Human Reproduction and Development

Part 1: The Male & the Female Reproductive System

Part 2: Sexual Intercourse & Pregnancy

Part 3: Birth Control & STDs

Key Concepts:

- The human reproductive system consists of a pair of gonads and accessory glands
- In response to signals from the hypothalamus and the pituitary gland, gonads release sex hormones
- Testosterone, LH, and FSH control male reproductive function

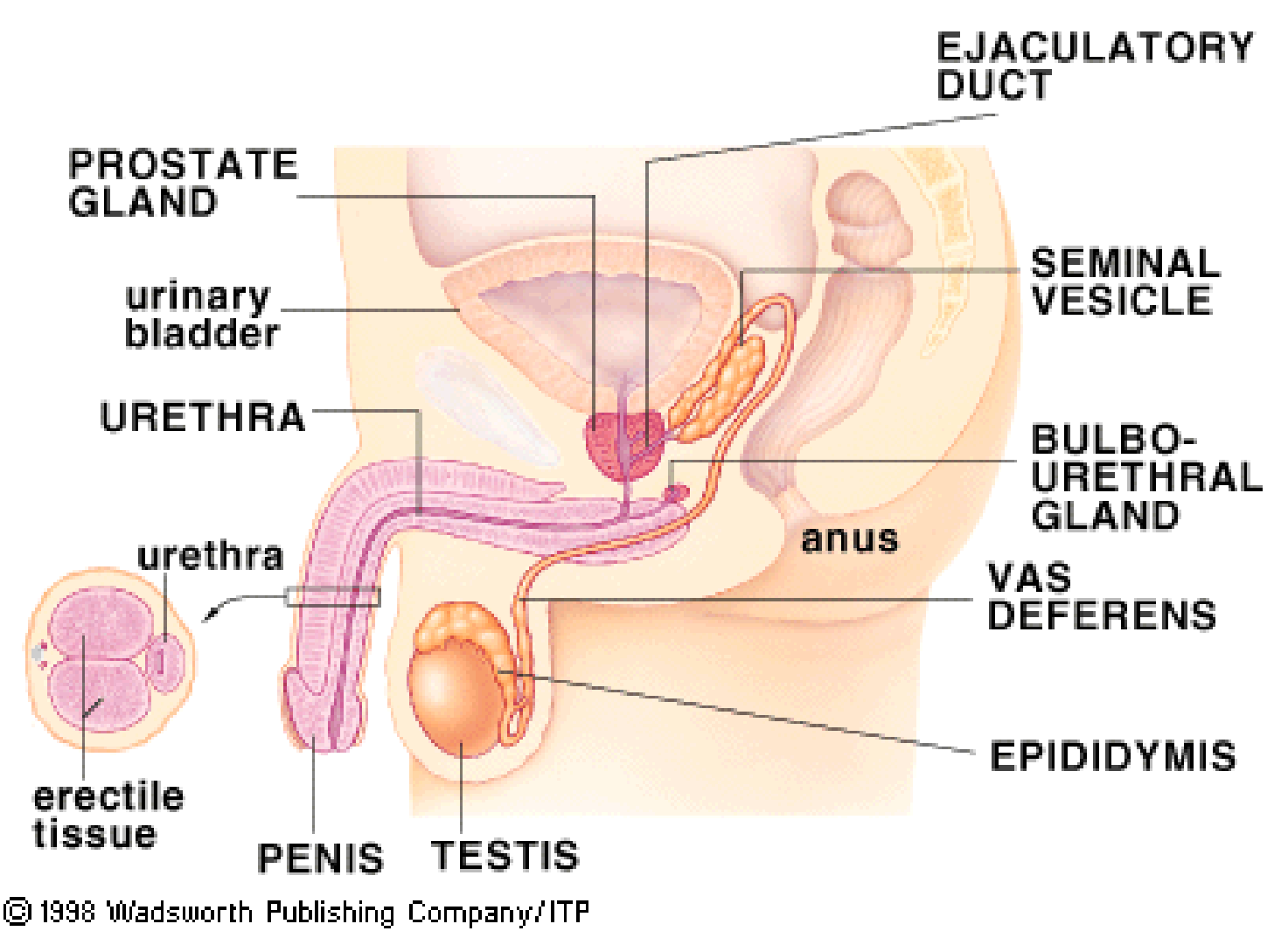
Key Concepts:

- Males produce sperm from puberty onward, while females are fertile on a cyclic basis
- Estrogen, progesterone, FSH and LH are hormones that dominate cyclic activity

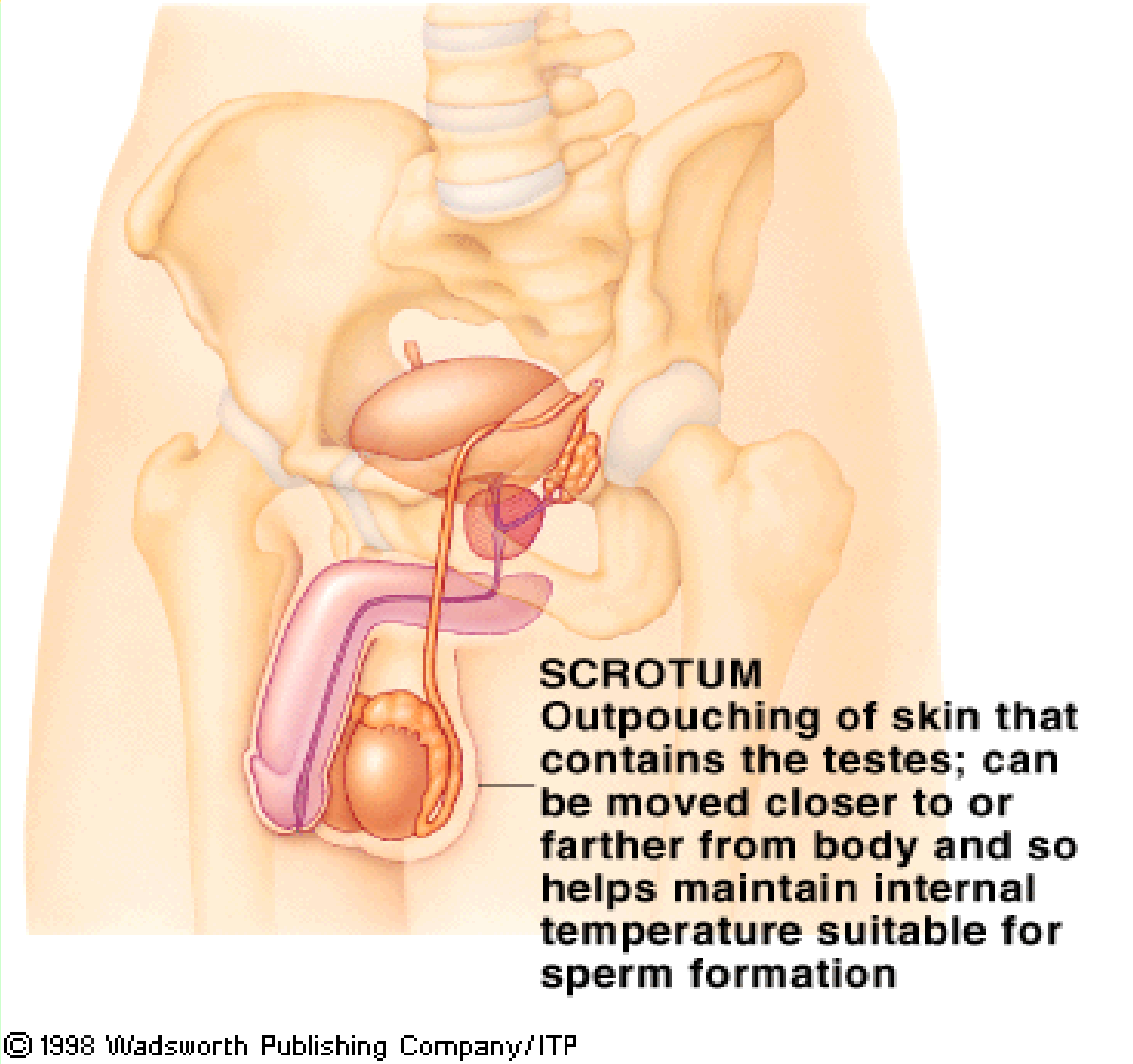
Organs & Glands of the Male Reproductive Tract

Organ	Function
Testis (2)	Production of sperm, sex hormones
Epididymis (2)	Sperm maturation site & storage
Vas deferens (2)	Rapid transport of sperm
Ejaculatory duct (2)	Conduction of sperm to penis
Penis	Organ of sexual intercourse
Seminal Vesicle (2)	Secretion of large part of semen
Prostate gland	Secretion of part of semen
Bulbourethral gland (2)	Production of lubricating mucus

Male Reproductive Structures and Glands



Male Reproductive Structures



Where Sperm Form

- Before birth, the testes descend from the abdominal cavity into the scrotum.
- At the time of birth, testes are fully formed miniature copies of the adult organs.
- They start to produce sperm at puberty – and continue until death.

Where Sperm Form (2)

- To produce sperm the scrotum's internal temperature should stay around 95 degrees (F).
- Each testis contains a large number of small, highly coiled tubes called the **seminiferous tubules**. Sperm is formed in these tubes.

