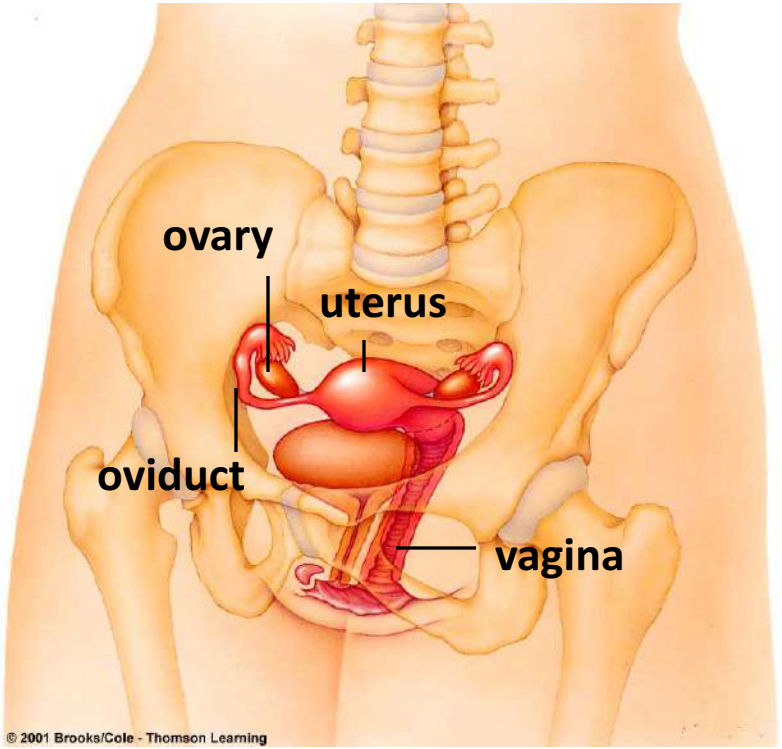
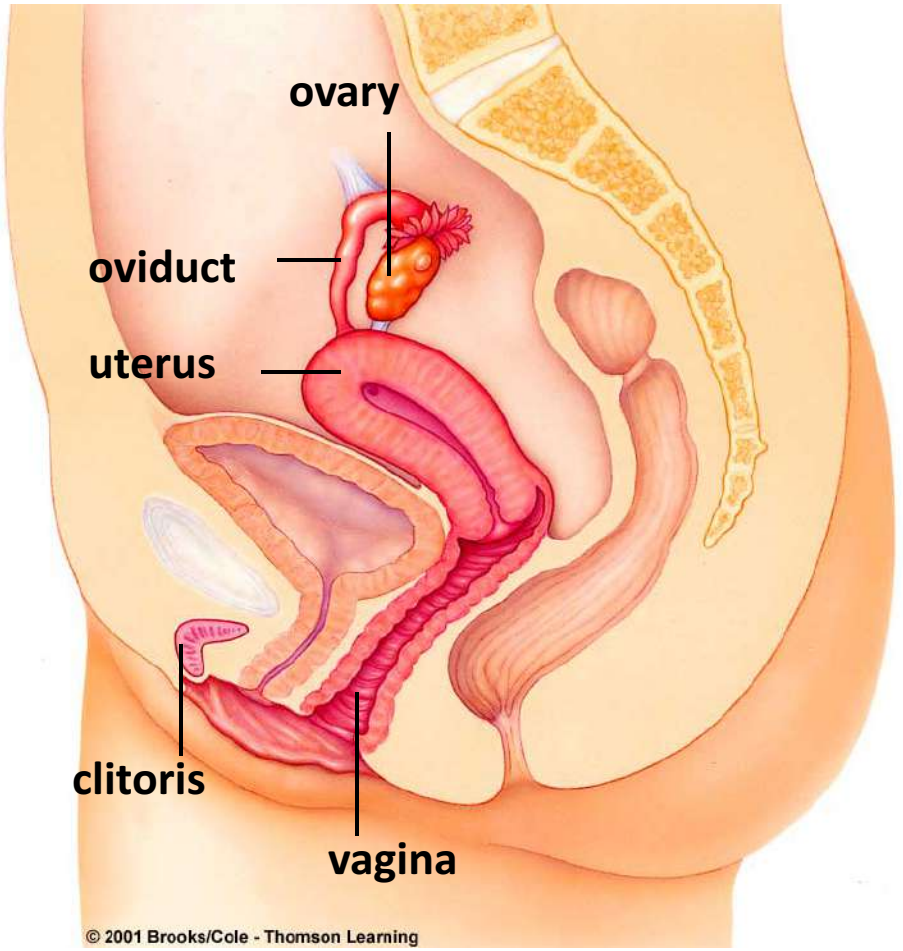
