

# **PENGANTAR FISIOLOGI REPRODUKSI**

## **Kuliah 1**

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# Reproduction

- Reproduction is process **to maintain continuation of species** by which
  - **new individuals** of a species are produced
  - **genetic material** is passed from generation to generation

Cell division in a multicellular organism is necessary for growth and it involves passing of genetic material from parent cells to daughter cells

- Performed by reproductive system

# The Reproductive System

- does not contribute to homeostasis
- is not essential for survival of an individual
- But still plays an important role in a person's life, e.g. the manner:
  - in which people relate as sexual beings contributes in significant ways to **psychosocial behavior**
  - how people **view themselves**
  - how people **interact with others**

# The Reproductive System.....

- **Reproductive function also has a profound effect on society:**
  - **universal organization of societies into family units provide a stable environment that is **conducive for perpetuating** our species**
  - **on other hand, **population explosion** and its resultant drain on dwindling resources have led to worldwide concern with means by which reproduction can be limited**

# The Reproductive System.....

- Reproductive capability depends on **intricate relationship among hypothalamus, anterior pituitary, reproductive organs, and target cells of sex hormones**
- These relationship employ many of **regulatory mechanisms** used by other body systems for maintaining homeostasis, such as **negative-feedback control**

# The Reproductive System.....

- Sexual behavior and attitudes are deeply influenced by emotional factors and socio-cultural mores of the society in which the individual lives
- However, Reproductive Physiology will **concentrate on basic sexual and reproductive functions that are under nervous and hormonal control**, and will not examine physiological and social ramifications of sexual behavior

# The Reproductive System.....

- **The organ of male and female may be grouped by function**
- **Testes and ovaries (gonads), function in production of gametes: sperm and ova**
- **Gonads also secrete hormones**
- **The ducts of reproductive systems transport, receive, and store gametes**
- **Accessory sex glands produce materials that support gametes**

# The Reproductive System.....

- In females, the breasts are also considered accessory reproductive organs
- The externally visible portions of reproductive system are known as external genitalia
- 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



# Secondary Sexual Characteristic

- Secondary sexual characteristics are many external characteristics **not directly involved in reproduction**
- That **distinguish male and female**
- Development and maintenance governed by testosterone in males and estrogen in females
- Progesterone has no influence on secondary sexual characteristics
- Axillary and pubic hair growth is not secondary sexual characteristics

# Secondary Sexual Characteristic.....

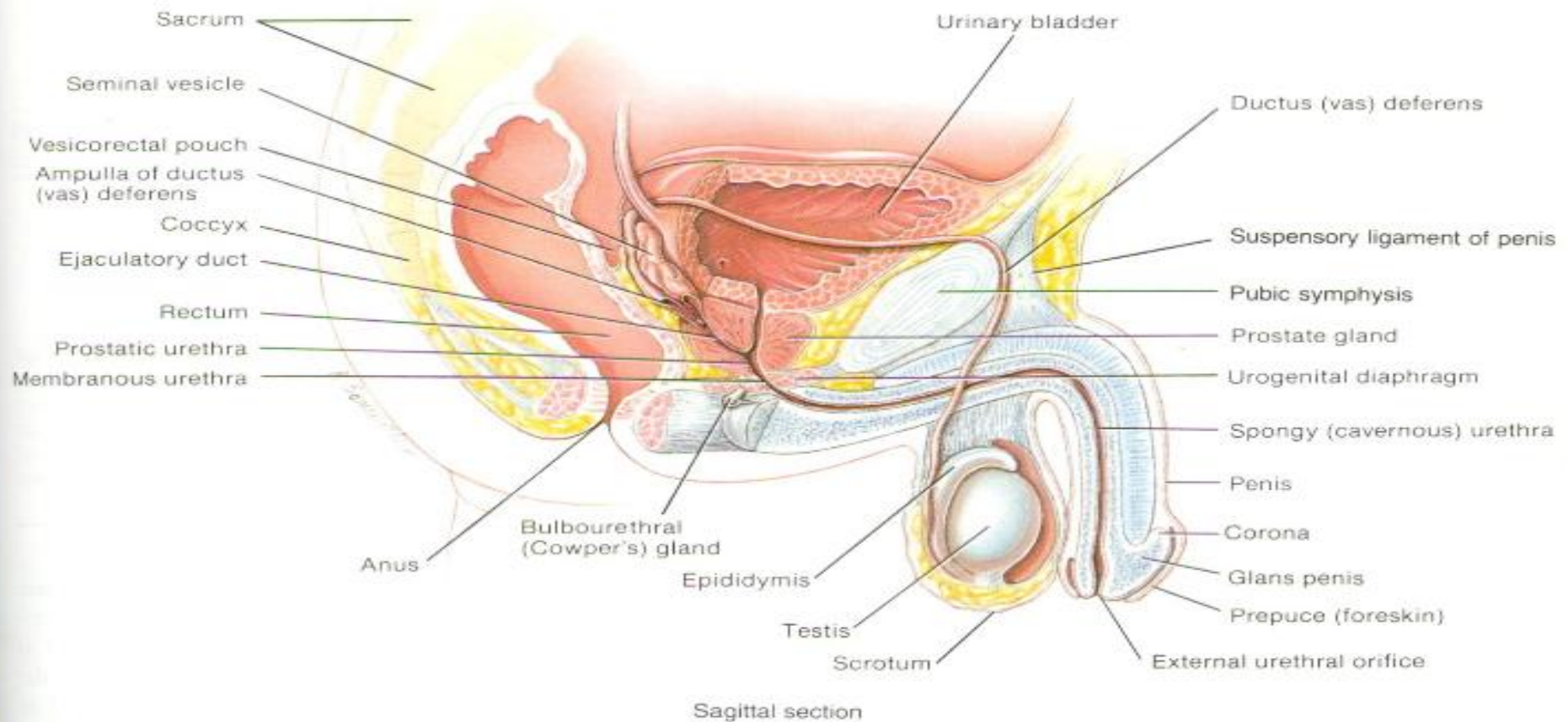
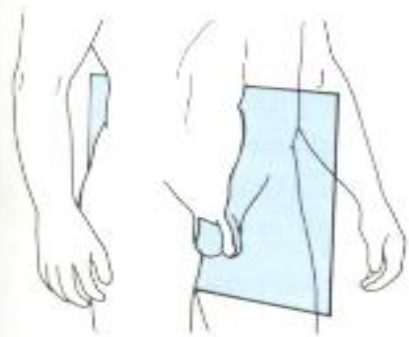
- In some species, secondary sexual characteristic are great importance in courting and mating behavior (e.g. to attract female's attention)
- In humans, attraction the opposite sex not only influenced by secondary sexual characteristic but also **strongly affected by the complexities of human society and cultural behavior**