Where Semen Forms

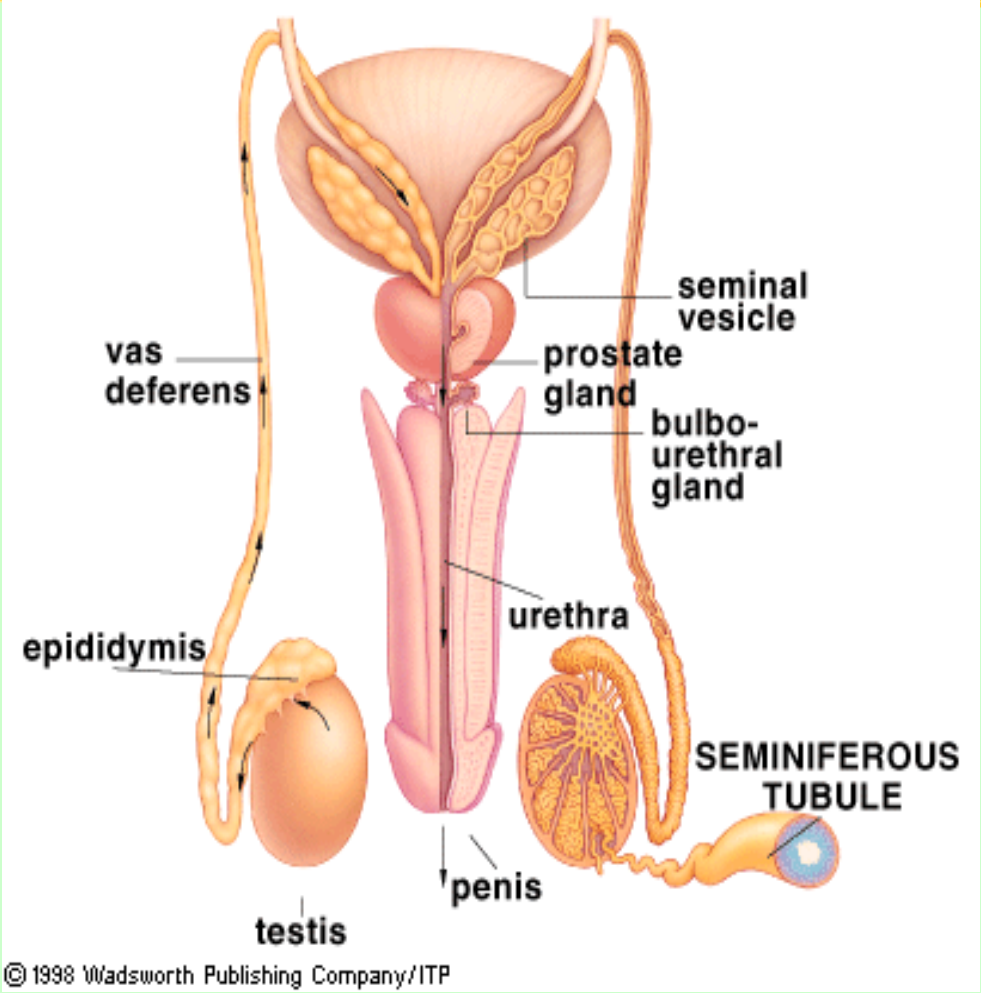
- Sperm travel from each testis through a series of ducts that lead to the urethra
- Sperm are not mature when they enter the 1st duct or **epididymis**. It is also here that they will be stored
- During ejaculation, the sperm are sent through the the **vas deferens** then through ejaculatory ducts and into the urethra

Where Sperm Form (2)

- As the sperm travels through the urethra it is mixed with glandular secretions to become **semen**
- The **seminal vesicles** secrete fructose and prostaglandins
- The **prostate gland** produces buffers to keep the sperm at a ph of 6 (the vagina is around 3.5-4.0
- The **bulbourethral glands** produce mucus rich fluid

Sperm Formation

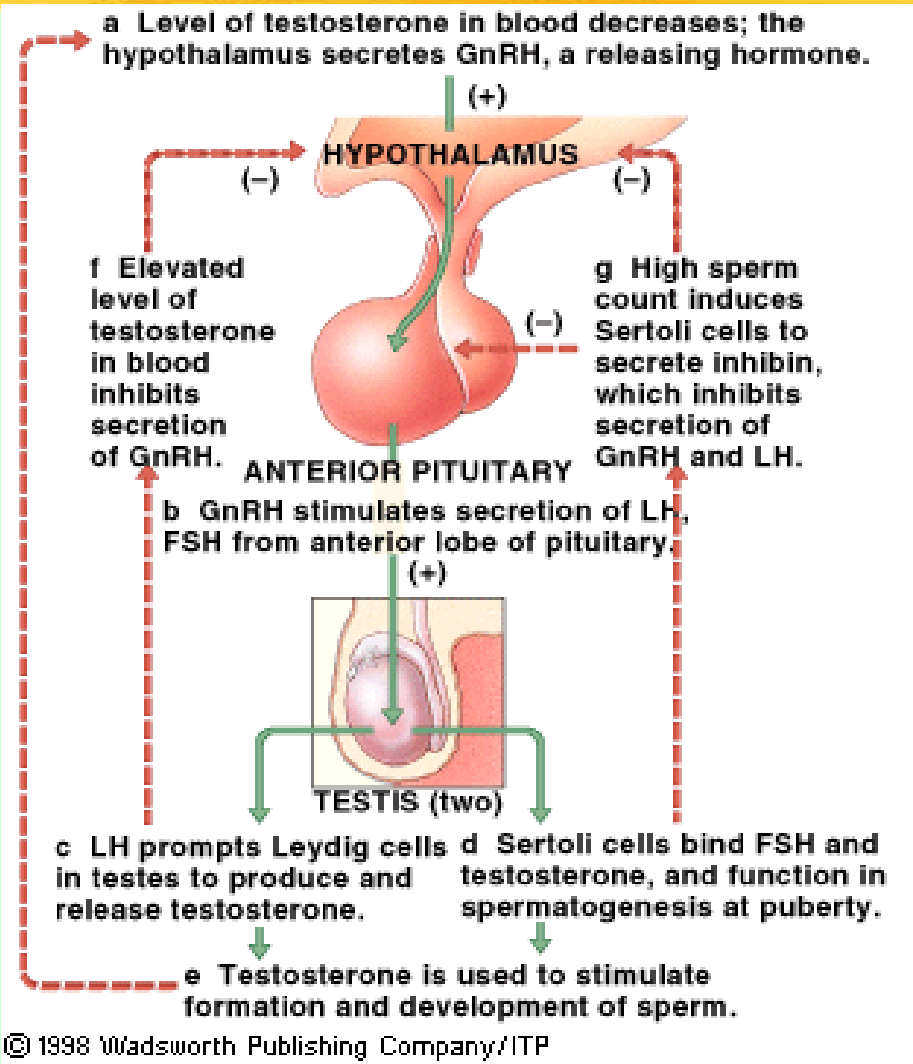
- In testis
  - Seminiferous tubules
  - Spermatogenesis
  - Spermatocytes
- Vas deferens
- Glands
  - Prostate
  - Seminal vesicles
  - Bulbourethral



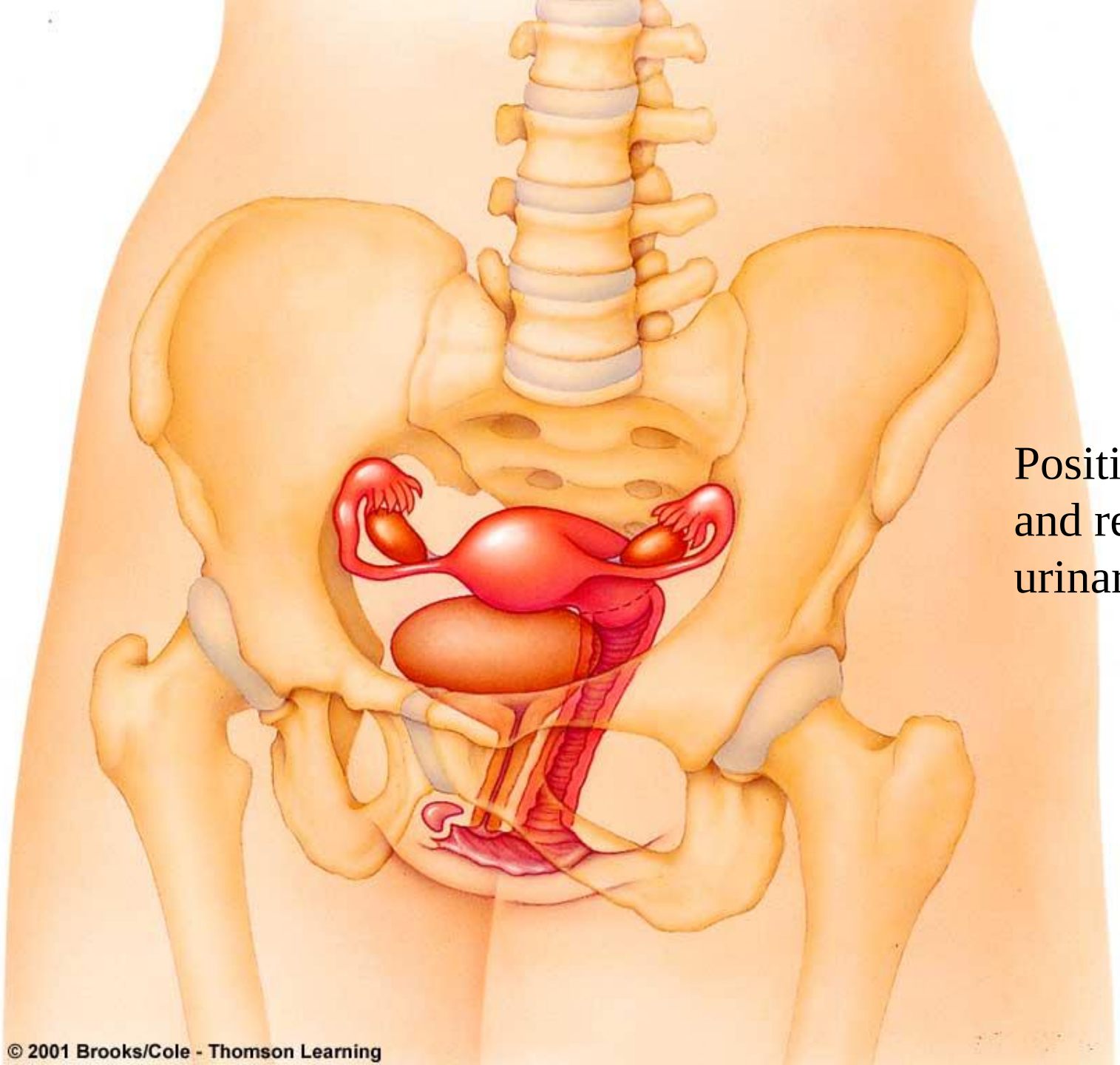
Cross section through the seminiferous tubules. Note the Leydig cells between lobes in the testes – they produce **testosterone**

Hormonal Control
Negative Feedback Loop

- Hypothalamus
  - GnRH
- Anterior pituitary
  - LH, FSH
- Leydig cells in testes
  - Testosterone