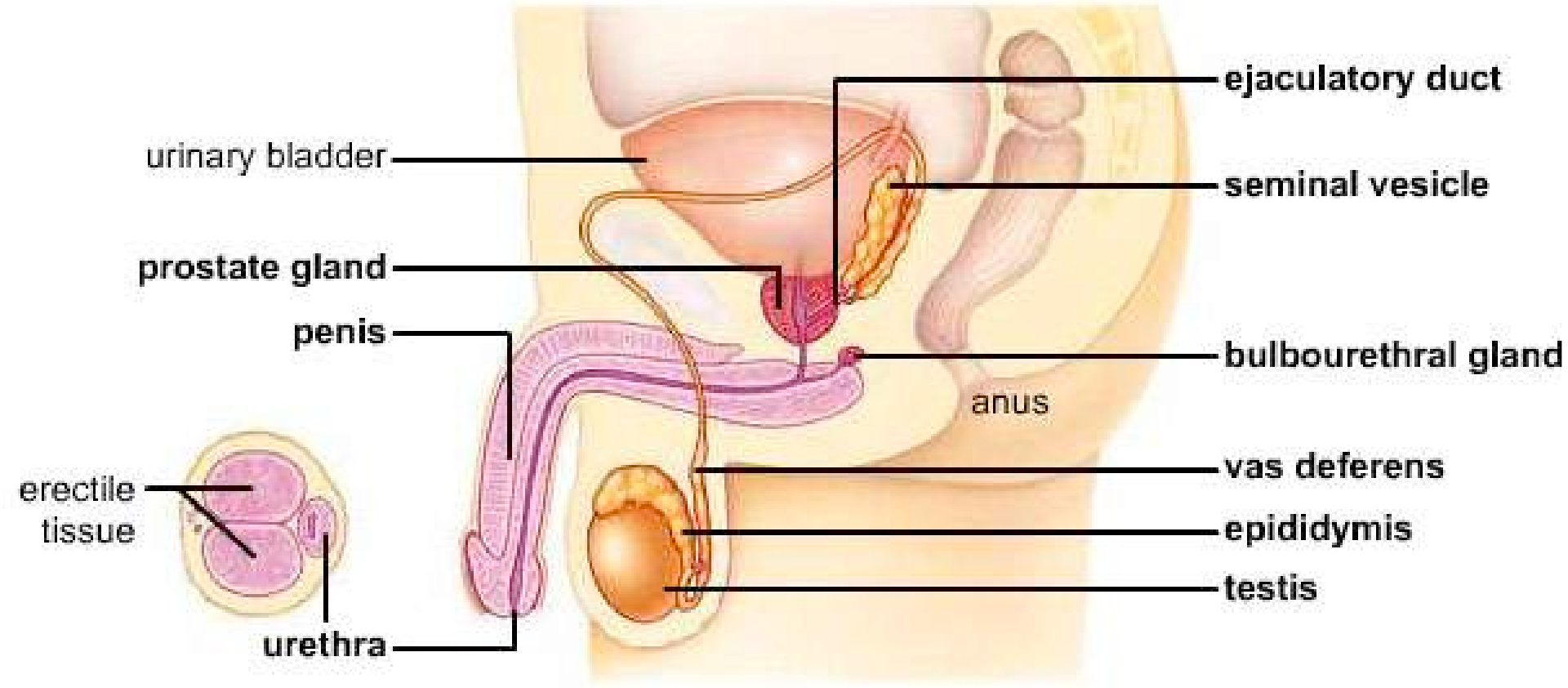
Chapter 44: Reproduction

