

PERKEMBANGAN ORGAN REPRODUKSI WANITA DARI JANIN SAMPAI LAHIR

Kuliah 5

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Overview of The Reproductive System

- The organ of male and female may be grouped by **function**
- Testes and ovaries (called **gonads**), function in **production of gametes**: sperm cells and ova
- Gonads also **secrete hormones**
- The ducts of reproductive systems transport, receive, and store gametes
- The externally visible portions of reproductive system are known as **external genitalia**

Overview of The Reproductive System.....

- **Accessory sex glands** produce materials that support gametes
- In females, the **breasts** are also considered **accessory reproductive organs**
- The production of gametes and fluid, and their discharge into ducts classify the gonads as **exocrine glands**
- Whereas the production of hormones classify the gonads as **endocrine glands**

Overview of Female Reproductive System

Female's role in reproduction is more complicated than male's:

1. Production of ova (**oogenesis**) by **ovaries**
2. Reception of sperm: **vagina-cervix**
3. Reception of sperm and ovum to a common site for union (**fertilization or conception**): **Fallopian tube**
4. Maintenance of the developing fetus until it can survive in outside world (**gestation or pregnancy**), including formation of **placenta** (organ exchange between mother and fetus): **uterus**
5. Giving birth to the baby (**parturition**)
6. Nourishing the infant after birth by milk production (**lactation**): **mammae**

Overview of Female Reproductive System.....

- Product of fertilization: **embryo**
During **first 2 months** of intrauterine development when **tissue differentiation** is taking place
- Developing living being is **recognizable as human: fetus**
 - no further tissue differentiation, only tremendous **tissue growth** and **maturation**

Chronology of Reproductive Function

Sequential changes in reproductive development or function:

- **Sex determination**

Genetic inheritance sets the gender of individual which is established at the moment of fertilization

- **Sex differentiation**

Multiple process in which development of reproductive system occurs in fetus

- **Maturation of system at puberty**

- **Eventual decrease in reproductive function that occurs with aging**

SEX DETERMINATION

Definition

- Sex determination is concerned with the regulation of the development of the primary of gonadal sex, while sex differentiation encompasses the events subsequent to gonadal organogenesis
- The processes are regulated by at least 70 different that are located on the sex chromosomes and autosomes and that act through a variety of mechanisms including organizing factors, gonadal steroids and peptide hormones, and tissue receptors
- Mammalian embryos remain sexually undifferentiated until the time of sex determination

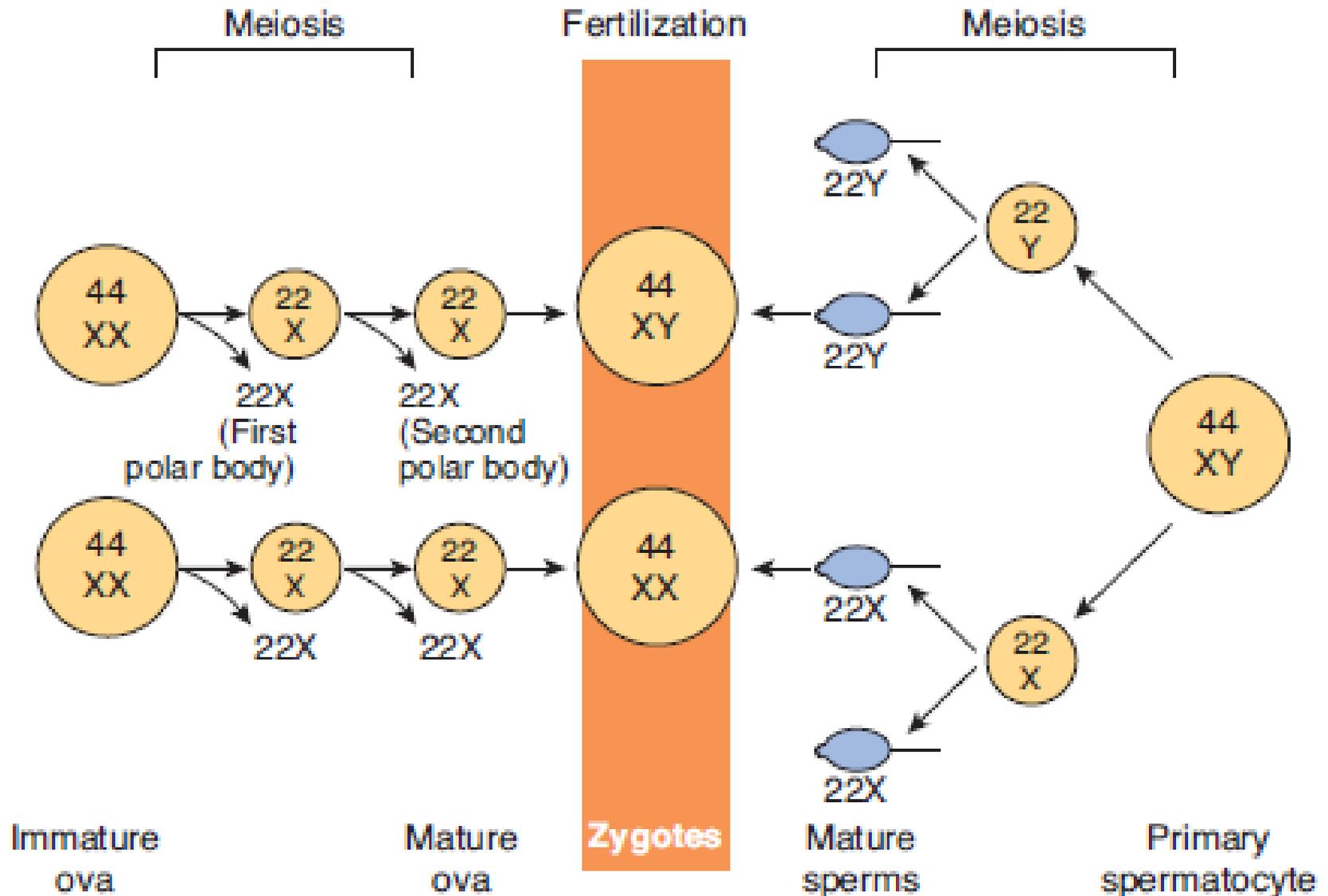
Sex Determining Region

- An important point: early embryos of both sexes possess indifferent common primordial that have an inherent **tendency to feminize**, unless in the interference by masculinizing factors
- **Sex-determining region Y (SRY) gene** is found to be the primary sex determinant that induce the indifferent **gonad into testes**
- SRY is expressed in XY gonads in Sertoli cell progenitors at the stage of sex cord formation
- In human, SRY gene is located **on the short arm of Y chromosome**