The Human Female



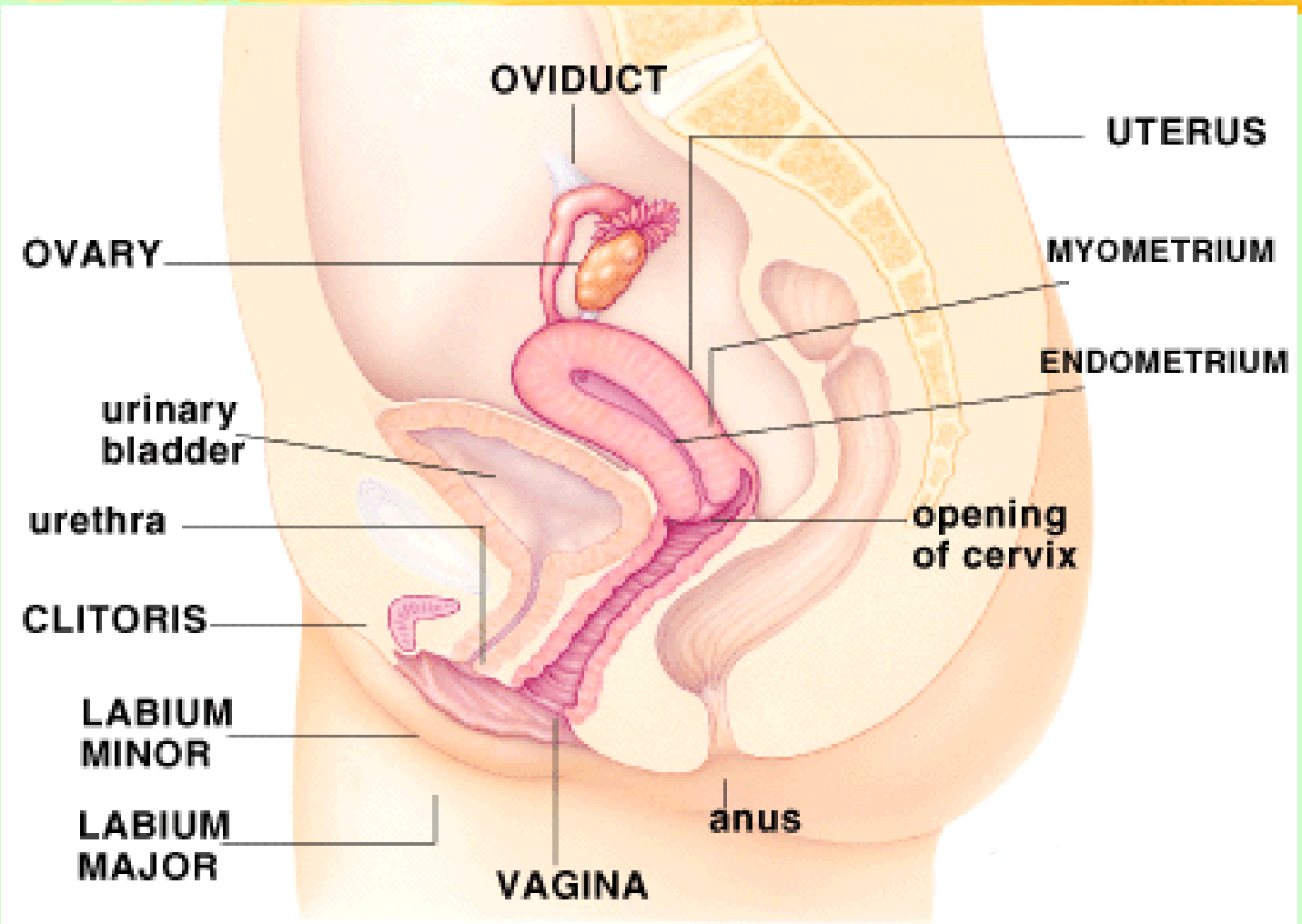
Position in pelvis and relation to the urinary bladder

Fig. 45.6a, p. 788

Female Reproductive Organs

Organ	Function
Ovaries	Oocyte production & maturation, sex hormone production
Oviducts	Ducts for conducting oocyte from ovary to uterus; fertilization normally occurs here
Uterus	Chamber in which new individual develops
Cervix	Secretion of mucus that enhances sperm movement into uterus and (after fertilization) blocks the uterus
Vagina	Organ of sexual intercourse; birth canal

Female Reproductive Structures



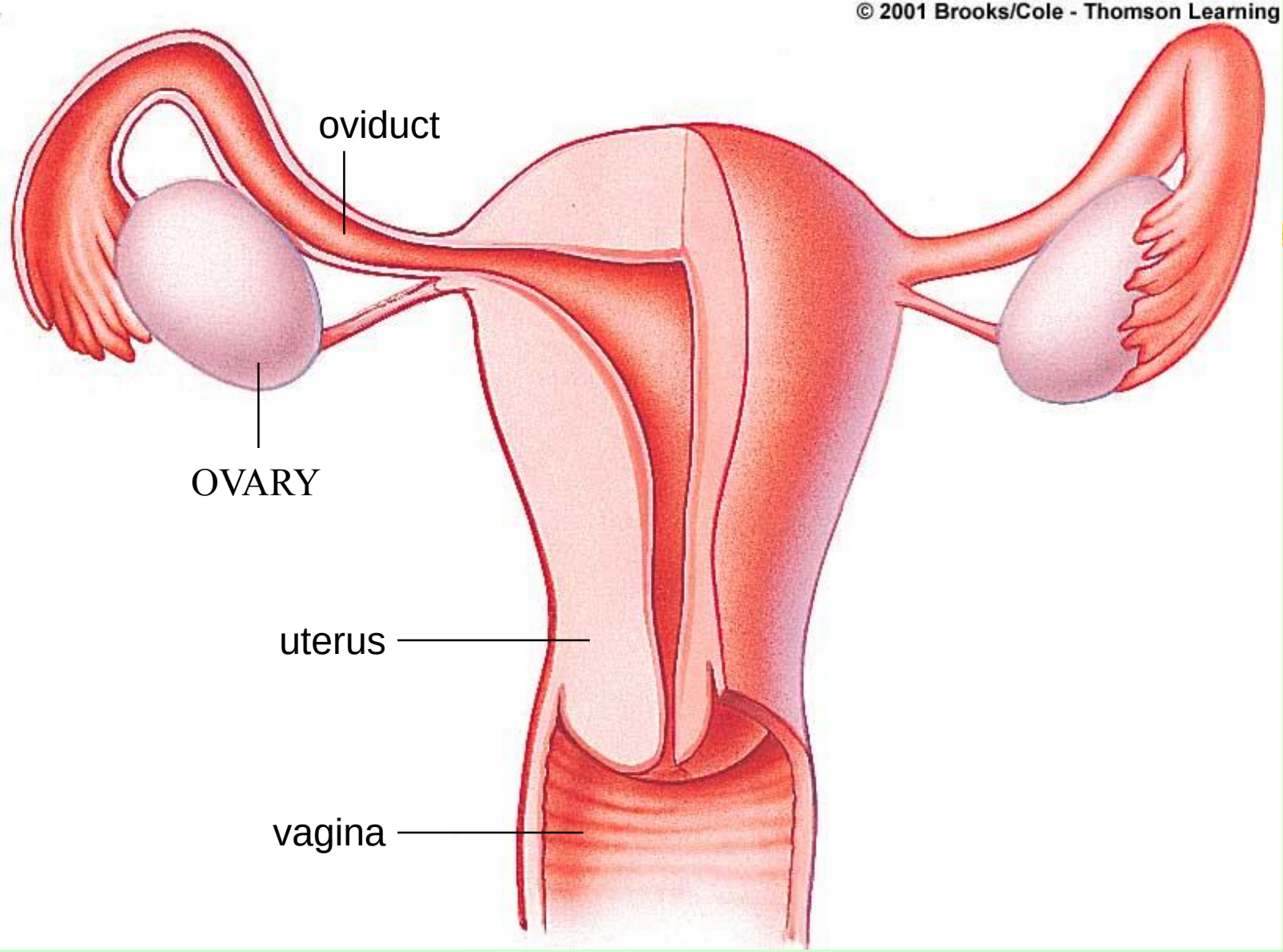


Fig. 45.7a, p. 790

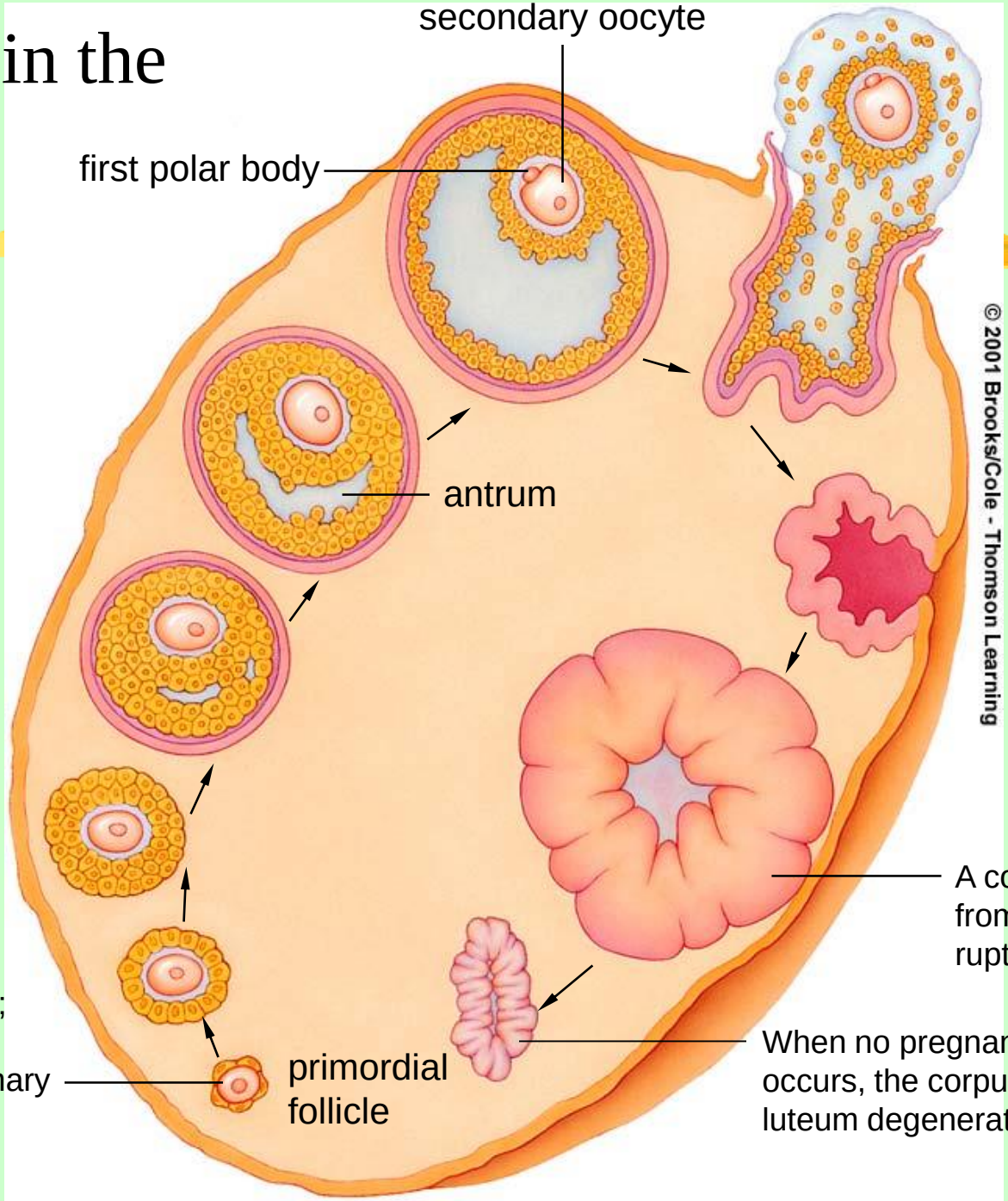
Menstrual Cycle Overview

- An oocyte (egg) matures and escapes from the ovary
- The **endometrium** becomes "primed"
- If the egg does not become fertilized than 4 to 6 tablespoons of blood-rich fluid from the uterus will flow out the vaginal canal.
- This is called menstruation; it marks the 1st day of the cycle

The 3 phases of the Menstrual Cycle

- Follicular Phase (phase 1)
  - Menstruation
  - Endometrium breakdown and buildup
  - Maturation of oocyte
- Ovulation (phase 2)
  - Release of oocyte from ovary (ovulation)
- Luteal Phase (phase 3)
  - Corpus luteum
  - Endometrium gets ready for pregnancy

Changes in the ovary



Ovulation.
Mature follicle ruptures and releases the secondary oocyte and the first polar body.