# Overview of Functions and Organs of Male Reproductive System

The essential reproductive functions of **male** are:

- 1. Production** of sperm (spermatogenesis) by testes (in skin-covered sac: scrotum)
- 2. Delivery** of sperm to female – semen by
  - male reproductive tract: epididymis, vas deferens, ejaculatory duct
  - urethra (in penis)
- 3. Male accessory** sex glands: providing bulk of semen: seminal vesicle, prostate, bulbourethral gland

**FIGURE 28.1** Male organs of reproduction and surrounding structures.



# Overview of Functions and Organs of Female Reproductive System

**Female's** role in reproduction is more complicated:

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 Functions and Organs 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**

- **tremendous tissue growth and maturation**

# Overview of Functions and Organs of Female Reproductive System.....

**Female** reproductive tract consists of:

■ **Ovaries**

■ **Oviduct s (Fallopian tubes)**

- pick up ova on ovulation and serve as fertilization site

■ **Uterus, thick-walled hollow:** responsible for

- maintaining fetus during development , and
- expelling it at the end of pregnancy

■ **Cervical canal**

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

■ **Cervix**

- lowest portion of uterus which projects into vagina

# Overview of Functions and Organs of Female Reproductive System.....

## ■ Vagina

- expandable tube
- connects uterus to external environment

## ■ 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

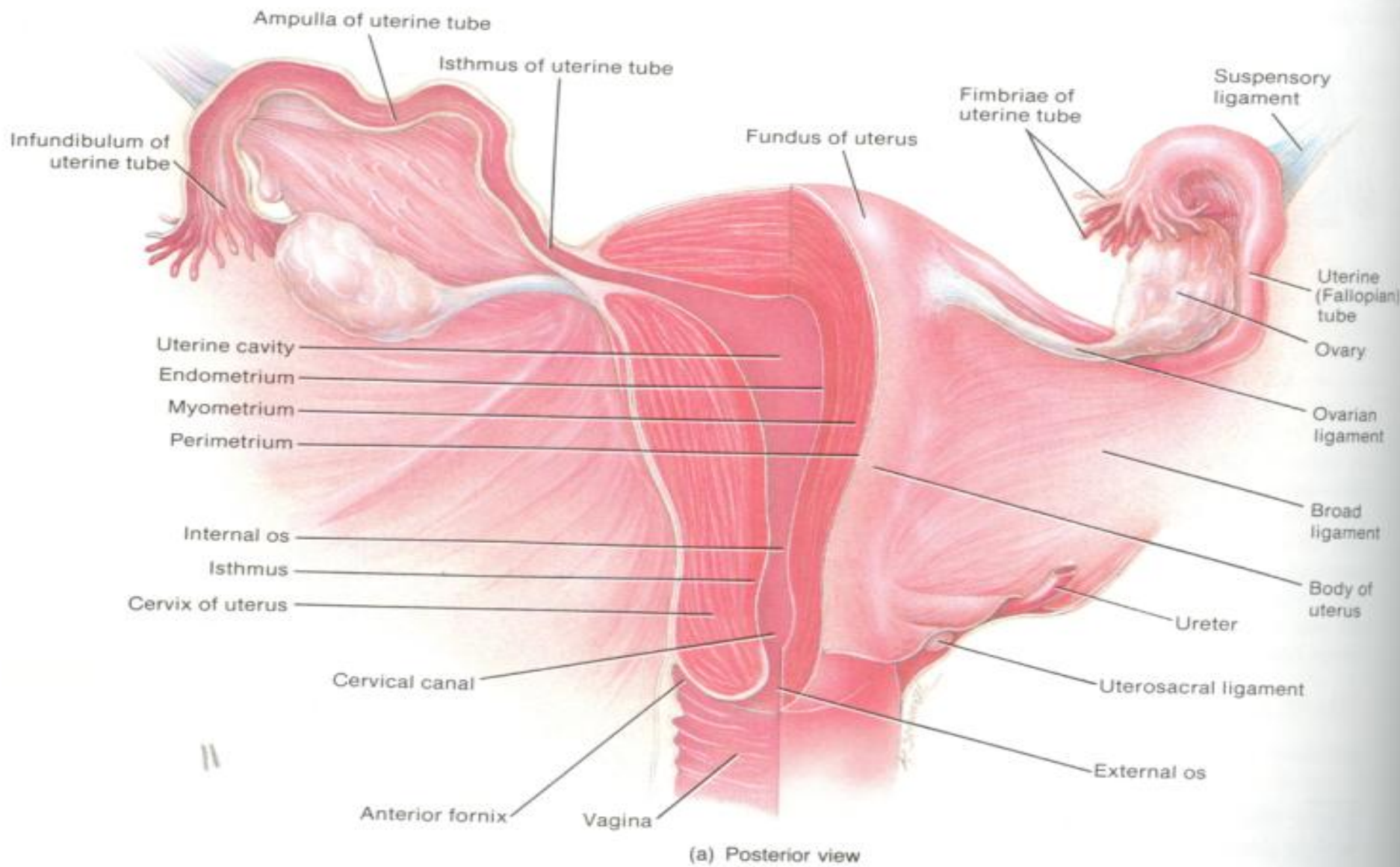
- skin folds surrounding vaginal and urethral openings