Female Reproductive Organs





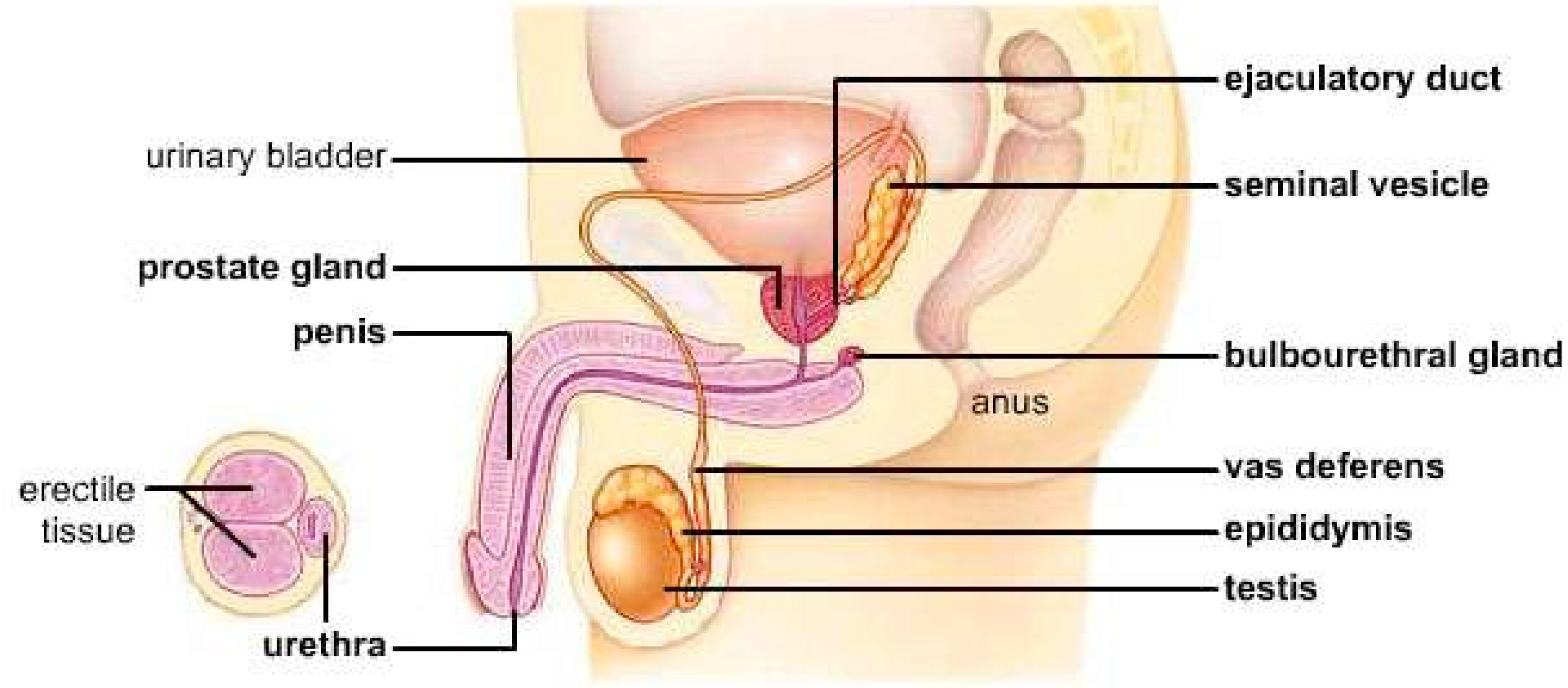
Male Reproductive System



Human Gonads

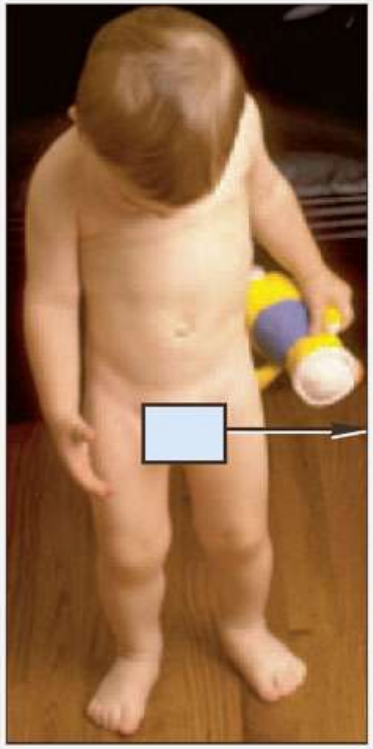
- **Primary sexual organs where genes are packaged into gametes**
  - **Male - testes**
  - **Female - ovaries**
- Secrete sex hormones
  - Regulate secondary sexual traits

Male Reproductive System



Reproductive Organs

Table 44.1 Organs and Accessory Components of the Human Male Reproductive System



Reproductive Organs	
Testis (2)	Sperm, sex hormone production
Epididymis (2)	Sperm maturation site and subsequent storage
Vas deferens (2)	Rapid transport of sperm
Ejaculatory duct (2)	Conduction of sperm to penis
Penis	Organ of sexual intercourse
Accessory Glands	
Seminal vesicle (2)	Secretion of large part of semen
Prostate gland	Secretion of part of semen
Bulbourethral gland (2)	Production of mucus that functions in lubrication

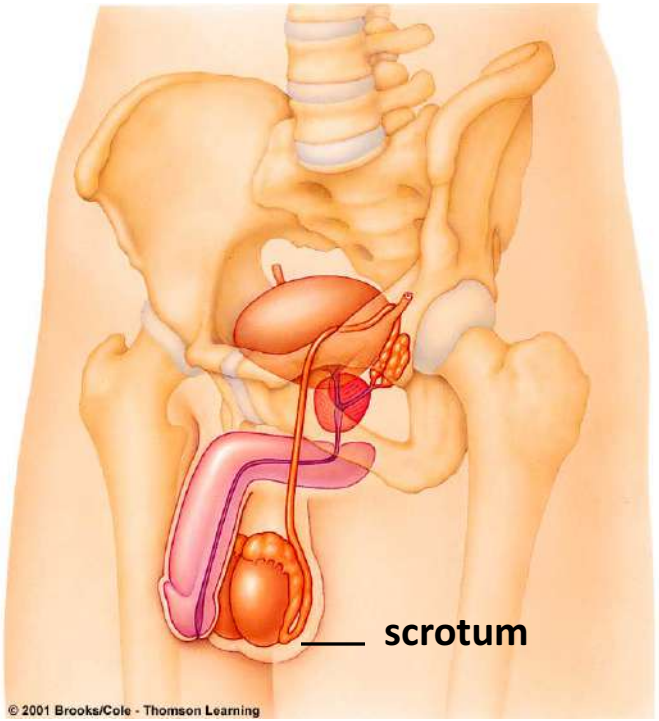
Semen = Sperm + Secretions

- Secretions from epididymis aid sperm maturation
- Seminal vesicle secretes fructose and prostaglandins
- Prostate-gland secretions buffer pH in the acidic vagina
- Bulbourethral gland secretes mucus

Prostate Cancer

- Second leading cause of death in American men
- Detection
  - Digital rectal exam by physician
  - Blood tests for prostate-specific antigen (PSA), a tumor marker