A corpus luteum forms from remnants of the ruptured follicle.

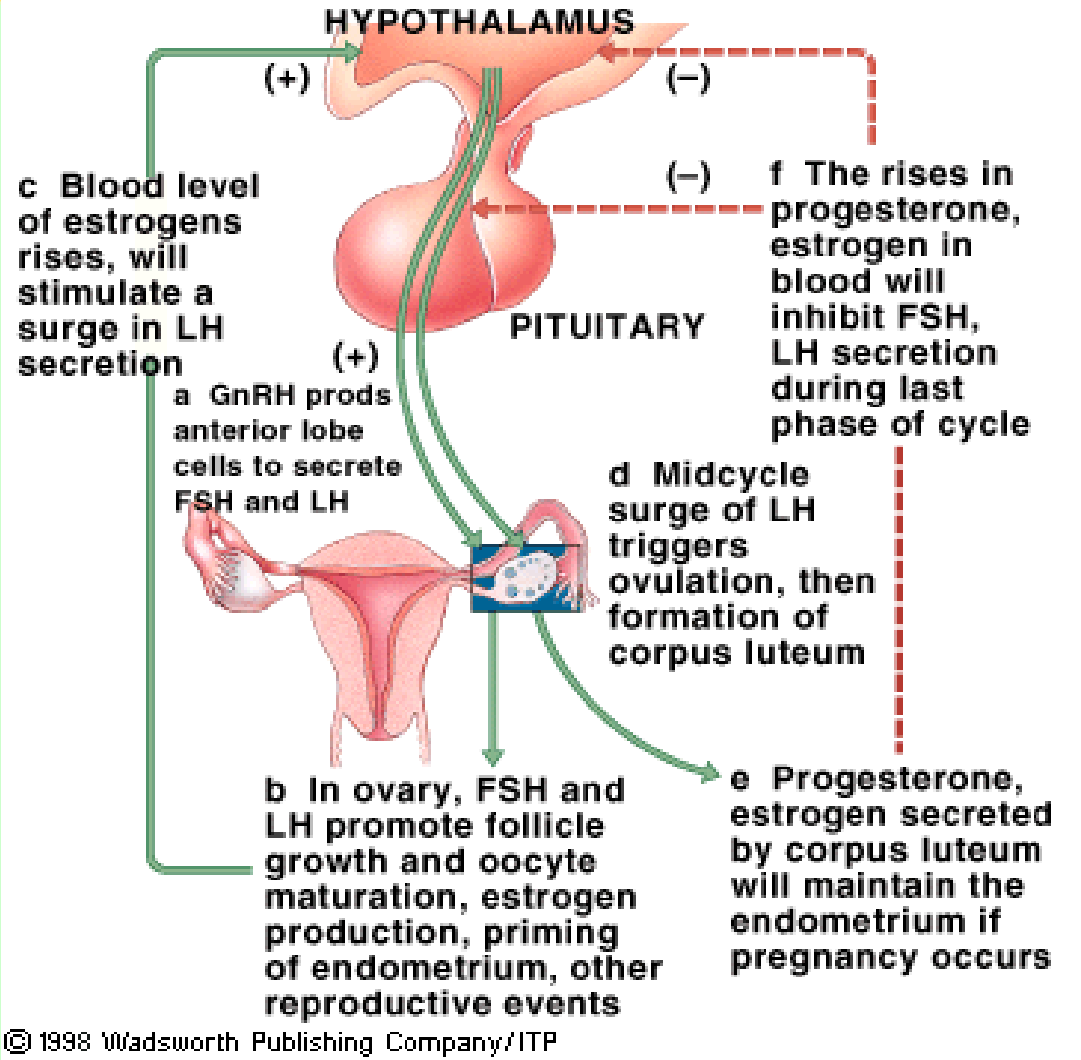
When no pregnancy occurs, the corpus luteum degenerates.

A primordial follicle; meiosis I has been arrested in the primary oocyte inside it.

Fig. 45.7b, p. 790

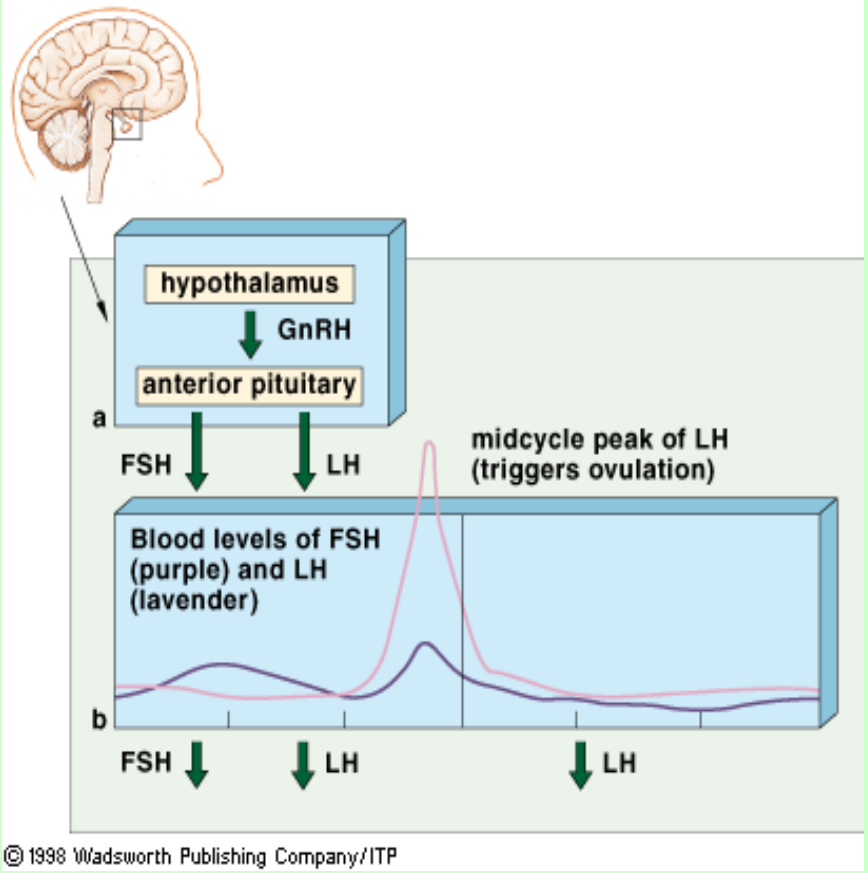
Hormonal Control in the Menstrual Cycle

- Hypothalamus
  - GnRH
- Anterior Pituitary
  - FSH
  - LH
- Ovaries
  - Estrogen
  - Progesterone

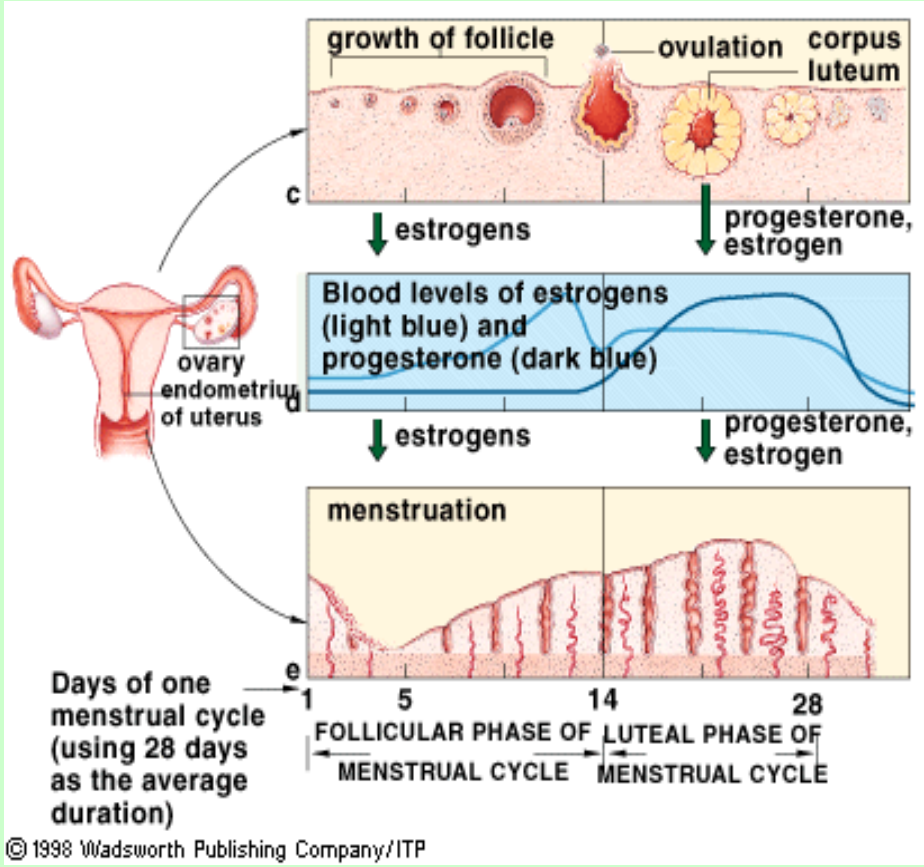


Changes in the Ovary and Uterus

Hormonal changes



Ovarian and Uterine changes



Part II

Sexual Intercourse and Pregnancy

Sexual Intercourse

- Sexual intercourse or **coitus**
- The male sex act requires *erection*, and *ejaculation*, a forceful expulsion of semen into the urethra and out from the penis
- The penis consists of two cylinders of spongy tissue
- In unaroused males, the large blood vessels that lead in are vasoconstricted