Translation of Genetic Sex

- **The SRY protein is detected at an early age of gonadal differentiation in XY embryos, where it induces Sertoli cell differentiation (in adult, it is present in both Sertoli and germ cells)**
- **In embryonic and fetal life, SRY gene product regulates gene expression in a cell autonomous manner**
- **The precise molecular mechanisms by which SRY triggers testis development are unknown, nor is it yet known how SRY is regulated**
- **The genetic sex of zygote is established by fertilization of a normal ovum with an X-chromosome by Y-chromosome-bearing sperm**

Sex Determination



SEX DIFFERENTIATION

Differentiation of Reproductive Tract

- Although male and female external genitalia develop from the same embryonic tissue, **but reproductive tract** develop from the **different system**
- 2 primitive duct systems: Mullerian ducts and Wolfian ducts develop in all embryos, so that the early embryo has potential to develop either a male or a female reproductive tract
- Development of reproductive tract is determined by the presence of 2 hormones secreted by fetal testes: testosterone and Mullerian-inhibiting factor
- In female fetus: reproductive tract develops from **Mullerian ducts** and Wolfian ducts degenerate

Differentiation of Gonads

- The genes directly determine only whether the individual will have testes or ovaries
- Sex differentiation **depends upon the presence or absence of substance produced by the genetically gonads, in particular, testes**
- Difference between male and female exist at 3 levels:
 - **genetic sex:** depends on combination of sex chr
 - **gonadal sex:** determined by genetic sex , the presence of a Y chr → SRY → H-Y antigen
 - **phenotype (anatomic) sex:** depends on genetically determined gonadal sex

Differentiation of Gonads.....

- The reproductive organs are embryologically developed from the intermediate mesoderm
- The male and female gonads derive from an area called **urogenital ridge**, a condensation tissue near adrenal gland
- The gonad develops a cortex and a medulla
- **Until the 6th week** of uterine life, primordial gonads are undifferentiated → identical in both sexes
- A gene on Y chromosome (SRY gene) is expressed at this time in urogenital ridge cells and triggers the development of testes
- Absence of Y chromosome, and hence, SRY gene, testes do not develop, instead, **ovaries begin to develop in the same area at about 11 weeks**

Differentiation of Gonads.....

- **In genetic males**, during the 7th and 8th weeks, the **medulla develops into a testis**, and the cortex regresses
Leydig and Sertoli cells appear → testosterone and MIS are secreted
- **In genetic females**, at about 11 weeks, the **cortex develops into ovary** and the medulla regresses
Embryonic ovary does not secrete hormones
- **Hormonal treatment of the mother has no effect on gonadal differentiation in humans**
- **When the embryo has functional testes → male internal and external genitalia develop**

Differentiation of Genitalia

- So far as its internal duct system and external genitalia are concerned, fetus is capable of developing into either gender
- Before the functional of fetal gonads, primitive reproductive tract includes a double genital duct system: Wolfian ducts and Mullerian ducts and a common opening for genital ducts and urinary system to the outside

Differentiation of Genitalia....