Male Reproductive System



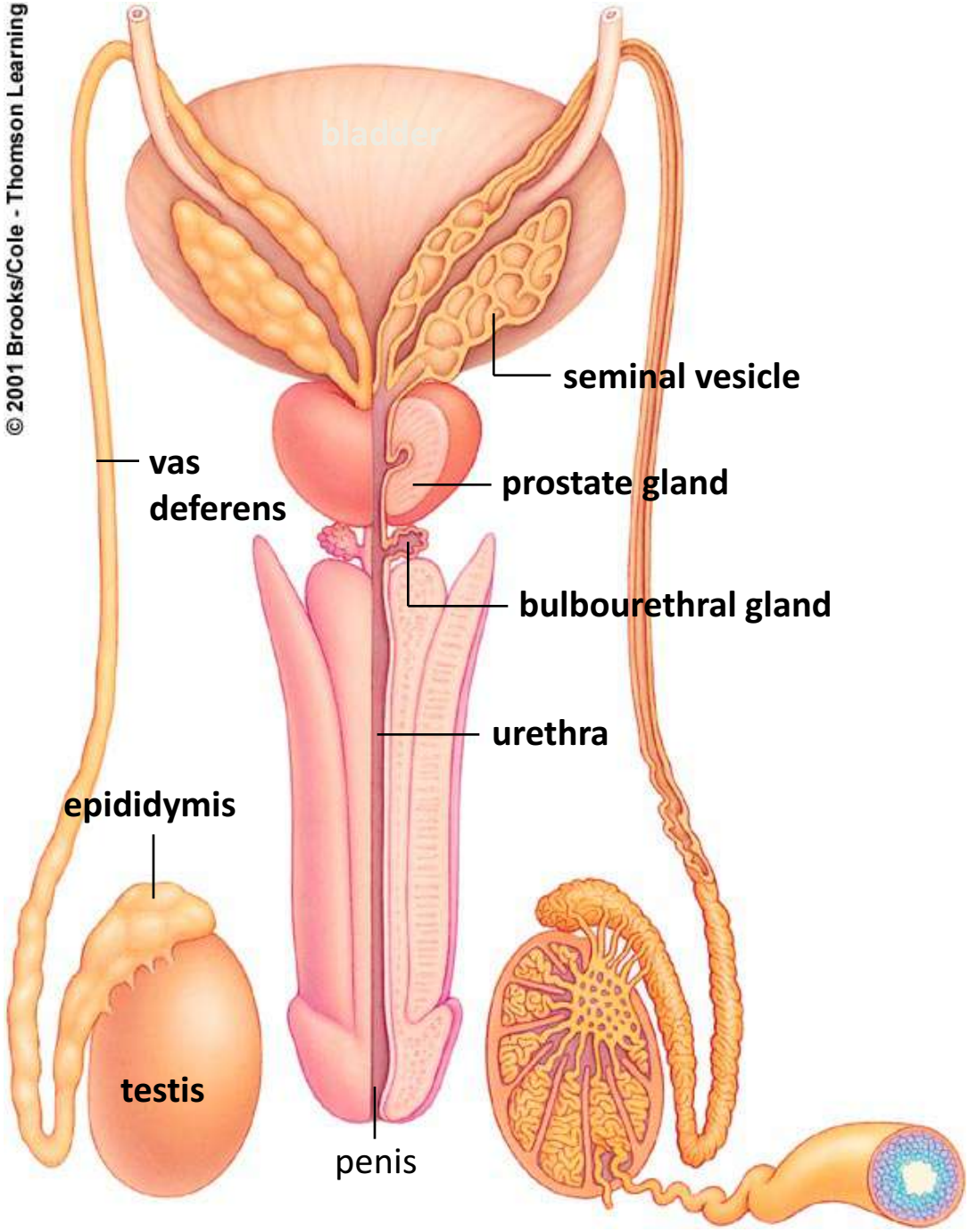


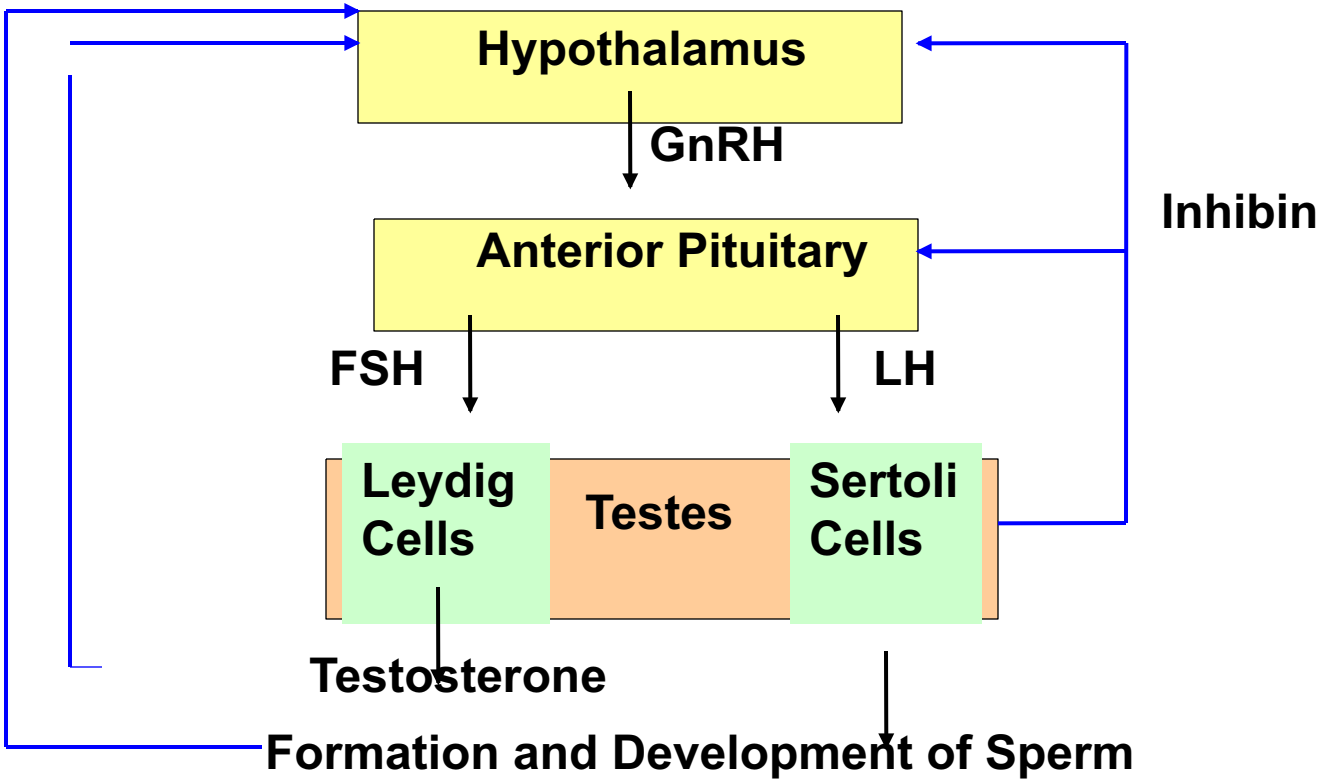
Figure 44.2
Page 772

Spermatogenesis

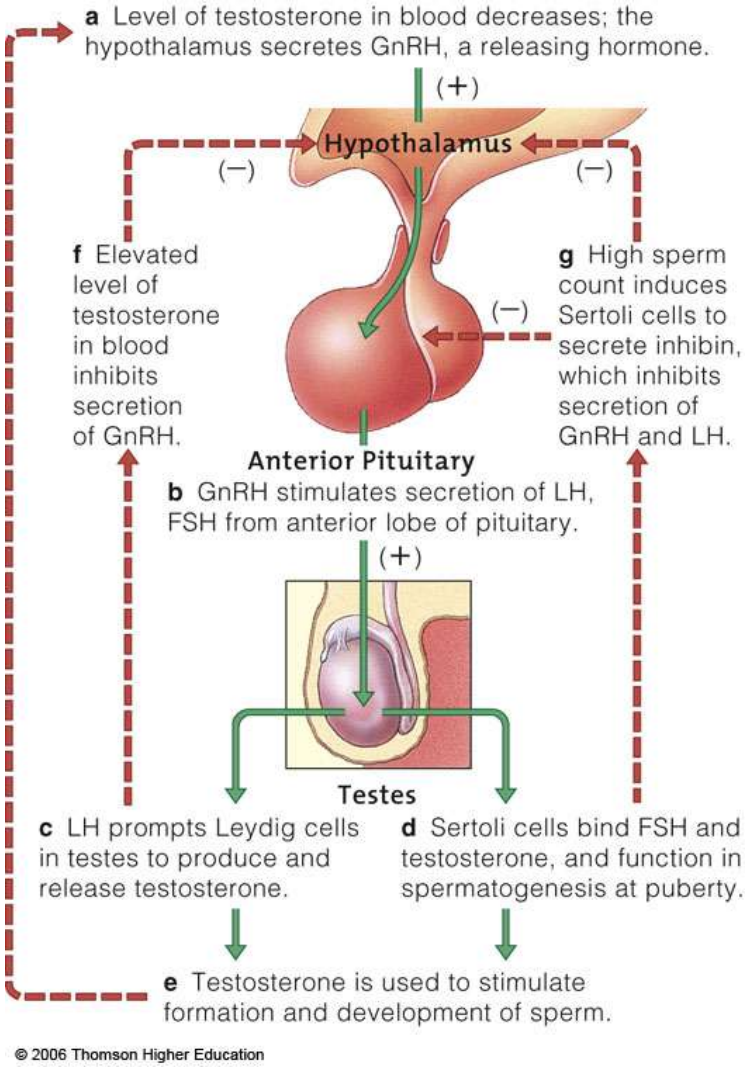
- Spermatogonium (2*n*) divides by mitosis to form primary spermatocyte (2*n*)
- Meiosis produces haploid spermatids
- Spermatids mature to become sperm