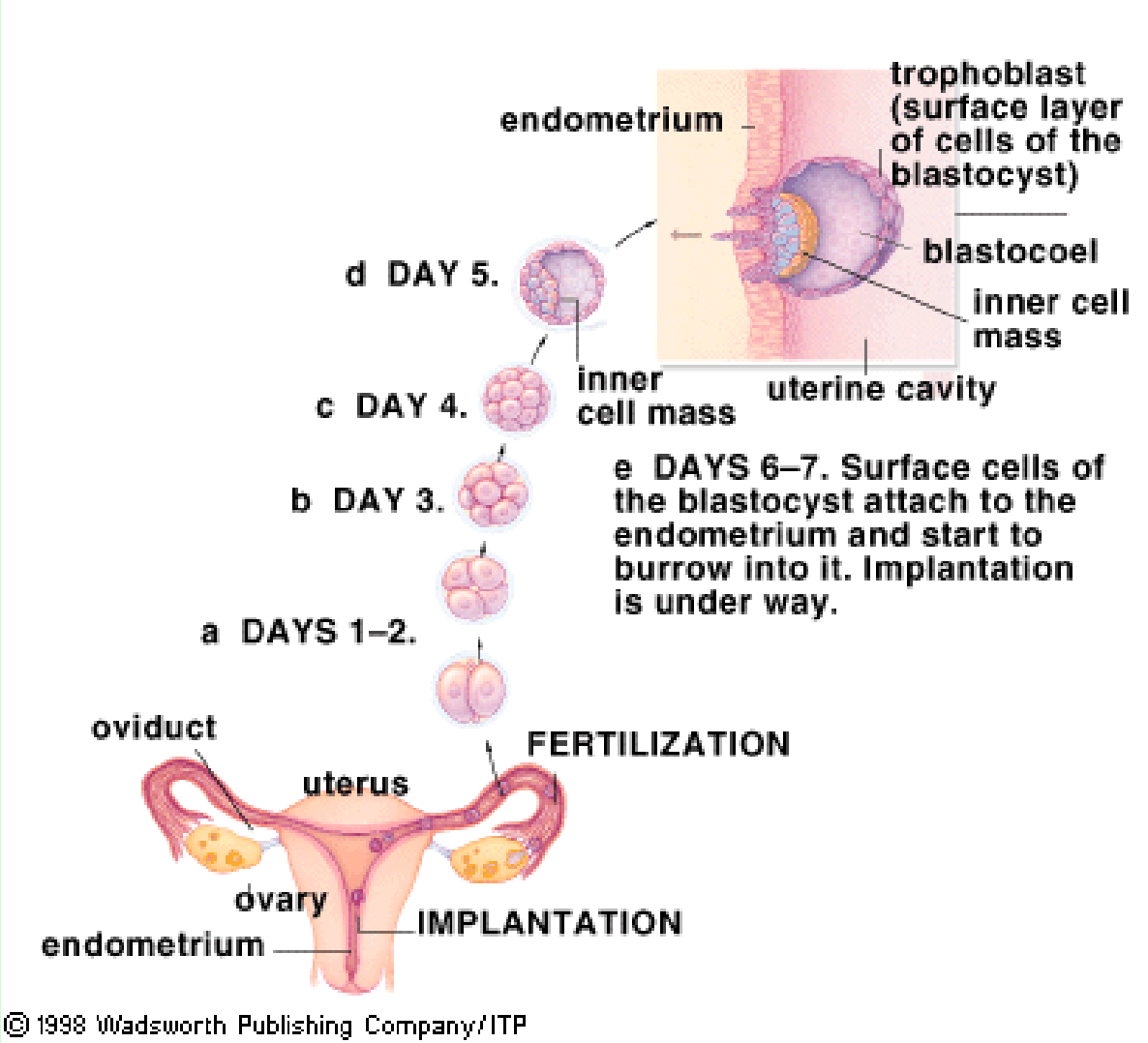
Sexual Intercourse

- In aroused males, these vessels vasodilate, so blood flows in faster than it flows out
- At **orgasm**, strong sensations of release, warmth, and relaxation dominate. Similar sensations typify female orgasm
- A women can become pregnant without an orgasm (contrary to some beliefs)

Fertilization

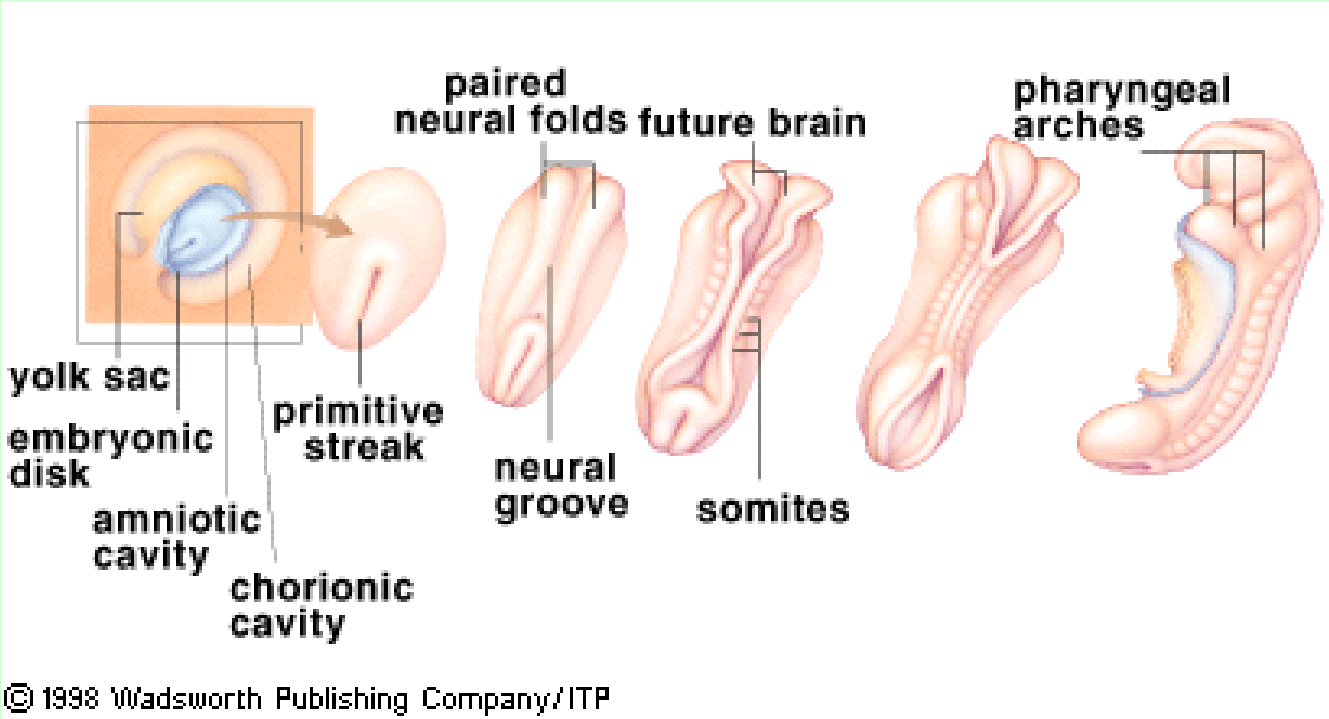
- Sperm surround ovum (though 150-350 million are released, only a few hundred make the journey to the ovum)
- Cap releases enzymes
  - Breaks down outer layers of ovum
- One sperm penetrates
- Oocyte completes meiosis II
- Sperm and egg nuclei fuse
  - Zygote