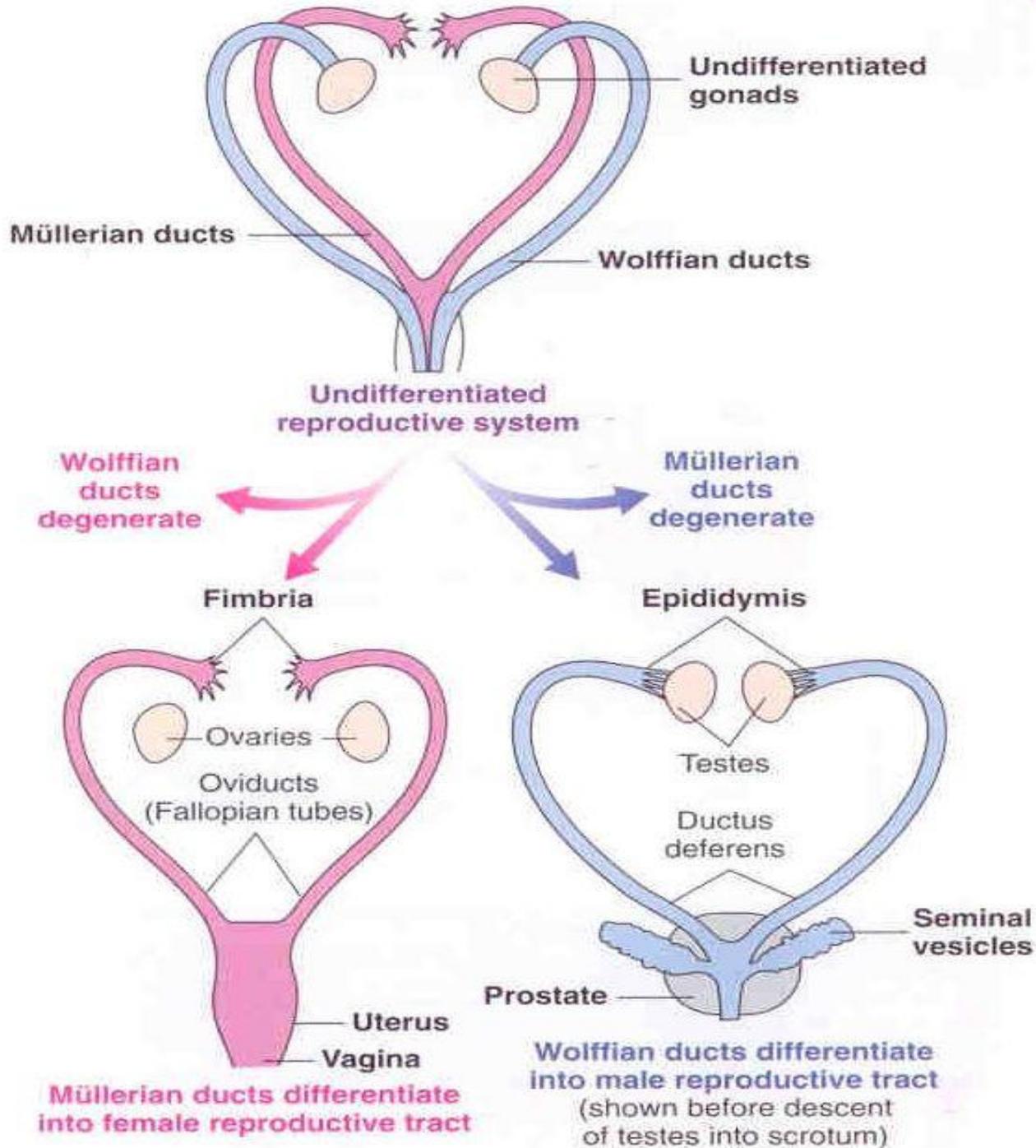
- Normally, most of reproductive tract develops from only one of the duct systems
- In female fetus: Mullerian ducts persist and Wolffian ducts regress
- External genitalia and outer part of vagina do not develop from the duct system, but from other structures at body surface
- Ovaries (unlike testes), do not play a role in the development processes of genitalia
- In other words, female development occurs automatically unless stopped from doing so by the presence of factors released from functioning testes

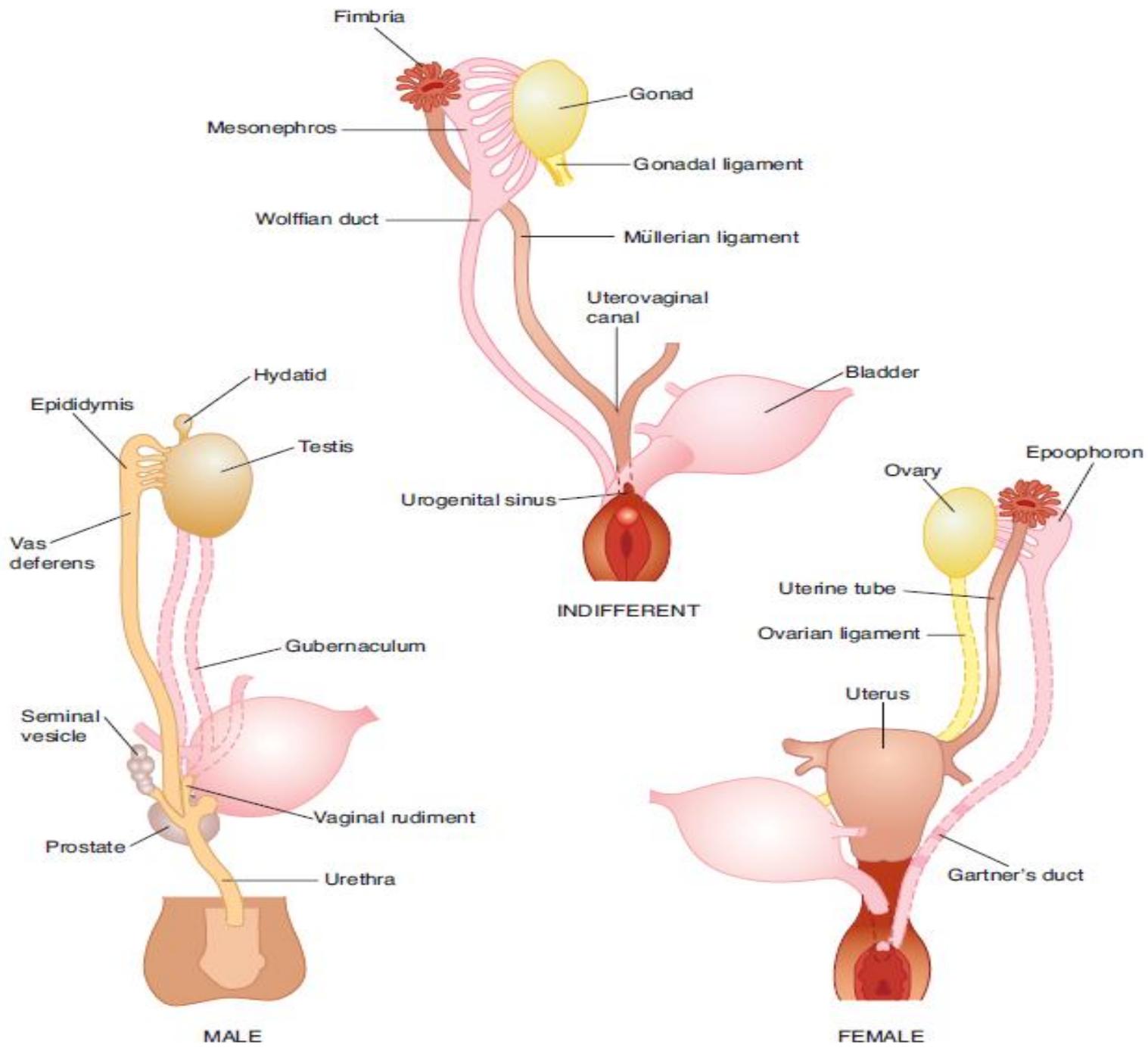
Differentiation of Internal Genitalia

- The **internal genitalia** are bi-potential until gonads undergo differentiation
- In the **7th week** of gestation, the embryo has both male and female internal genitalia
- **Internal genitalia** develop from the **different system**
- Two primitive duct systems: **paramesonephric ducts (Mullerian duct)** and **mesonephric ducts (Wolffian duct)** develop in all embryos, so that the early embryo has potential to develop either a male or a female reproductive tract

Differentiation of Internal Genitalia.....