## ● Clitoris

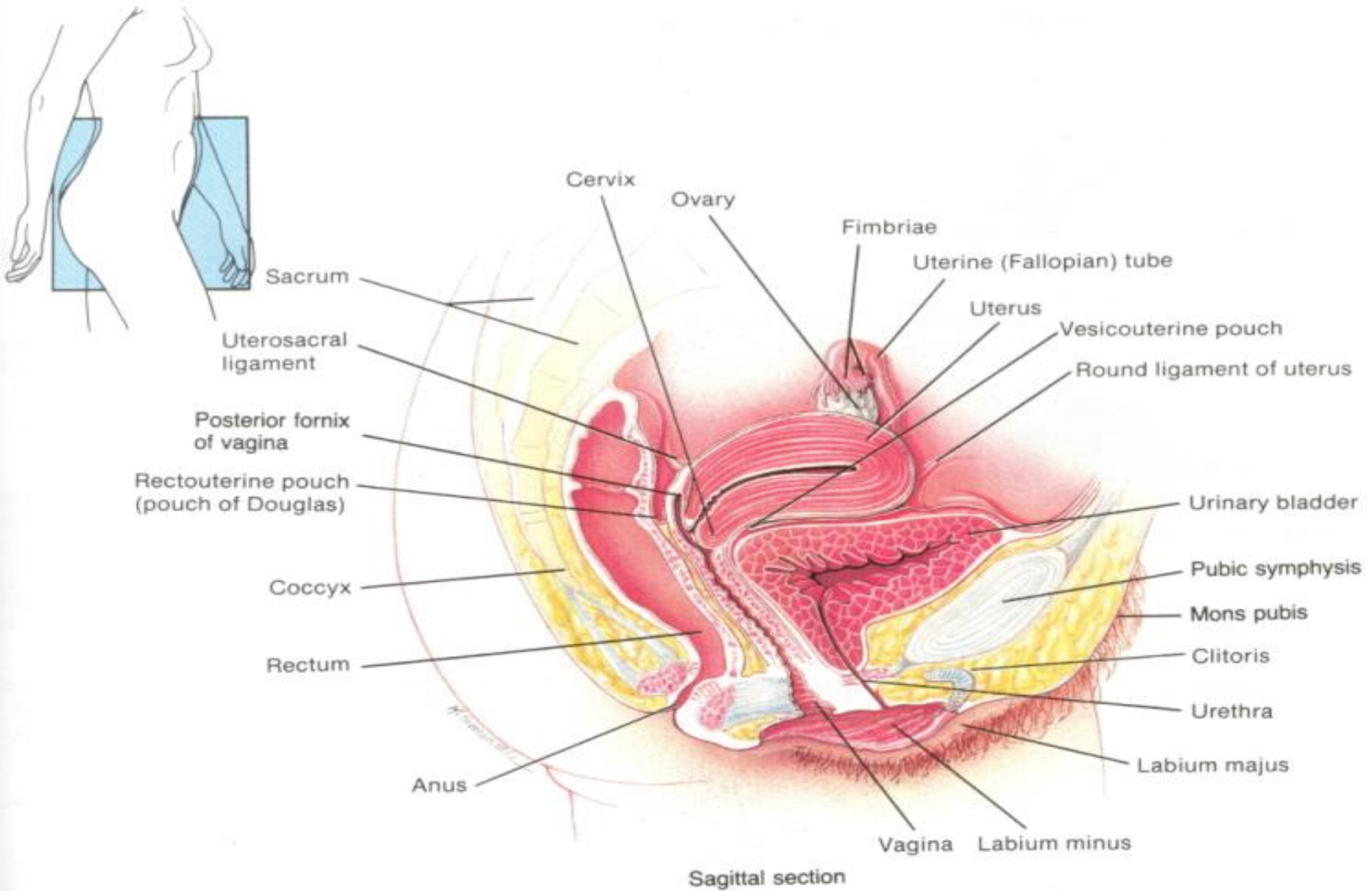
Female external genitalia collectively: **vulva**