Formation of the Early Embryo



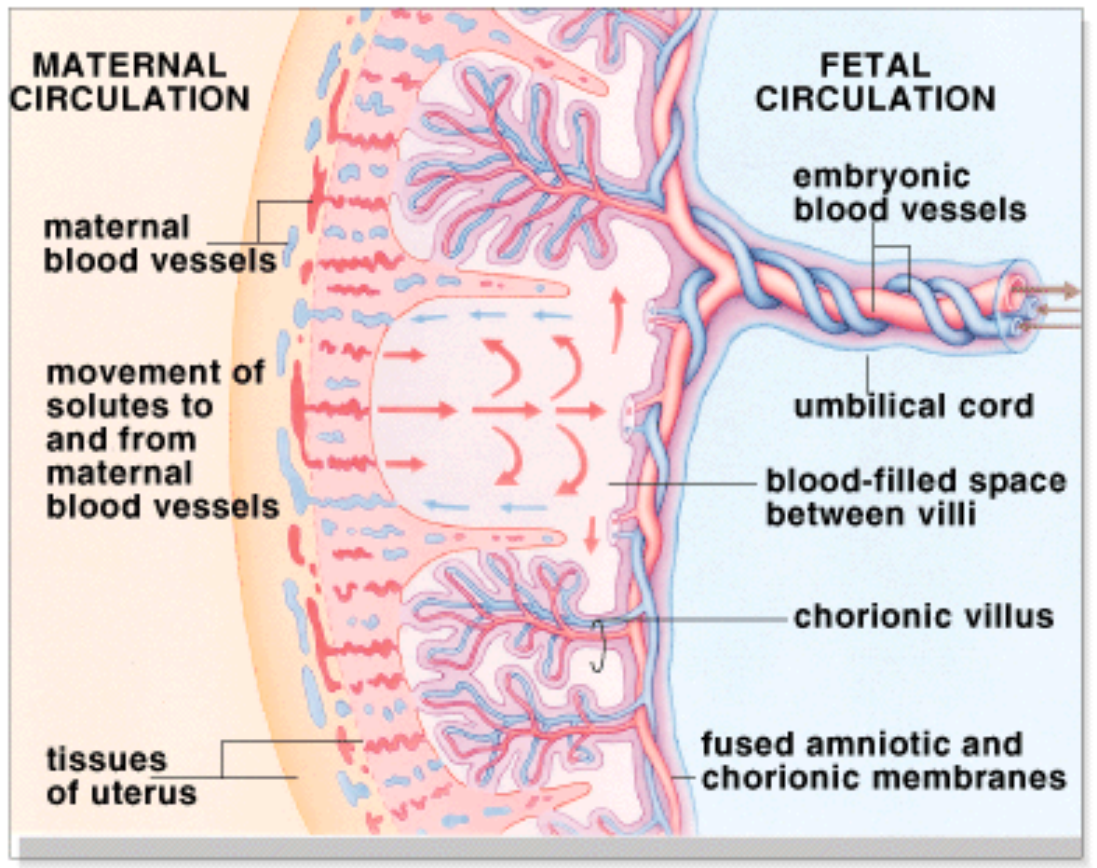
Embryonic Period of Vertebrate

- Primitive streak
- Notochord
- Brain and spinal cord



Maternal and Fetal Blood Circulation

- Diffusion of O_2, CO_2 and other solutes



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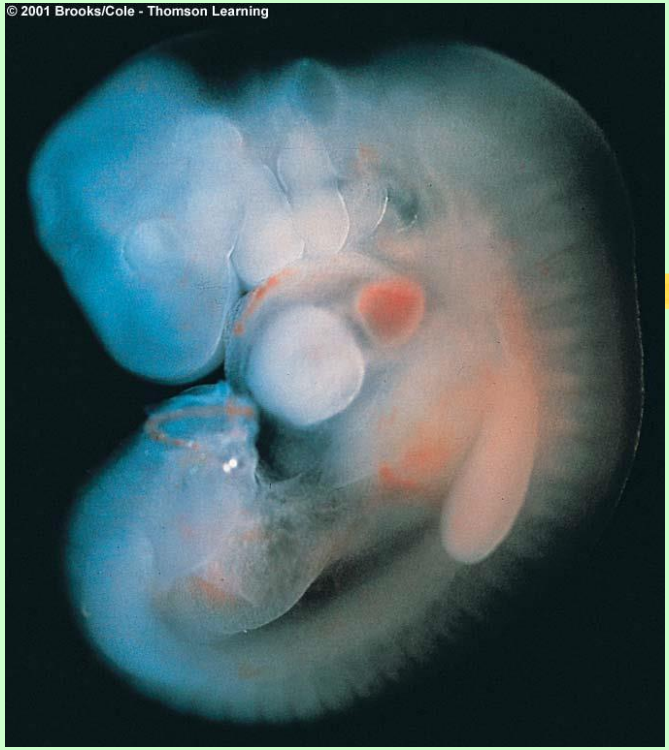
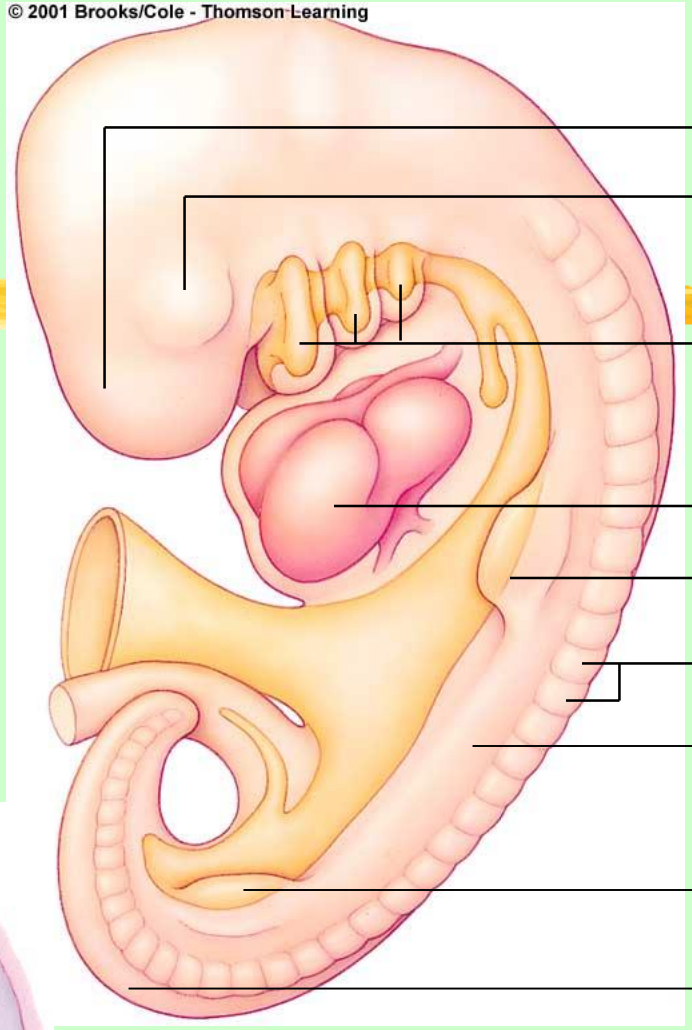
Placental Development



WEEK 4



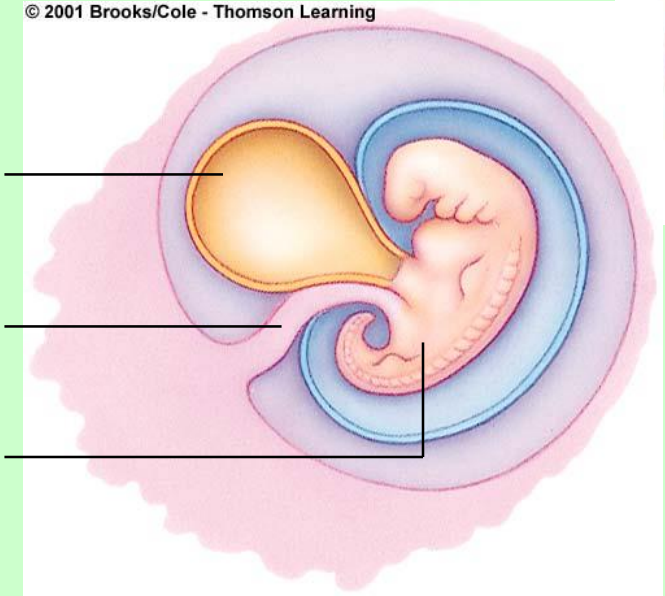
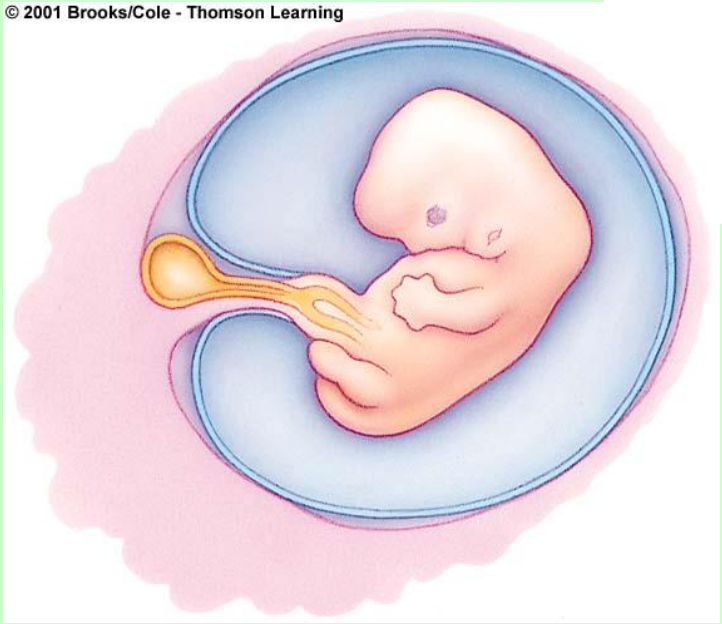


Fig. 45.14a, p. 798

WEEK 5-6



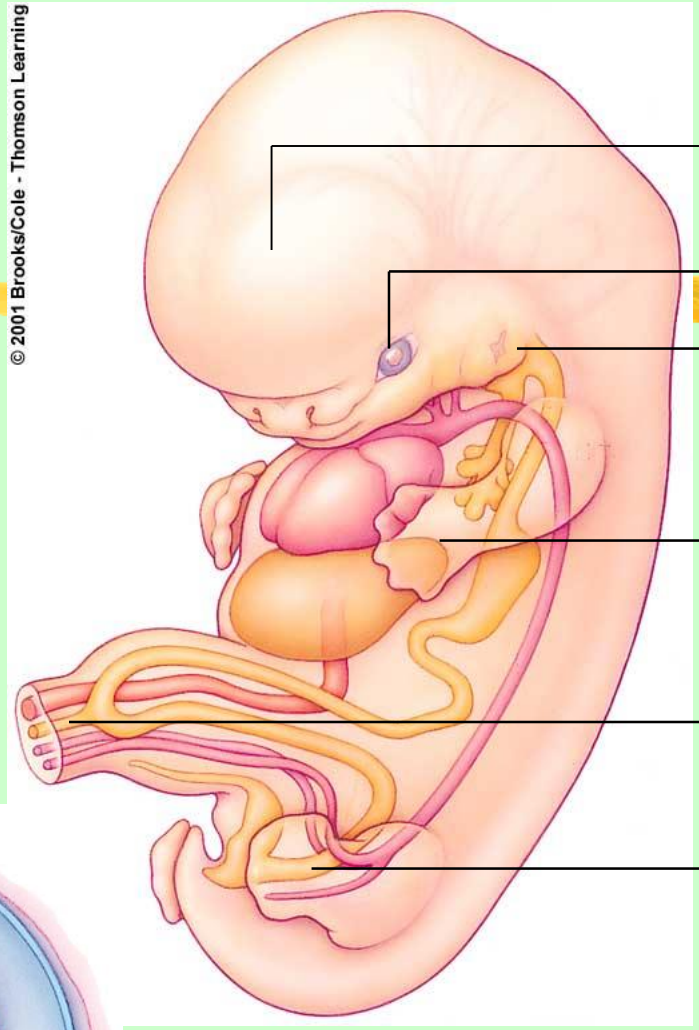
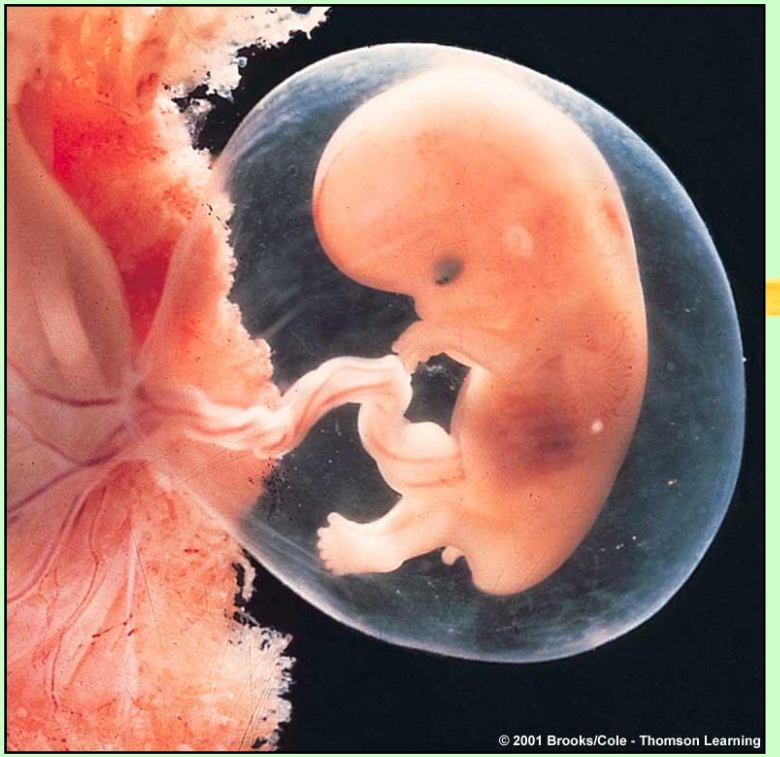


Fig. 45.14b, p. 798



WEEK 8

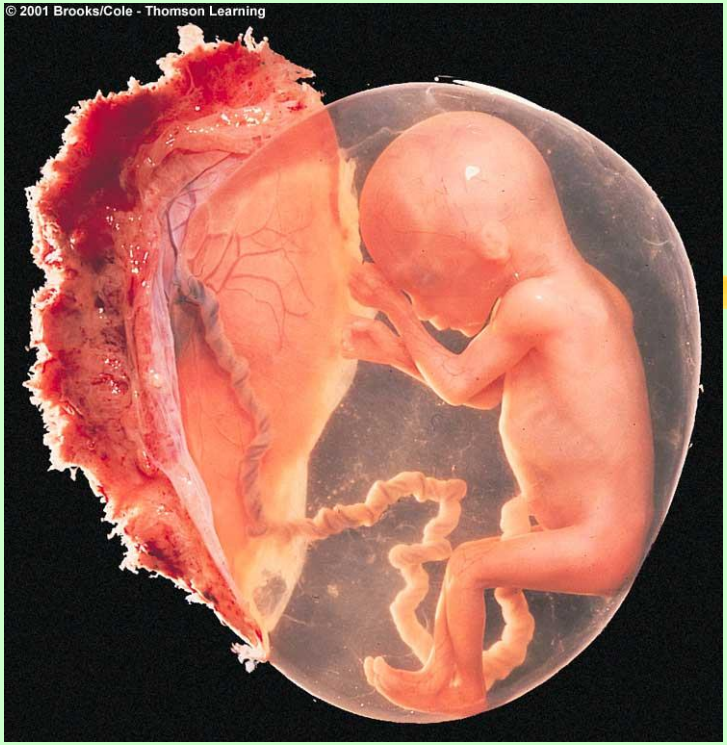
final week of embryonic period; embryo looks distinctly human compared to other vertebrate embryo

upper and lower limbs well formed; fingers and then toes have separated

primordial tissues of all internal, external structures now developed

tail has become stubby

Fig. 45.14c, p. 799



WEEK 16

Length: 16 centimeters (6.4 inches)

Weight: 200 grams (7 ounces)

WEEK 38 (full term)

Length: 50 centimeters (20 inches)

Weight: 3,400 grams (7.5 pounds)

During fetal period, length measurement extends from crown to heel (for embryos, it is the longest measurable dimension, as from crown to rump).