- Development of internal genitalia is determined by the presence of 2 hormones secreted by fetal testes: testosterone and Mullerian-inhibiting factor
- In normal **male fetus**, the Wolffian duct system develops into epididymis ducts and vas deferens, and Mullerian ducts degenerate
- In normal **female fetus**, the Mullerian duct system develops into uterine tubes (oviducts) and a uterus, and Wolffian ducts degenerate





Differentiation of External Genitalia

- Male and female external genitalia develop from the same embryonic tissue
- Undifferentiated external genitals consist of:
 - Genital tubercle which rise to exquisitely sensitive erotic tissue
 - Urethral folds surrounding a urethral groove
 - Genital (labioscrotal) swellings
- The **external genitalia** are bi-potential until **the 8th week** of gestation
- Thereafter, the **urogenital slit disappears** → **male genitalia form**, or the **urogenital slit remains open** → **female genitalia form**

Differentiation of External Genitalia.....

In normal **female fetus**

■ **Genital tubercle**

Develop into **clitoris** without penetration by urethral opening

■ **Paired urethral folds**

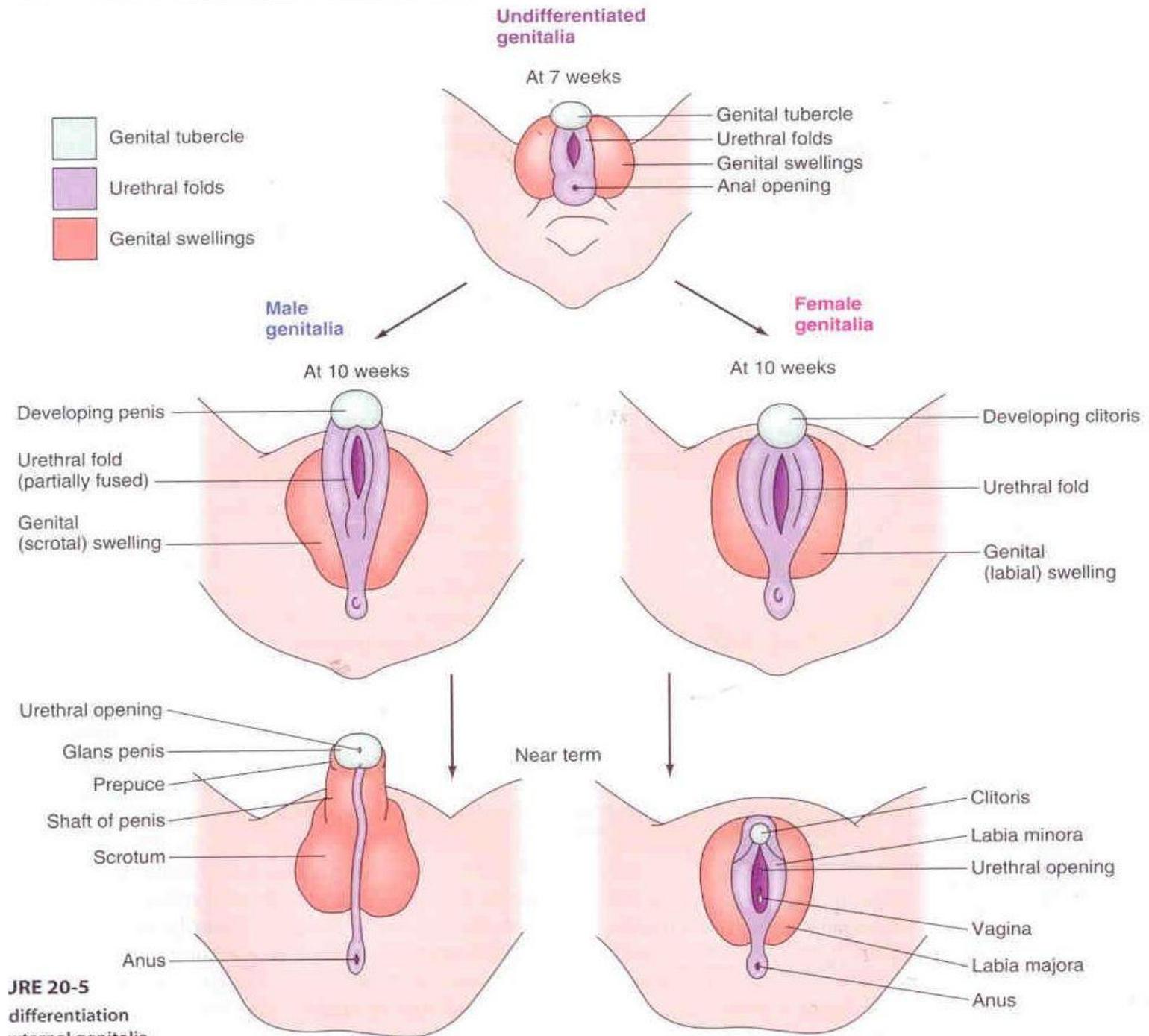
Does not fuse and become labia minora

■ **Urogenital slit**

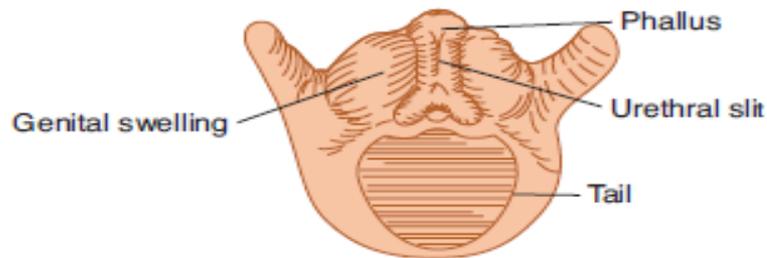
Urogenital slit remains open and become vagina