Figure 44.4
Page 775

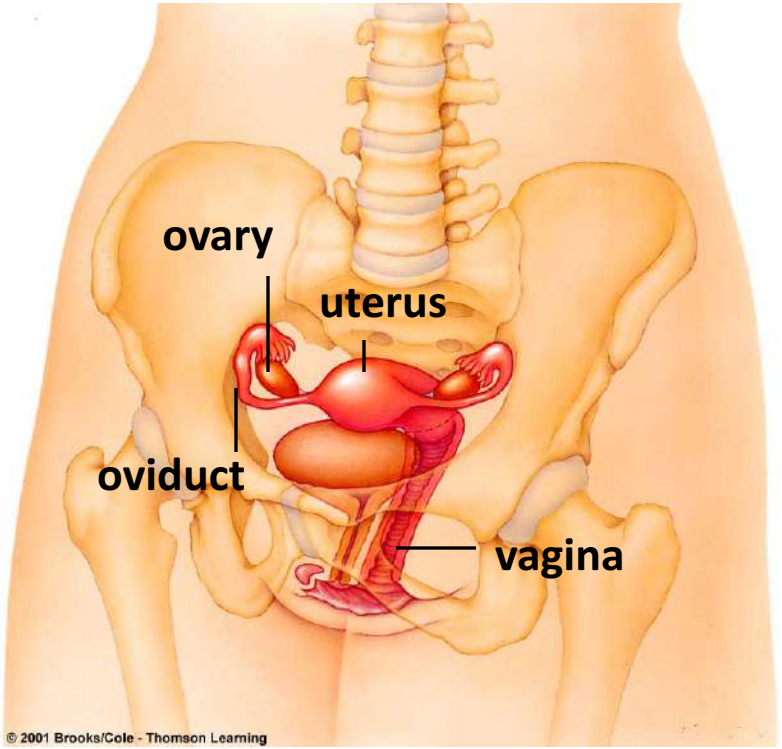
Male Hormonal Control

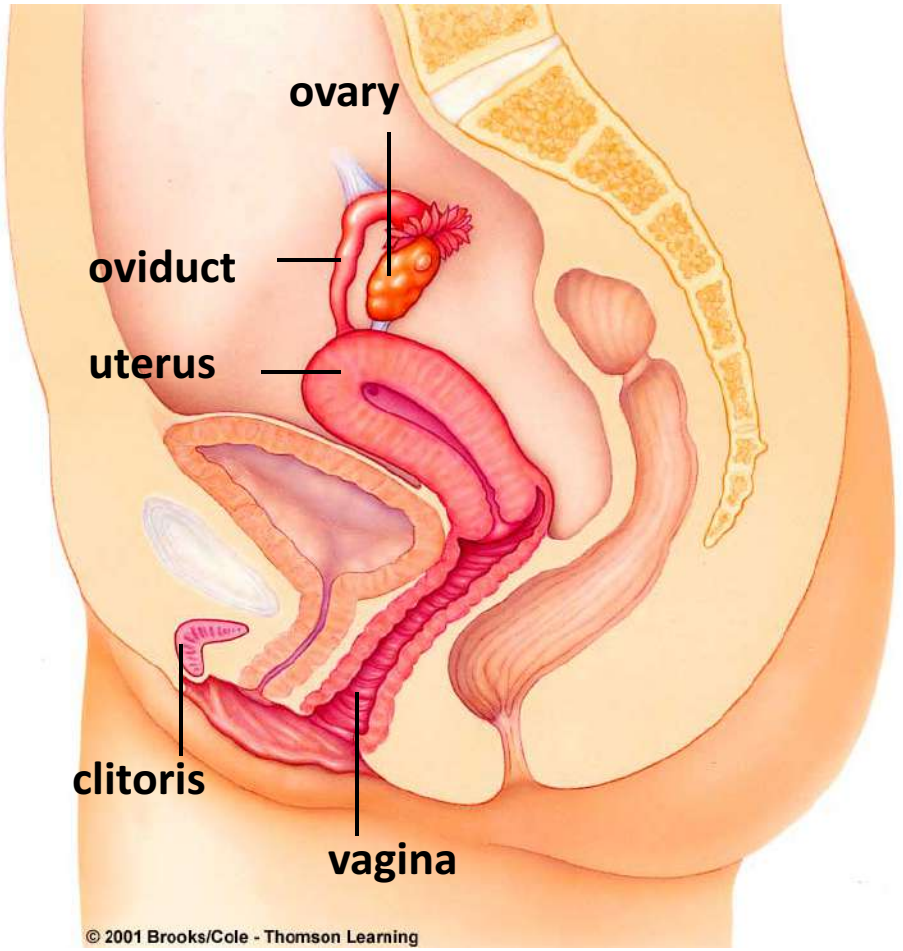


Male Hormonal Control



Female Reproductive Organs





Female Reproductive Organs

Table 44.2 Organs of the Human Female Reproductive Tract

Ovaries	Oocyte production and 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) reduces embryo's risk of bacterial infection
Vagina	Organ of sexual intercourse; birth canal

Menstrual Cycle

- The fertile period for a human female occurs on a cyclic basis
- Menstrual cycle lasts about 28 days
- Follicular phase and luteal phase

Menstrual Cycle

Table 44.3 Events of a Menstrual Cycle Lasting Twenty-Eight Days

Phase	Events	Days of Cycle
Follicular phase	Menstruation; endometrium breaks down	1–5
	Follicle matures in ovary; endometrium rebuilds	6–13
Ovulation	Oocyte released from ovary	14
Luteal phase	Corpus luteum forms, secretes progesterone; the endometrium thickens and develops	15–28

Oocytes Arrested in Meiosis I

- Girl is born with primary oocytes already in ovaries
- Each oocyte has entered meiosis I and stopped
- Meiosis resumes, one oocyte at a time, with the first menstrual cycle