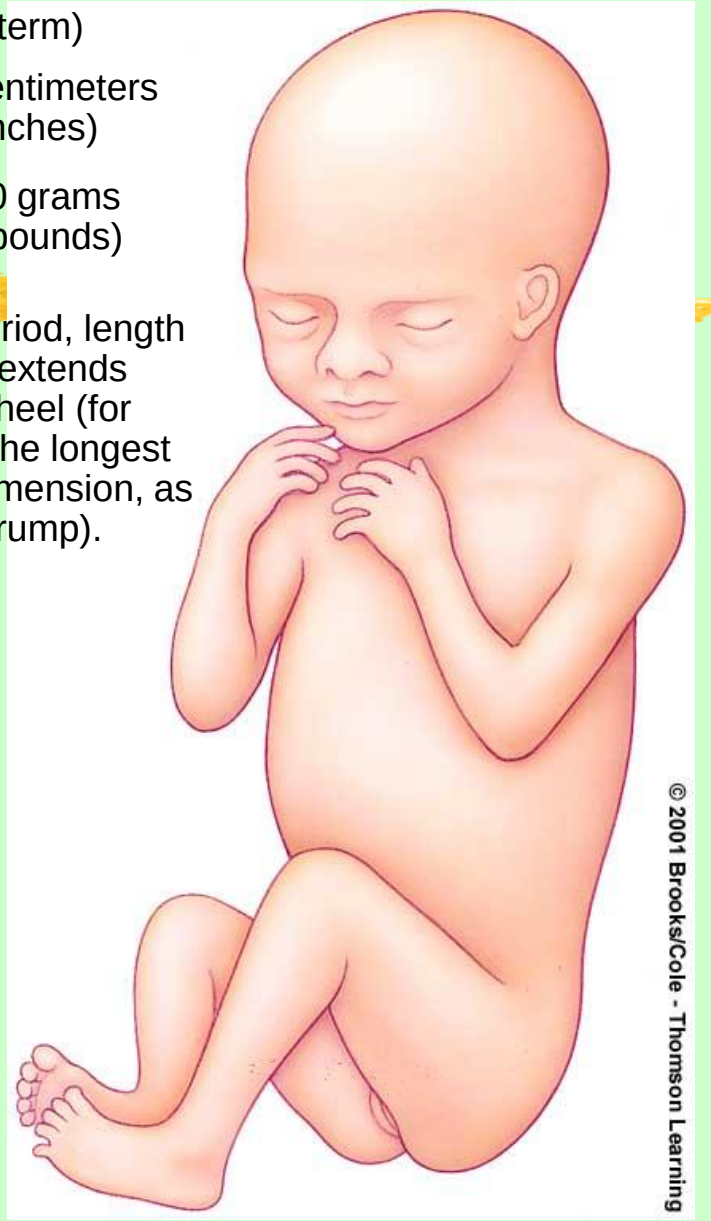


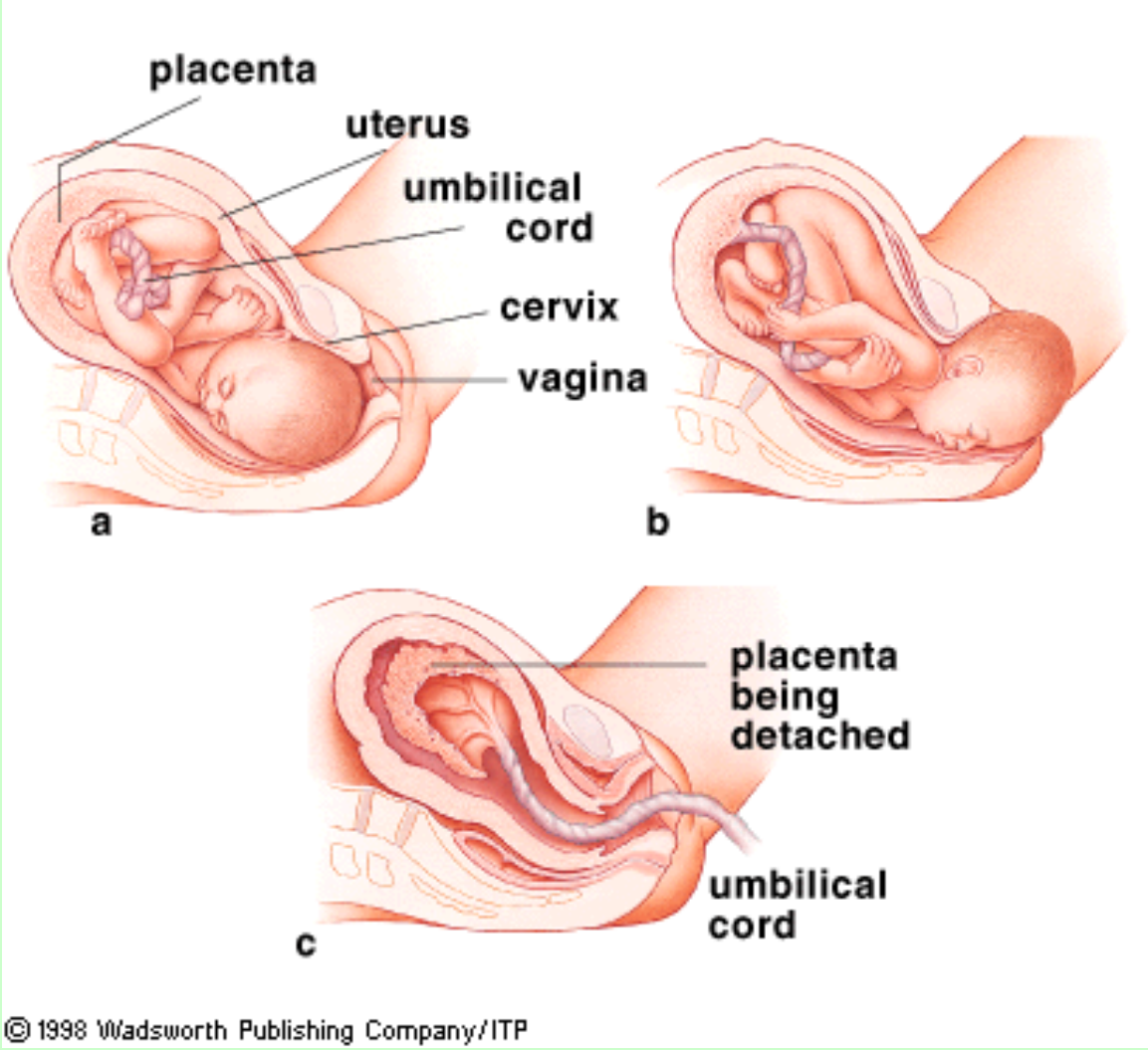
Fig. 45.14d, p. 799

What Can Affect Development?

- Nutrition
  - Diet
  - Extra vitamins
  - Increased calories
- Infections
  - Bacteria
  - Rubella virus
- Prescription drugs
  - Tranquilizers
  - Barbiturates
  - Anti-acne medication
  - Antibiotics
- Alcohol
- Cocaine
- Cigarettes

Birth

- Birth usually takes place 38 weeks after fertilization
- The birth process is called labor
- Labor involves dilation of the cervical canal