■ **Genital (labioscrotal) swellings**

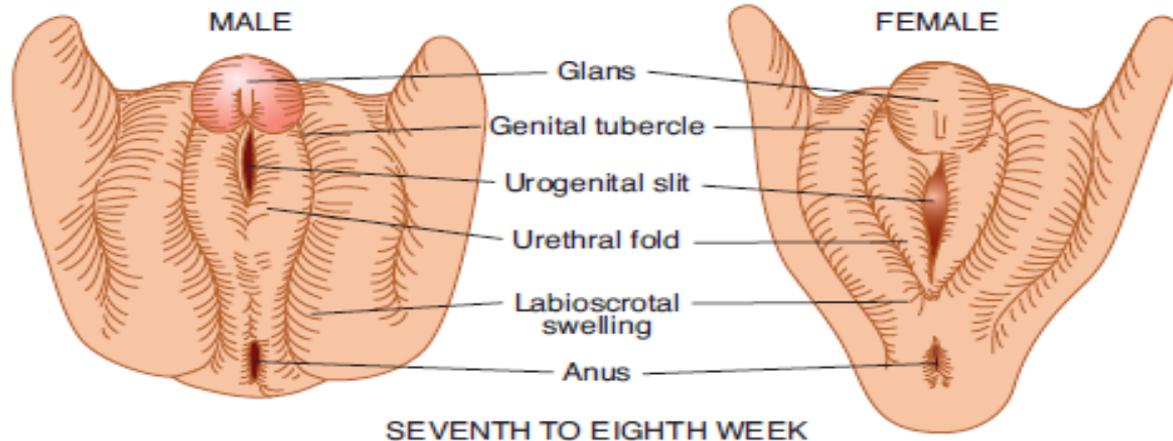
Does not fuse and become labia majora



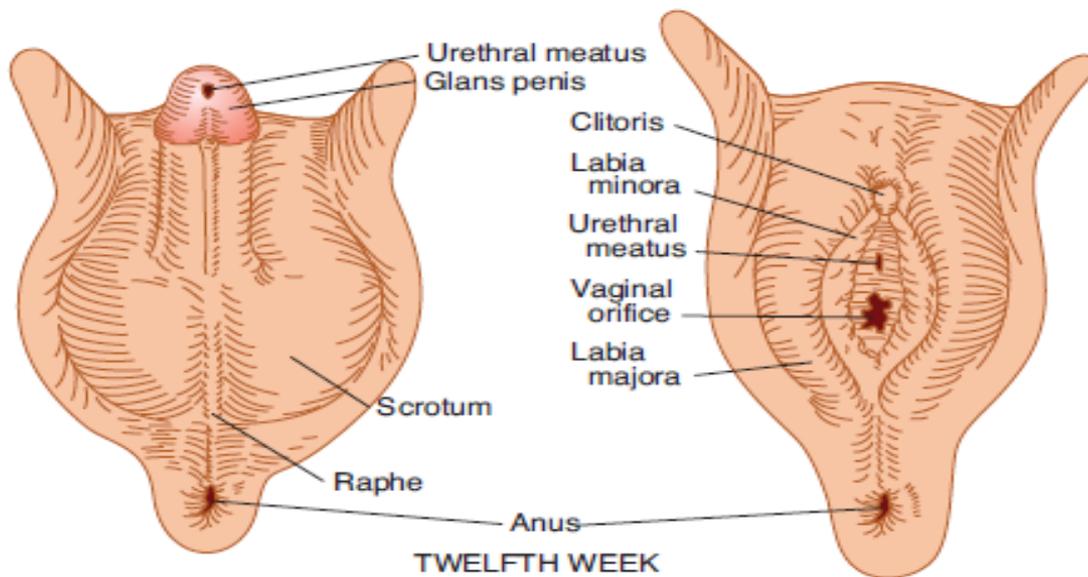
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 differentiation
 external genitalia