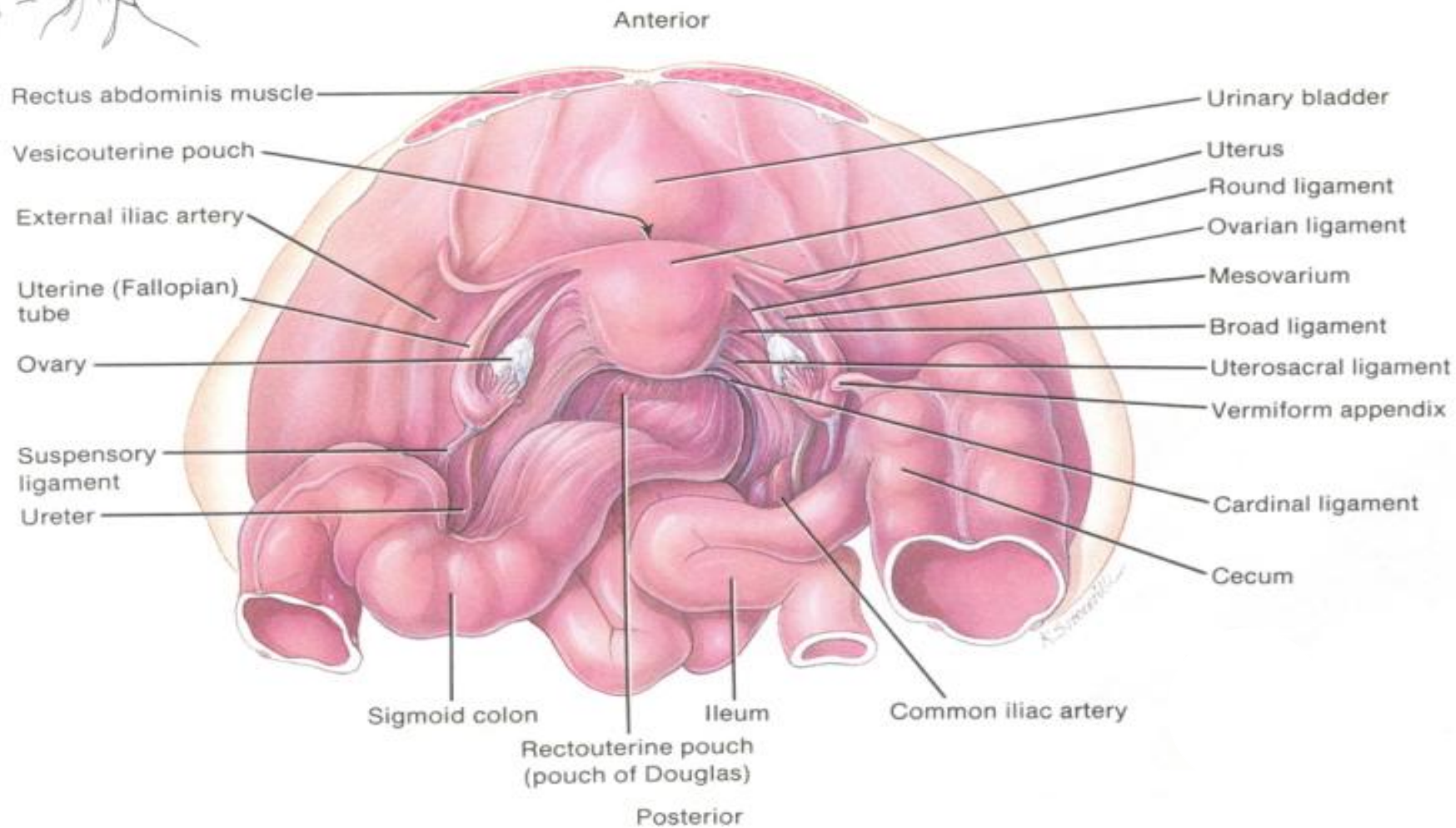
**FIGURE 28.12** Uterus and associated structures. In (a), the left side of the figure has been sectioned to show internal structures. In (b), part of the posterior wall of the uterus has been removed.



**FIGURE 28.11** Female organs of reproduction and surrounding structures.



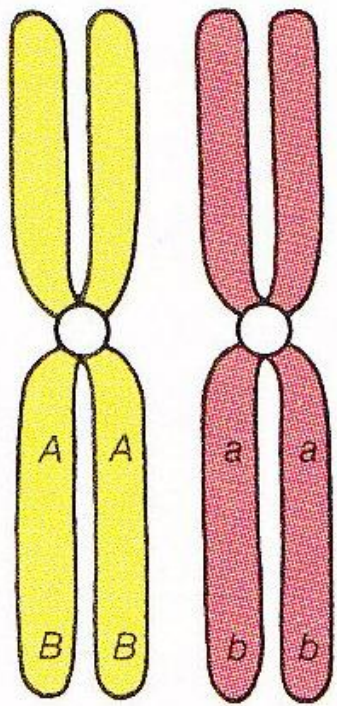
**Question:** Which male structures are homologous to the ovaries? Clitoris? Paraurethral glands? Greater vestibular glands?