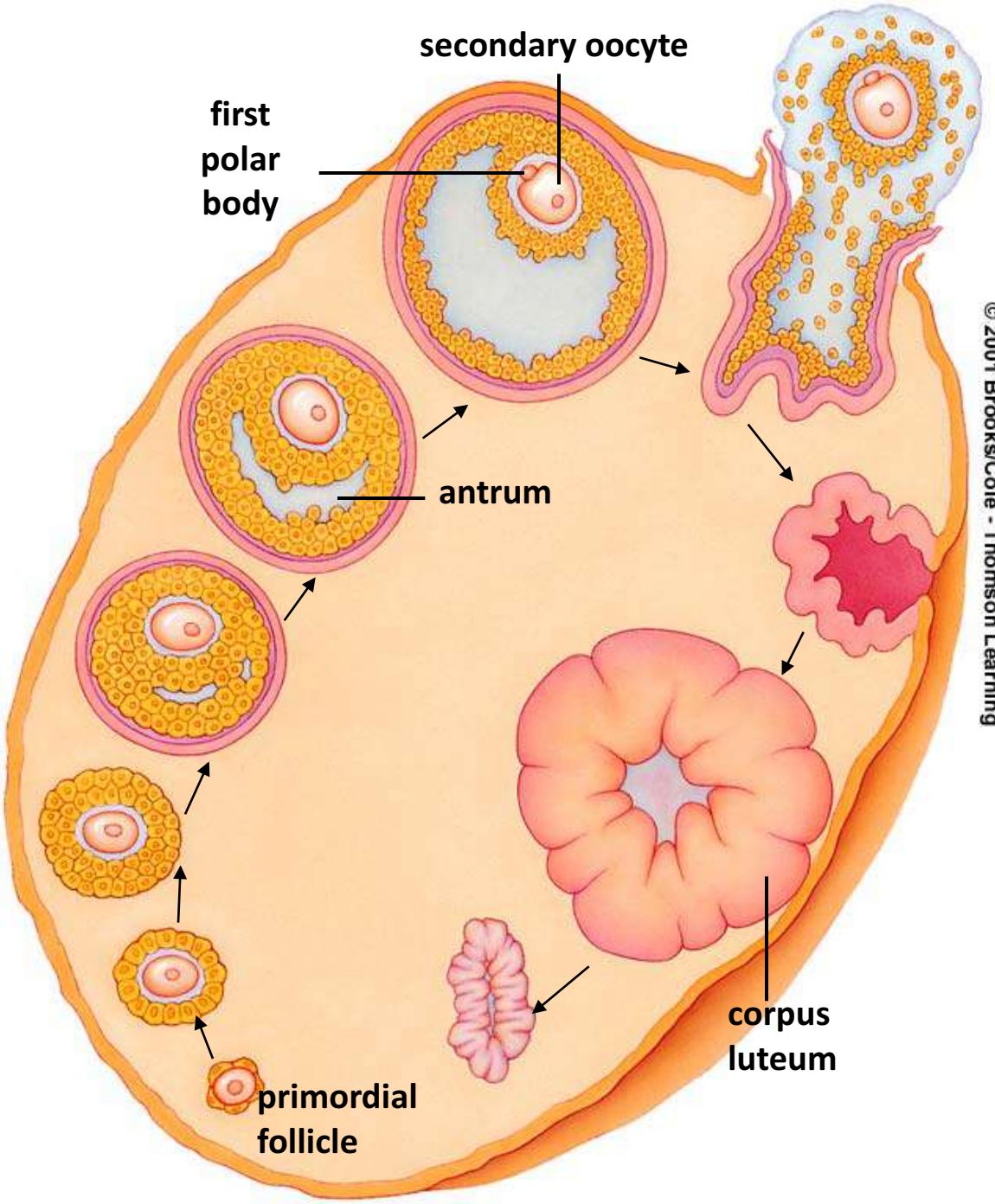
Menarche to Menopause

- First menstruation, or menarche, usually occurs between ages 10-16

- Menstrual cycles continue until menopause, in a woman's late 40s or early 50s