INDIFFERENT STAGE



SEVENTH TO EIGHTH WEEK



TWELFTH WEEK

DEVELOPMENT OF REPRODUCTIVE ORGAN AND FUNCTION

Development of Ovaries

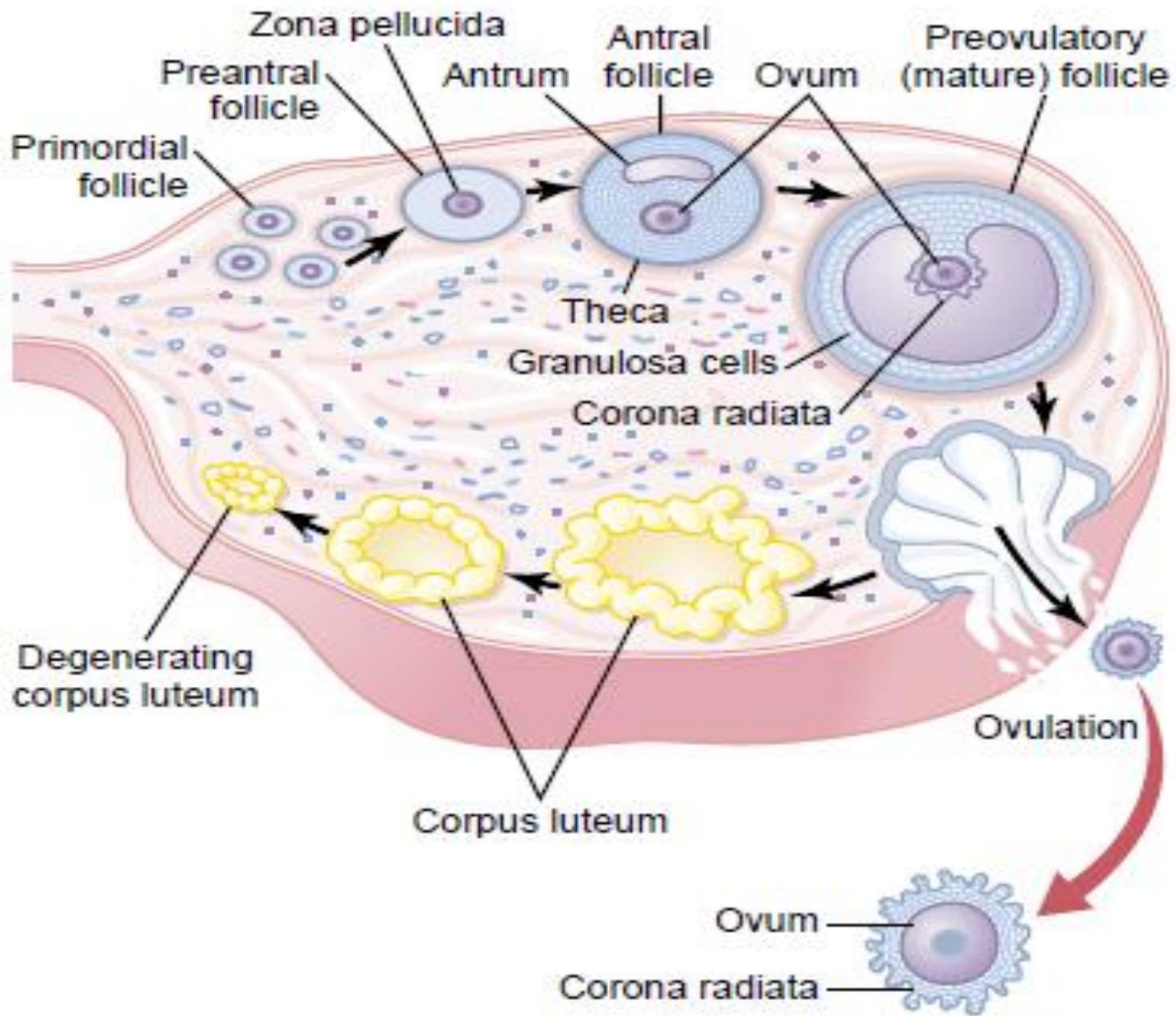
- Descend to brim of pelvis during third month of development
- During fetal life, the outer surface of ovary is covered by a germinal epithelium, which embryologically is derived **from epithelium of germinal ridges**
- As the female fetus develops, cells that give rise to ova arise from endoderm of yolk sac and migrate to ovaries during embryonic development
- Primordial (primitive) germ cells migrate from endoderm of the yolk sac to ovaries during early fetal development

Development of Ovaries.....

- Primordial ova differentiate and migrate into the substance of ovarian cortex
 - In the 3rd month of prenatal development: oogonia divided mitotically into primary oocytes (2n) until 20-24 weeks
 - ± 7 month after conception, fetal oogonia cease dividing
- From this point on no new germ cells are generated
- Still in the fetus, all oogonia develop into primary oocytes

Development of Ovaries.....

- Each ovum collects around it a layer of spindle cells from ovarian stroma and causes them to take on epithelioid characteristics; then called granulosa cells
- Ovum surrounded by a single layer of granulosa cells is called **primordial follicle** with ovum at stage of **primary oocyte**
- Primary oocytes enter prophase of reduction division (meiosis I), but do not complete
- All the eggs present at birth are primary oocytes containing 46 chromosomes, each with two sister chromatids
- Almost from the start → attrition process occurs
- By birth only 2 million primary oocytes remain



Components of Female Reproductive Tract

■ Ovaries

- Primary female reproductive organs
- Perform dual function:
 - > producing ova (oogenesis)
 - > secreting female sex hormones:
estrogen and progesterone which act together to:
 - ◇ promote fertilization of ovum
 - ◇ prepare female reproductive system for pregnancy

Components of Female Reproductive Tract.....

■ Oviduct s (Fallopian tubes)

- in close association with ovaries,
- pick up ova on ovulation and serve as fertilization site

■ Uterus

- thick-walled hollow
- responsible for:
 - > maintaining fetus during development
 - > expelling it at the end of pregnancy

Components of Female Reproductive Tract.....

■ **Vagina**

- expandable tube
- connects uterus to external environment

■ **Cervix**

- lowest portion of uterus
- projects into vagina

■ **Cervical canal**

- small opening of cervix
- pathway for sperm to uterus then to oviduct
- passageway for delivery of baby from uterus

Components of Female Reproductive Tract.....