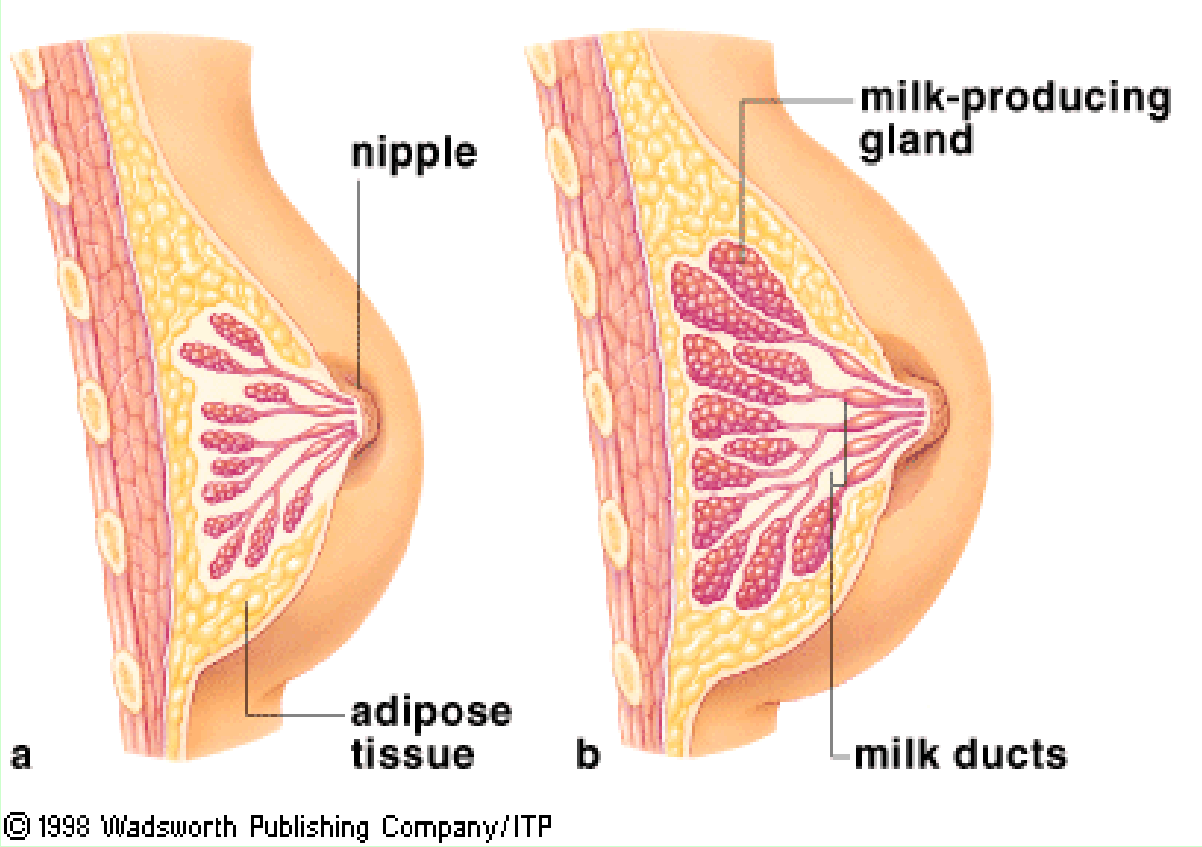


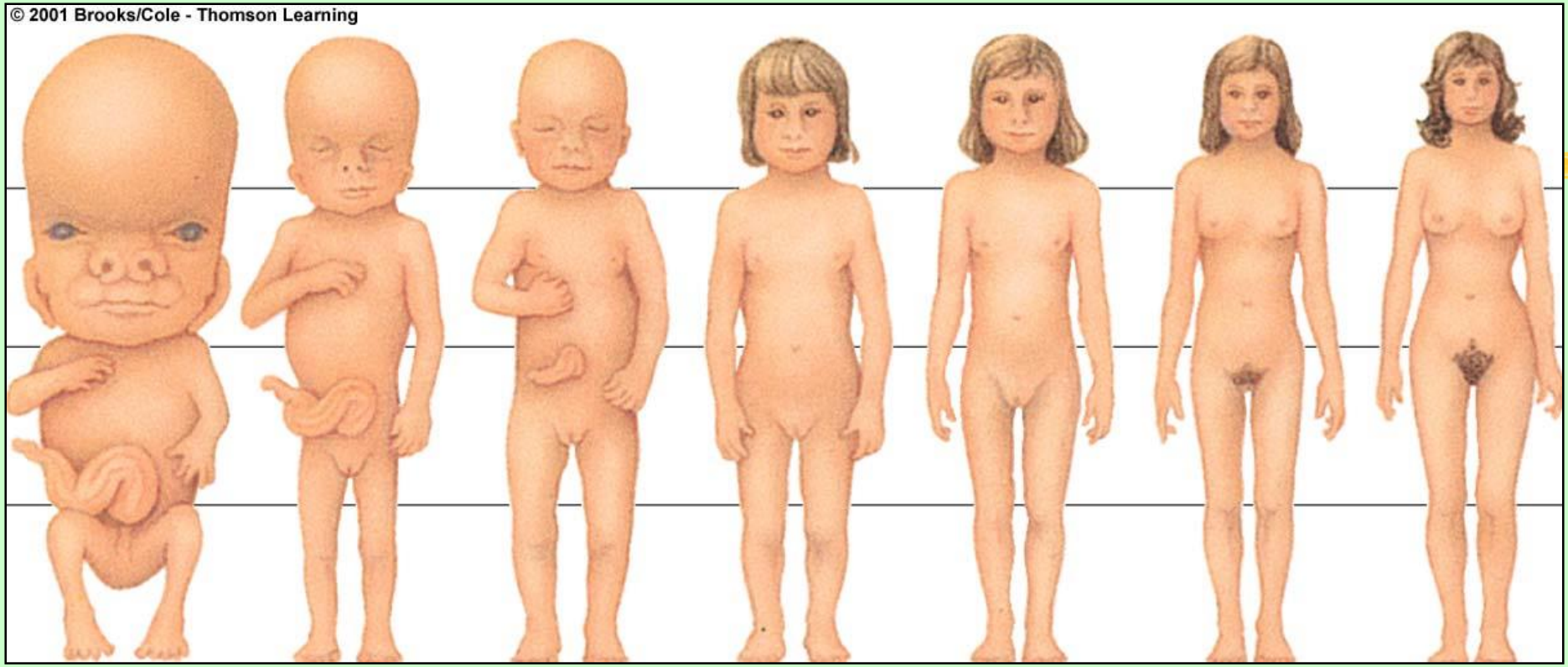
Birth (continued)

- During the last few weeks before birth, the baby "drops" becomes low in the pelvis with the head against the cervix
- If the head is not down, a breech birth could result

Nourishing the Newborn

- Lactation
  - Glands activated
- The pituitary produces prolactin that starts milk production
- Then oxytocin is released to force the milk out





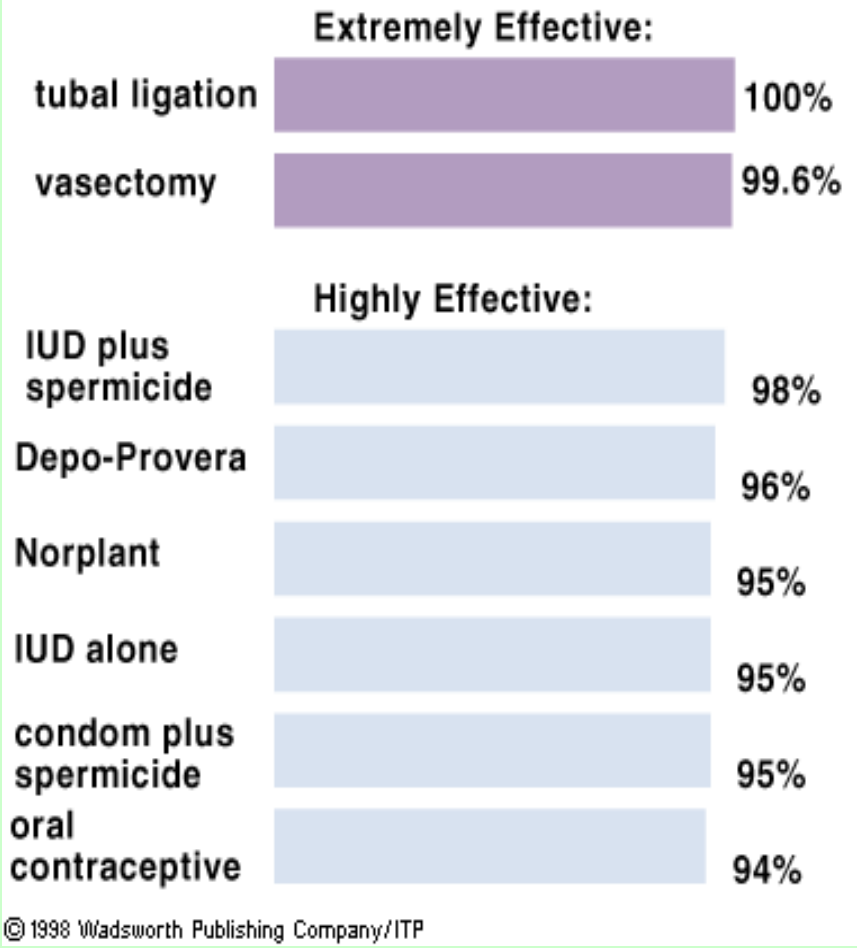
embryo at 8 weeks | embryo at 12 weeks | newborn | 2 years | 5 years | 13 years (puberty) | 22 years

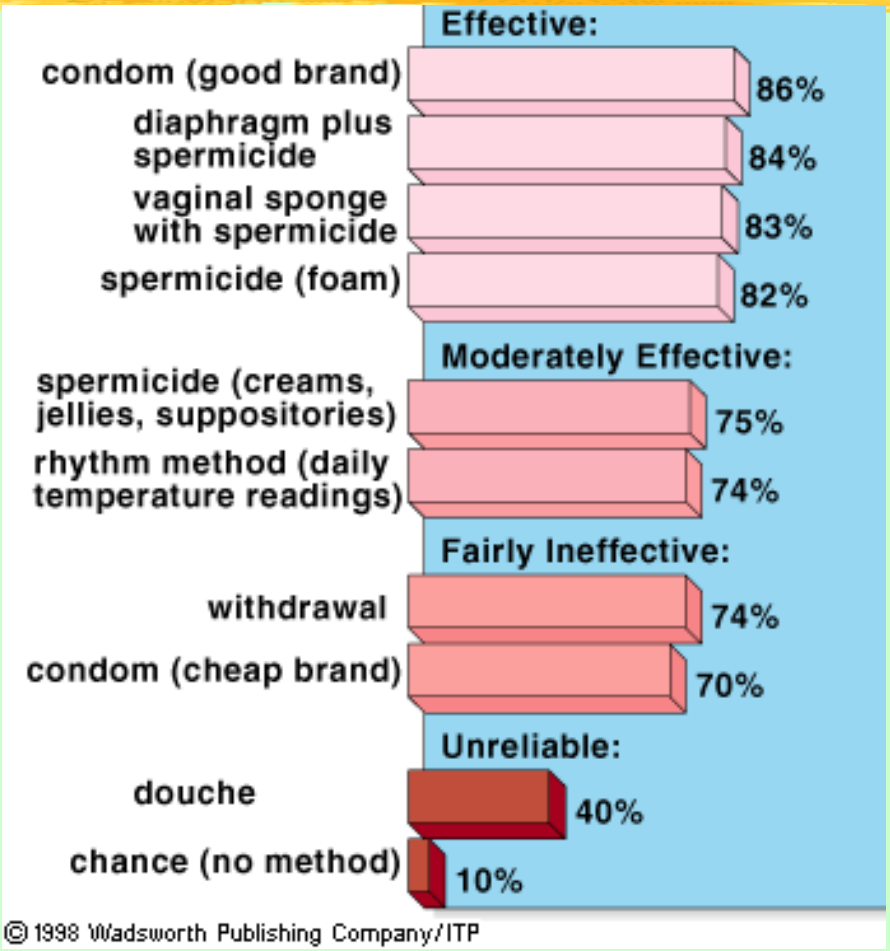
Fig. 45.19, p. 803

Birth Control Options

- The most effective is abstinence but unrealistic
- Rhythm method
- Withdrawal
- Douching-useless
- Vasectomy
- Tubal ligation
- Spermicidal foam & Jelly
- IUDs – coils inserted in uterus
- Diaphragm
- Condoms
- "The pill"
- Depo-Provera injections
- Norplant

Control of Human Fertility





Sexually Transmitted Disease

Sexually Transmitted Diseases

- **AIDS**
  - ***HIV***
- **Gonorrhea**
  - ***Neisseria gonorrhoeae***
- **Syphillis**
  - ***Treponema pallidum***
- **Chlamydial Infection**
  - ***Chlamydia trachomatis***
- **Pelvic Inflammatory Disease**
  - **Chlamydia and Gonorrhea**
- **Genital Herpes**
  - ***Herpes simplex virus***
- **Genital warts**
  - ***Papilloma virus***

STD Report

- Write a summary on the previous list of sexually transmitted diseases
- Your summary should include but not be limited to the following:
  - Cause (name organism)
  - How organism enters the body
  - 1st and secondary symptoms
  - Treatment
  - Prognosis