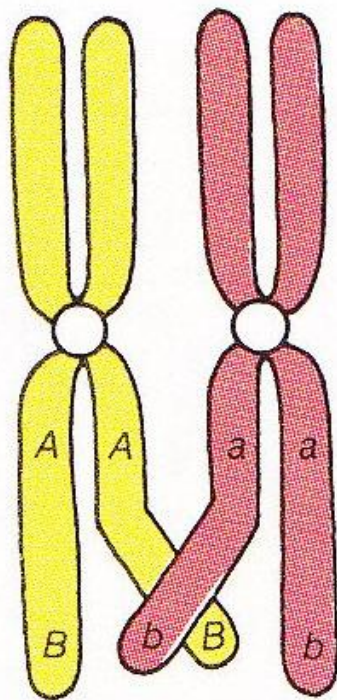
(d) Superior view of transverse section

# Sex Determination and Differentiation

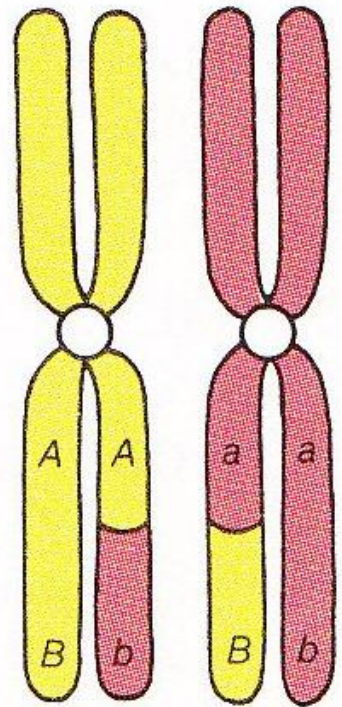
- Reproductive cells each contain a half set of chromosomes
- Gametogenesis is accomplished by **meiosis**
- The sex of an individual is determined by combination of sex chromosomes
- Sexual differentiation along male or female lines depends on the presence/ absence of masculinizing determinant