■ Vaginal opening

- located in perineal region
- between urethral opening and anal opening

■ Hymen

- thin mucus membrane partially covering vaginal opening

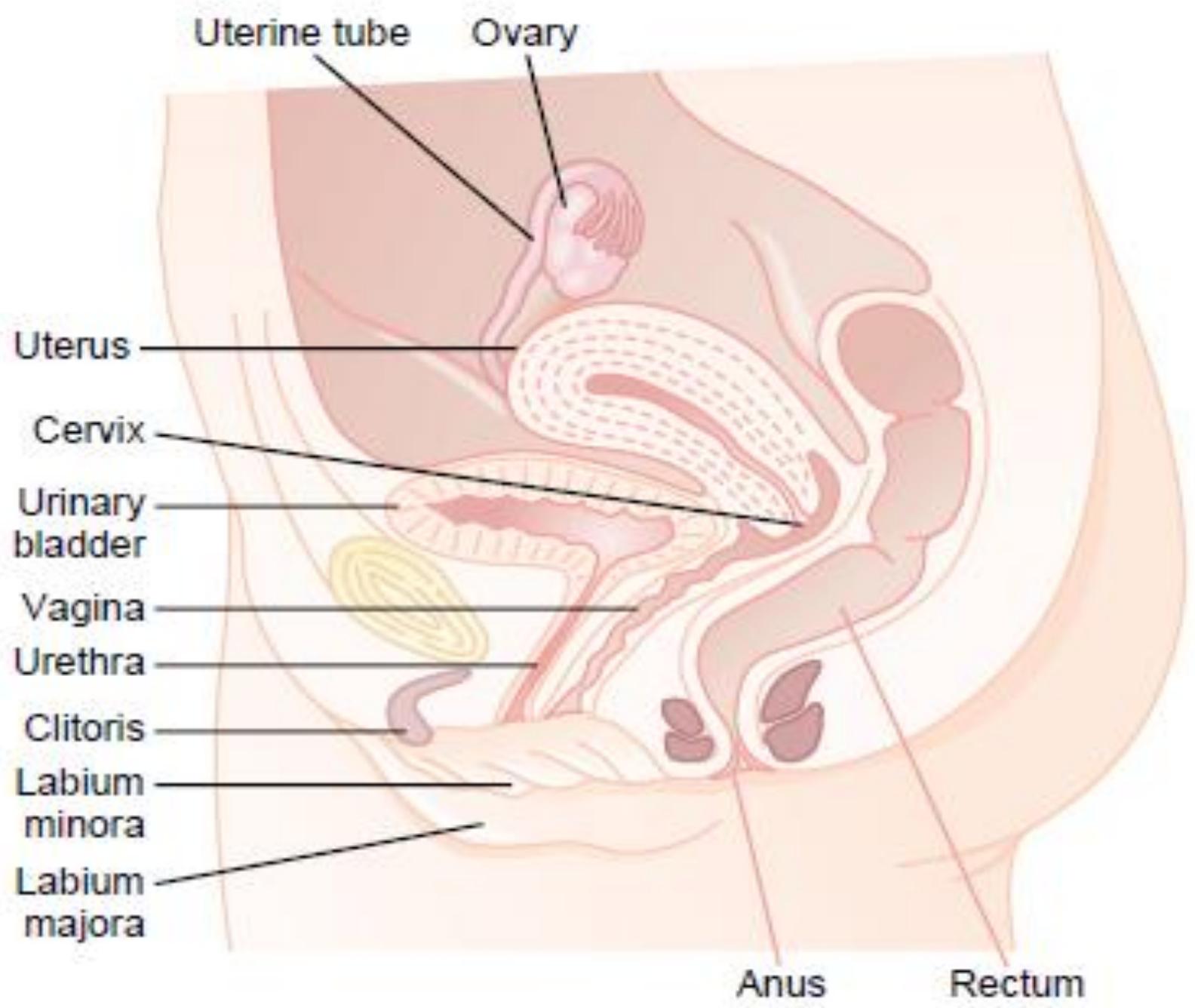
■ Labia minora and labia majora

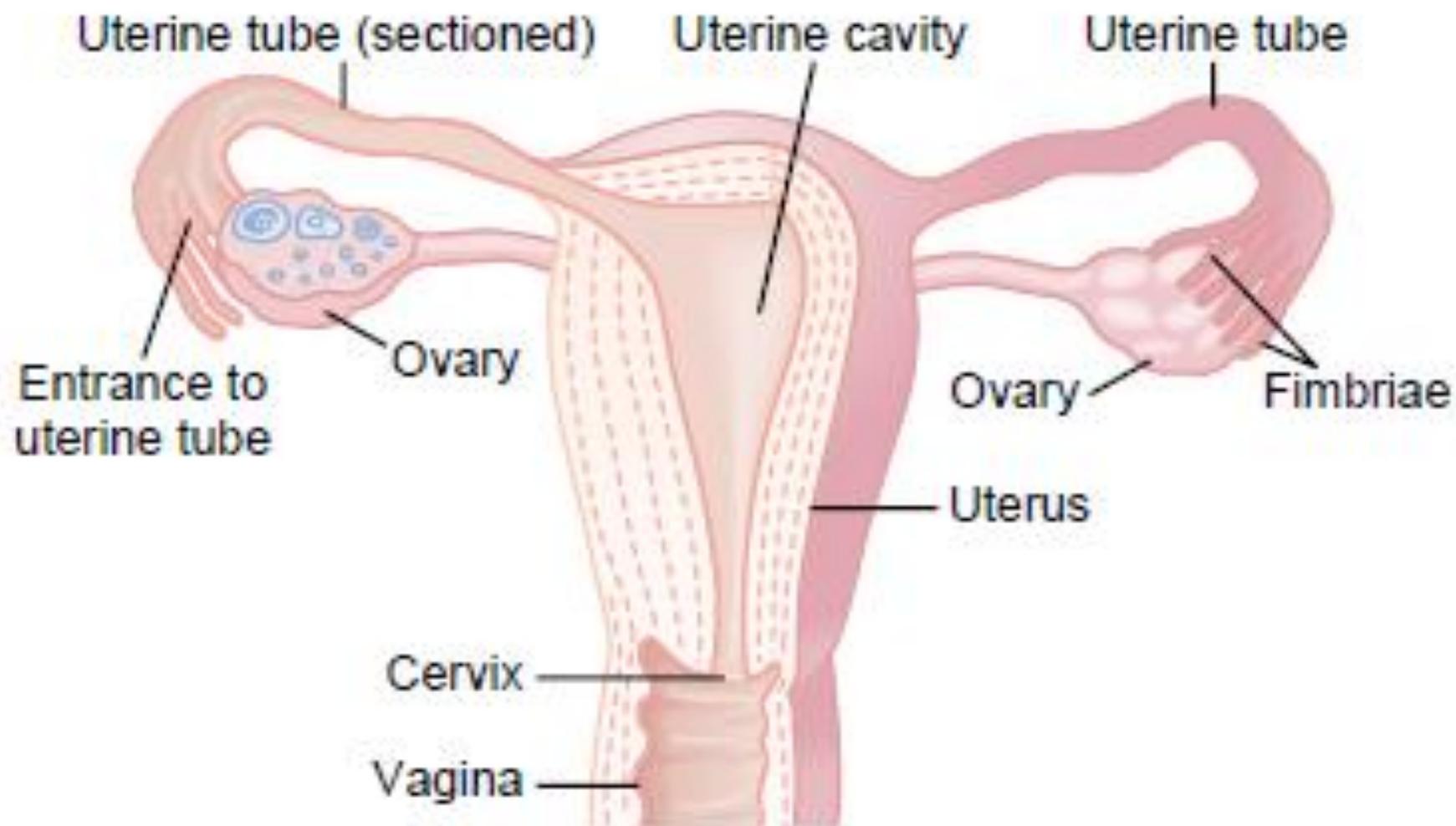
- skin folds surrounding vaginal and urethral openings

