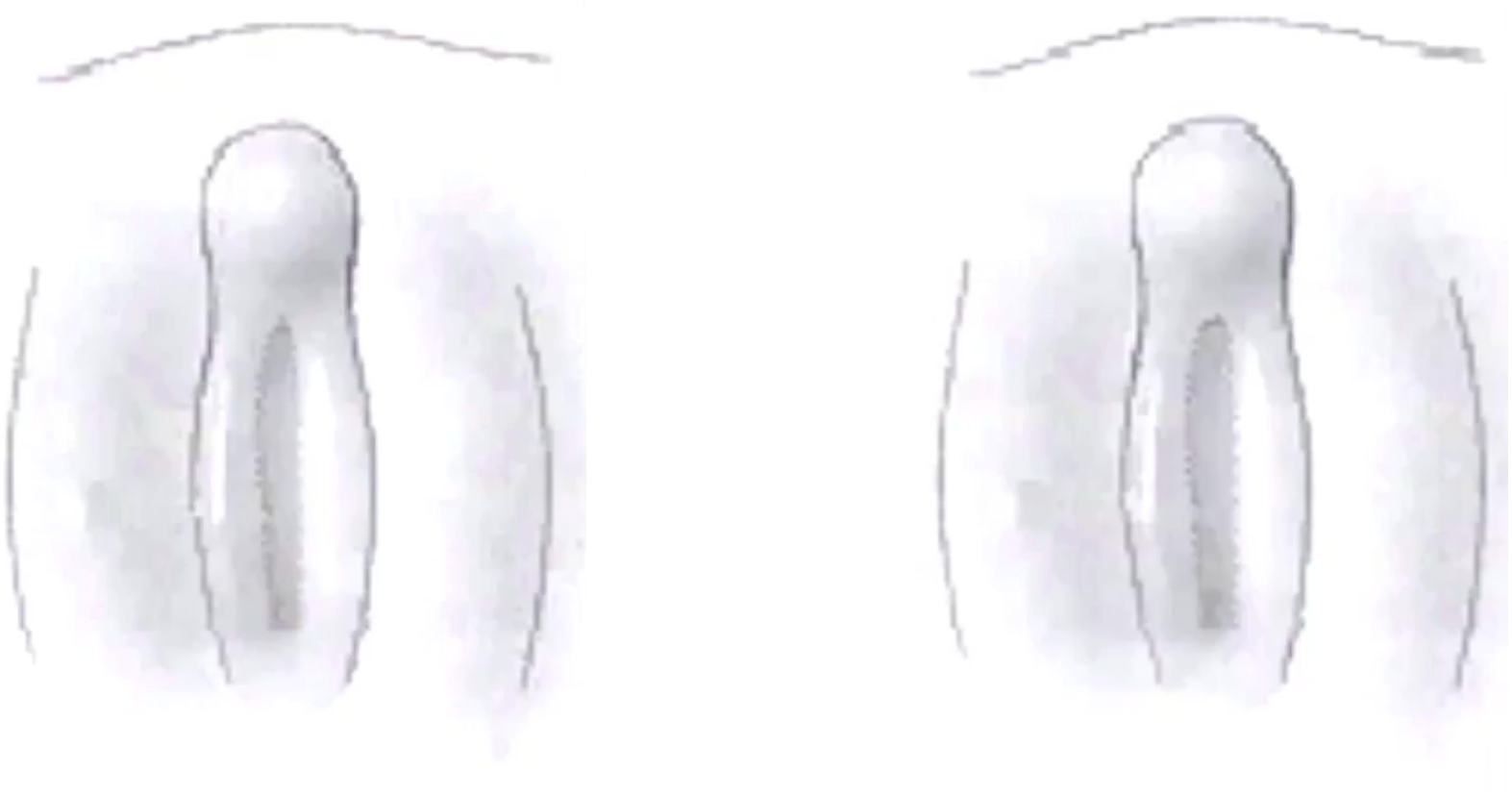

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