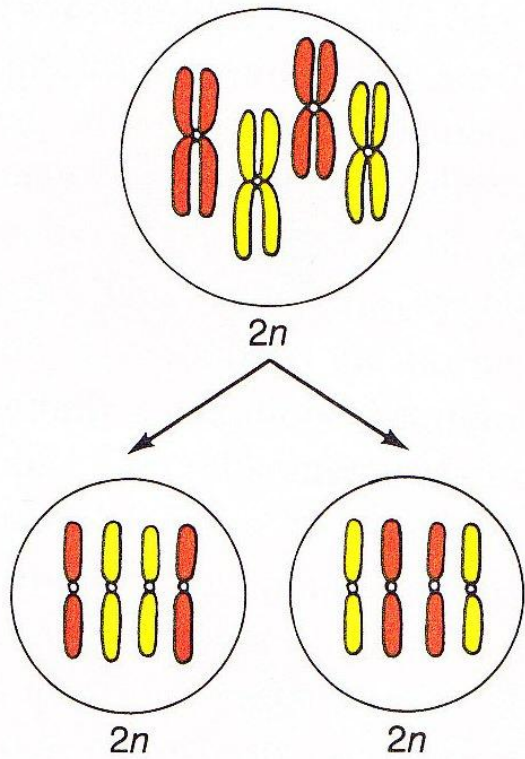
(a) Synapsis and tetrad formation



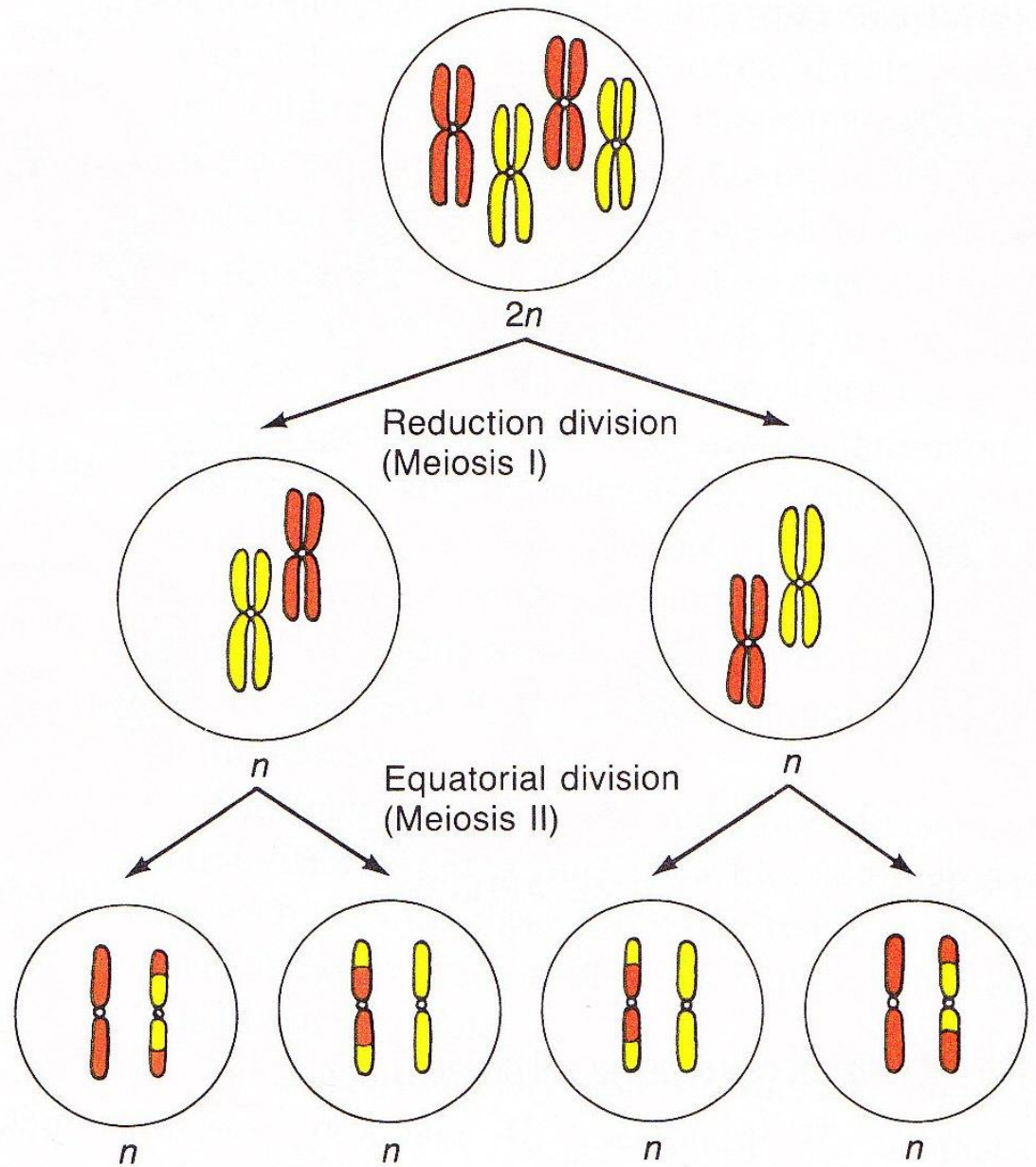
(b) Crossing-over



(c) Genetic recombination



(a) Mitosis



(b) Meiosis

Parents with diploid (46 chr) somatic cells

Mother

Father

Meiotic division  
of germ cells

Meiotic division  
of germ cells

Haploid Ovum