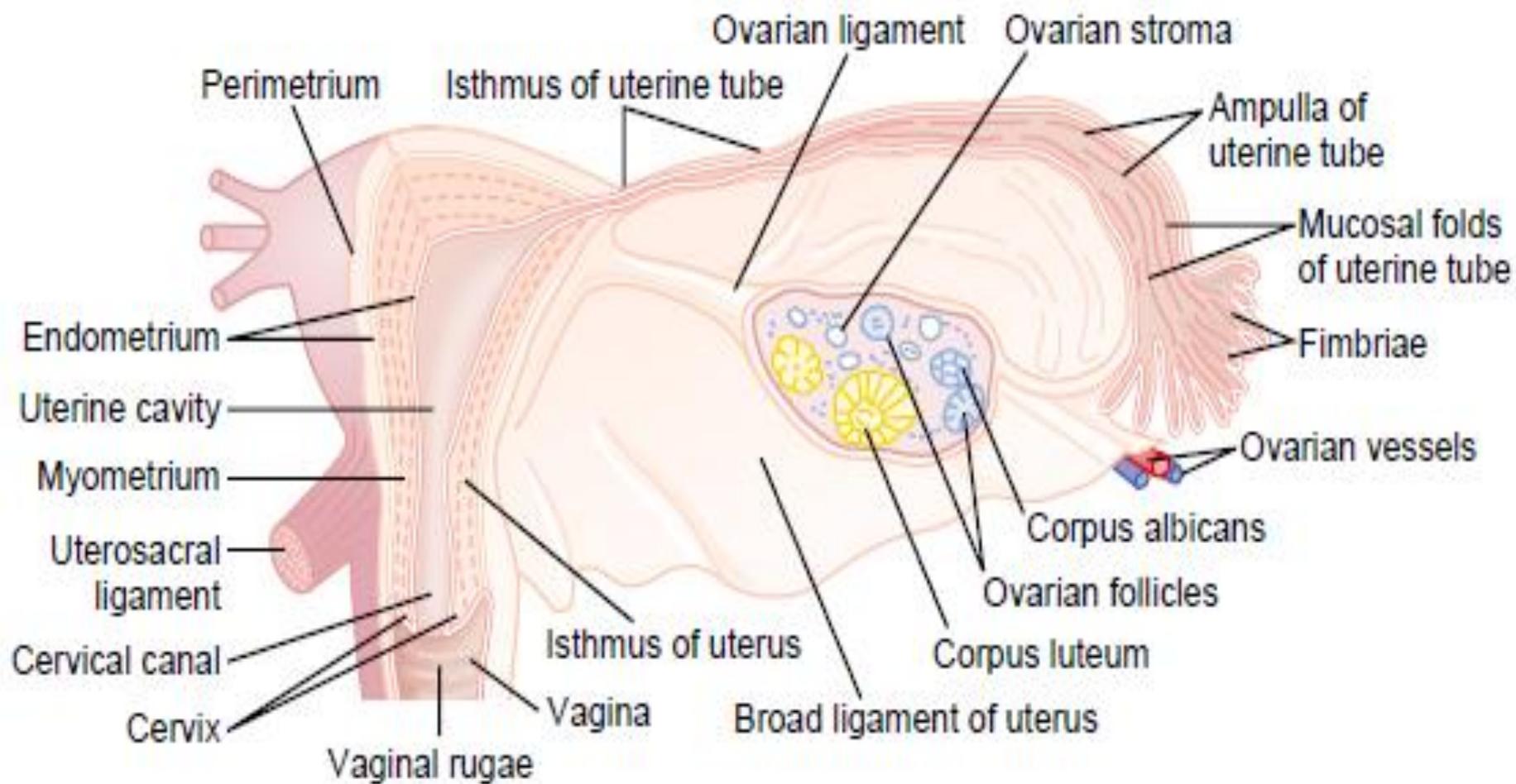
■ Clitoris

- erectile tissue (analog with penis)

Female external genitalia collectively: **vulva**







Development of Brain

- **At least in some species, the development of the brain as well as the external genitalia is affected by androgens early in life.**
- **In rats, a brief exposure to androgens during the first few days of life causes the male pattern of sexual behavior and the male pattern of hypothalamic control of gonadotropin secretion to develop after puberty. In the absence of androgens, female pattern develop**
- **In monkeys, similar effects on sexual behavior are produce by exposure to androgens in utero, but the patter of gonadotropin secretion remains cyclical**

Development of Brain.....

- **In humans, early exposure of female fetuses to androgens also appears to cause subtle but significant masculinizing effects on behavior**

However, women with adrenogenital syndrome due to congenital adrenocortical enzyme deficiency develop normal menstrual cycles when treated with cortisol.

Thus, the human, like the monkey, appears to retain the cyclical pattern of gonadotropin secretion despite exposure to androgens in utero

Thank You

Tugas

Perkembangan anatomi sistem reproduksi wanita sampai lahir