Haploid Sperm

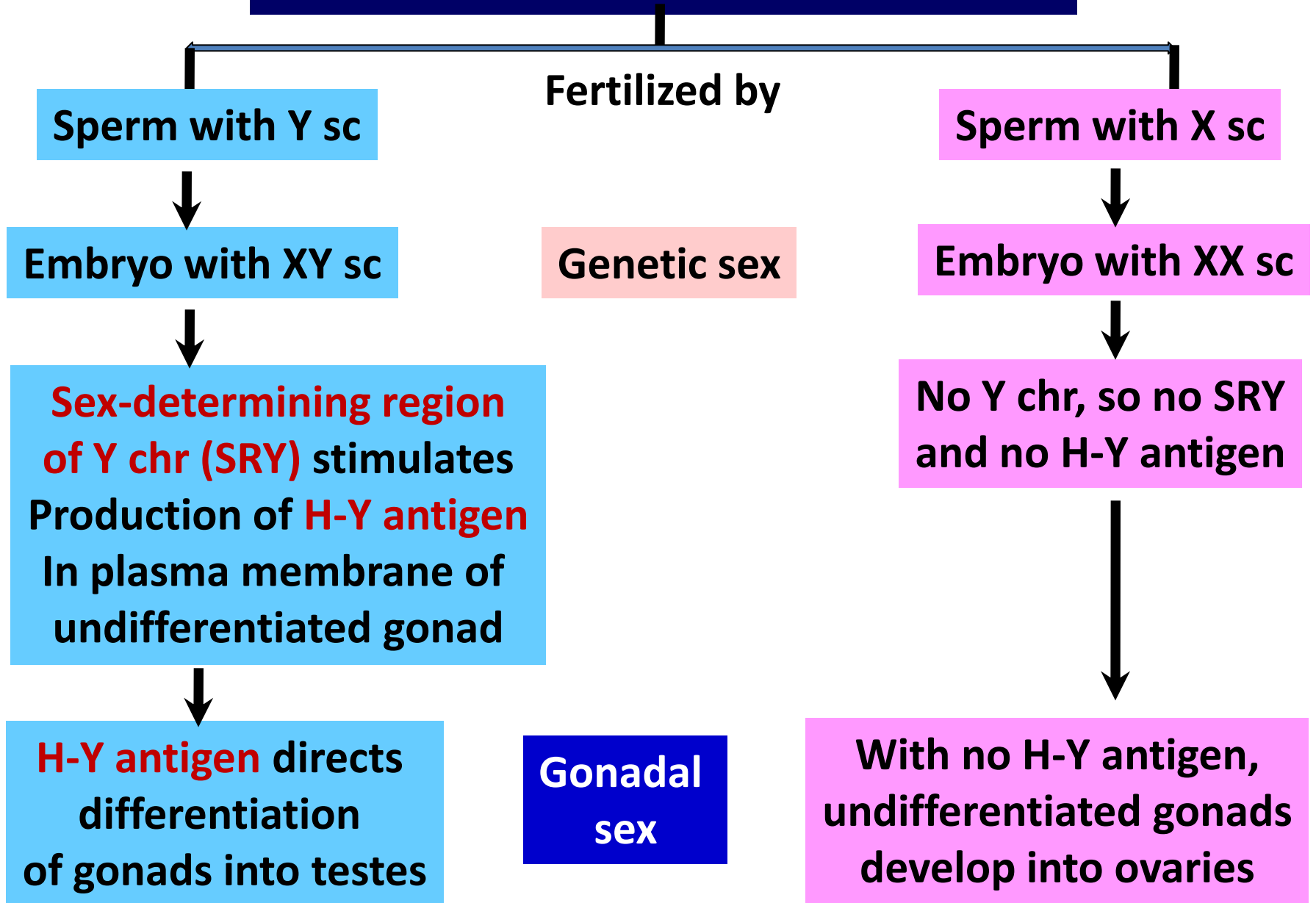
Fertilization

Diploid fertilized Ovum

Mitosis

Offspring of diploid somatic cells

# Ovum with X sex chromosome





# Testes secrete hormone and factor

Testosterone

Mullerian-inhibiting factor

Converted to

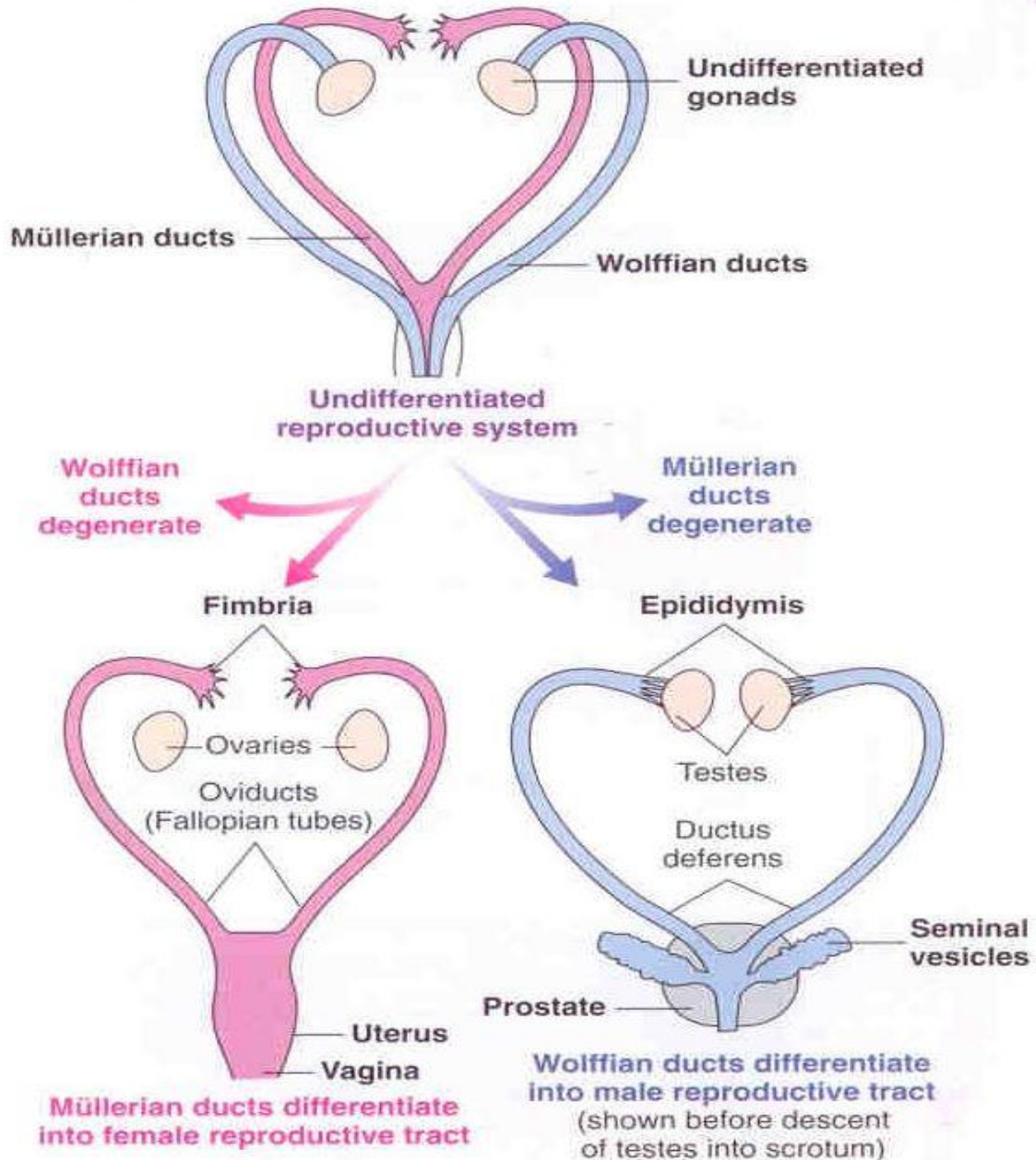
Dihydrotestosterone (DHT)

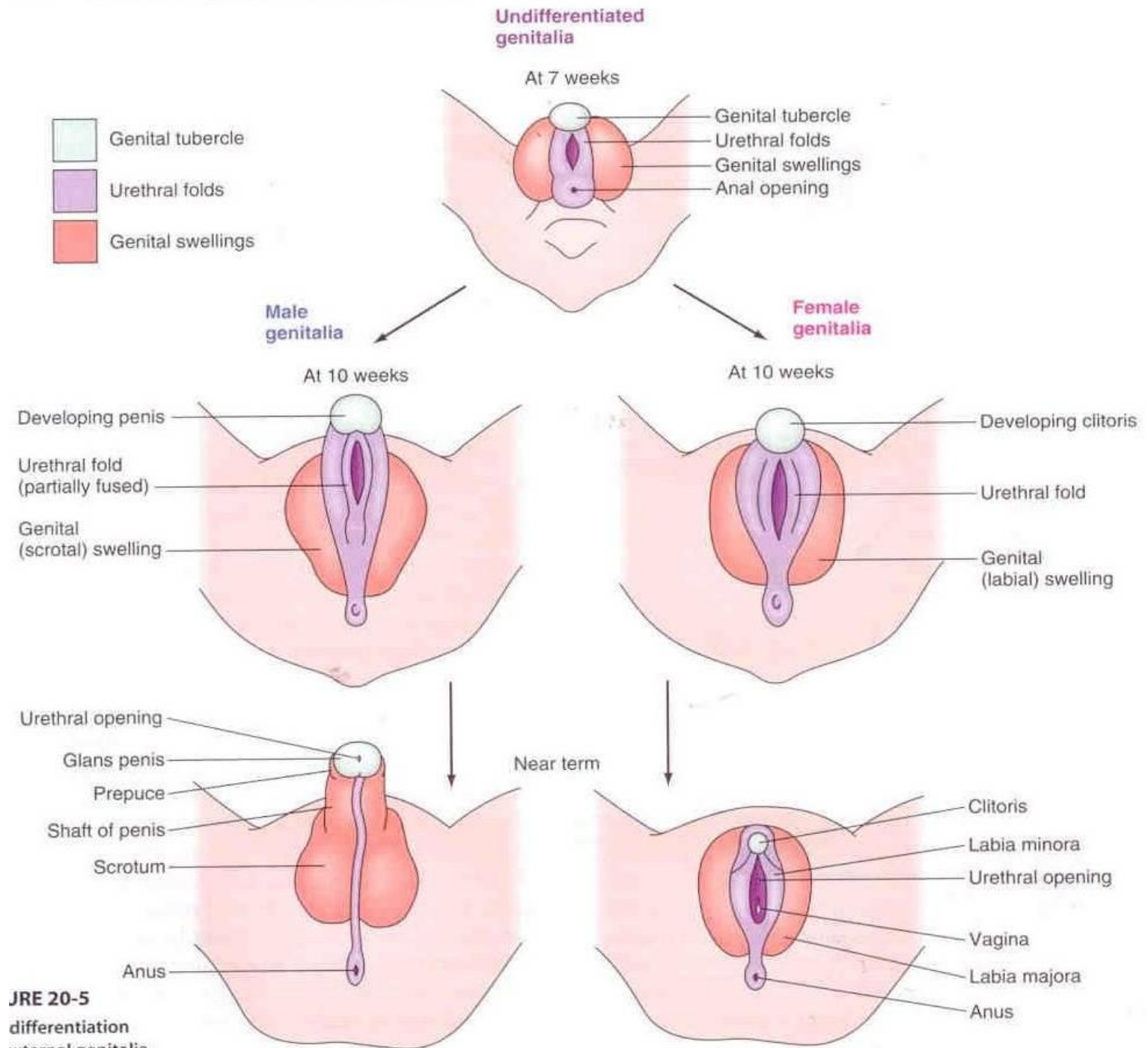
Degeneration of Mullerian ducts

Promotes development of undifferentiated external genitalia along male lines (e.g. penis, scrotum)

Transforms Wolffian ducts into male reproductive tract (e.g. epididymis, ductus deferens, ejaculatory duct, seminal vesicle)

Phenotype sex





**JRE 20-5**  
 differentiation  
 external genitalia

**Ovaries does not secrete hormone and factor**

**Absence of testosterone**

**Absence of Mullerian-inhibiting factor**

**Degeneration of  
Wolfian ducts**

**Undifferentiated external  
genitalia along female lines  
(e.g. clitoris. labia)**

**Mullerian ducts develop  
Into female reproductive  
tract (e.g. oviducts, uterus)**

**Phenotype  
sex**

# Errors in Sexual Differentiation

- **Genetic sex and phenotype sex are usually compatible**
- **Occasionally, discrepancies occur between genetic and anatomic sexes because of errors in sexual differentiation**

# Errors in Sexual Differentiation.....

1. If testes in **a genetic male** fail to properly differentiate and secrete hormones, the result is the development of an apparent anatomic female in a genetic male, who, of course will be sterile.

Similarly, genetic males whose target cells lack receptors for testosterone are feminized, even though their testes secrete testosterone

# Errors in Sexual Differentiation.....

- 2. Testosterone acts on Wolffian ducts to convert them into a male reproductive tract;**

**If testosterone derivative dihydrotestosterone (DHT) that responsible for masculinization of external genitalia because of genetic deficiency of the enzyme which converts testosterone into DHT, results in a genetic male with testes and a male reproductive tract but with female external genitalia**

# Errors in Sexual Differentiation.....

**3. Adrenal gland normally secretes a weak androgen, dehydroepiandrosterone in insufficient quantities to masculinize females.**

**If, pathologically excessive secretion of this hormone in a genetically female fetus during critical developmental stages imposes differentiation of reproductive tract and genitalia along males lines**



# Errors in Sexual Differentiation.....

- Sometimes, the discrepancies between genetic sex and apparent sex are not recognized until puberty, when discovery produces psychologically traumatic gender identity crisis
- For instance: a masculinized genetic female with ovaries, but with male type external genitalia may be reared as a boy until puberty. When breast enlargement and lack of beard growth signal an apparent problem

# Errors in Sexual Differentiation.....

- **Less dramatic cases of inappropriate sex differentiation often appear as sterility problems**
- **Therefore, important to diagnose any problems in sexual differentiation in infancy. It can be reinforced, if necessary, with surgical and hormonal treatment, so that psychosexual development can proceed as normally as possible**

Thank You

# Tugas

- 1. Hubungan sistem limbik (*limbic system*) dengan pengaturan fungsi seks**
- 2. Hubungan kelenjar pineal (*pineal body*) dengan pengaturan fungsi seks**