Ovarian Cycle

- Follicle grows and matures
- Ovulation occurs
- Corpus luteum forms



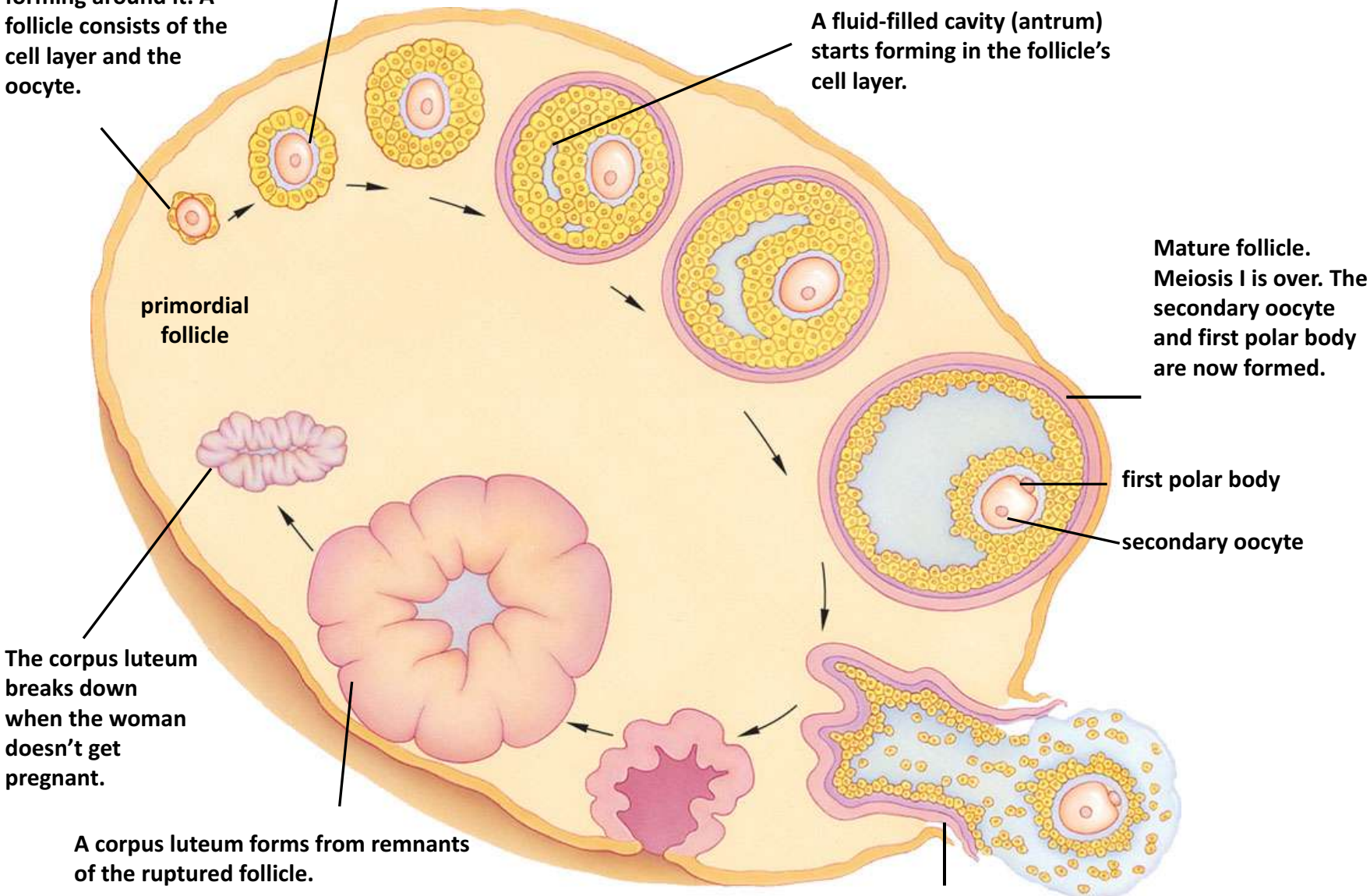
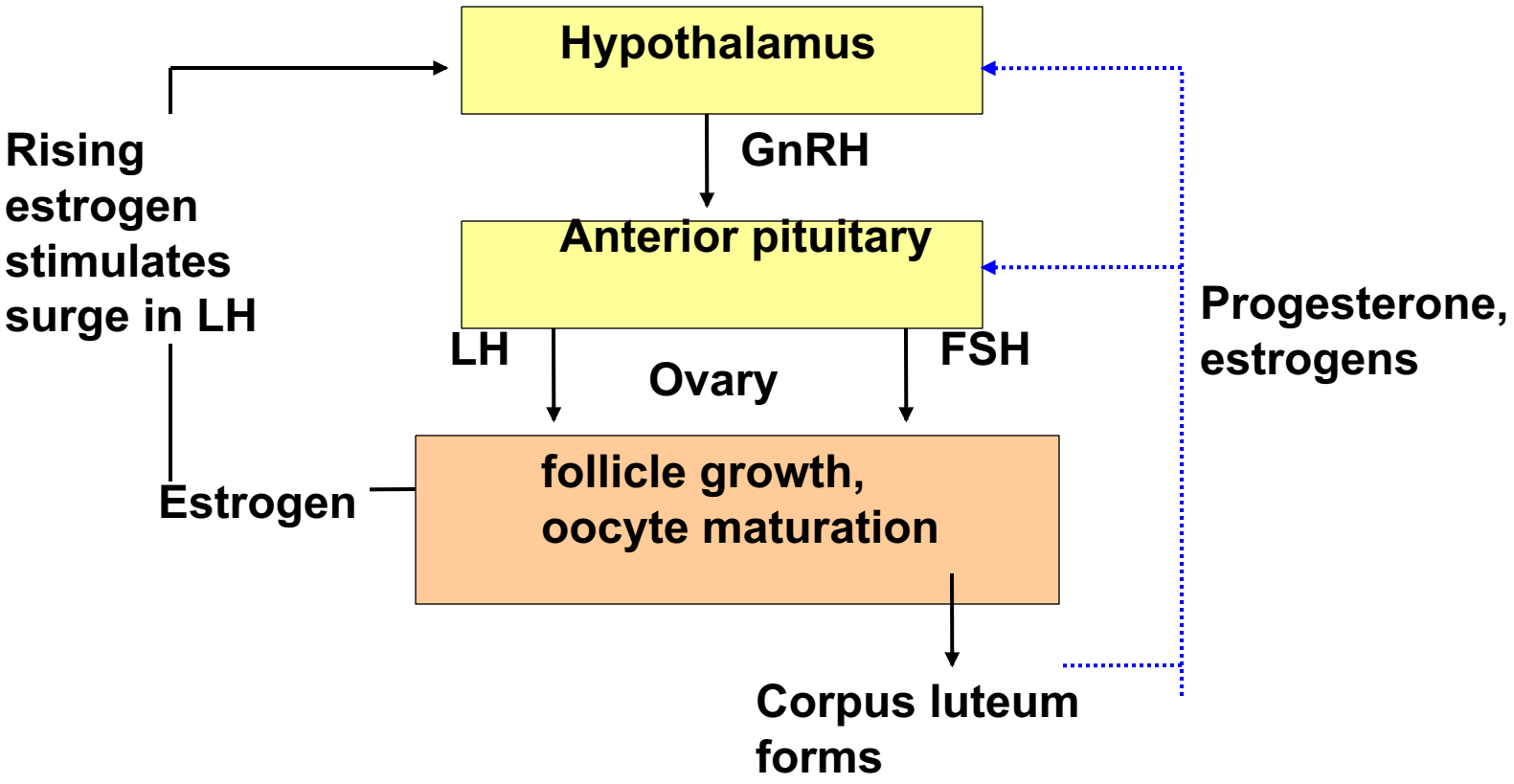


Fig. 44-8b, p.778

Female Hormonal Control



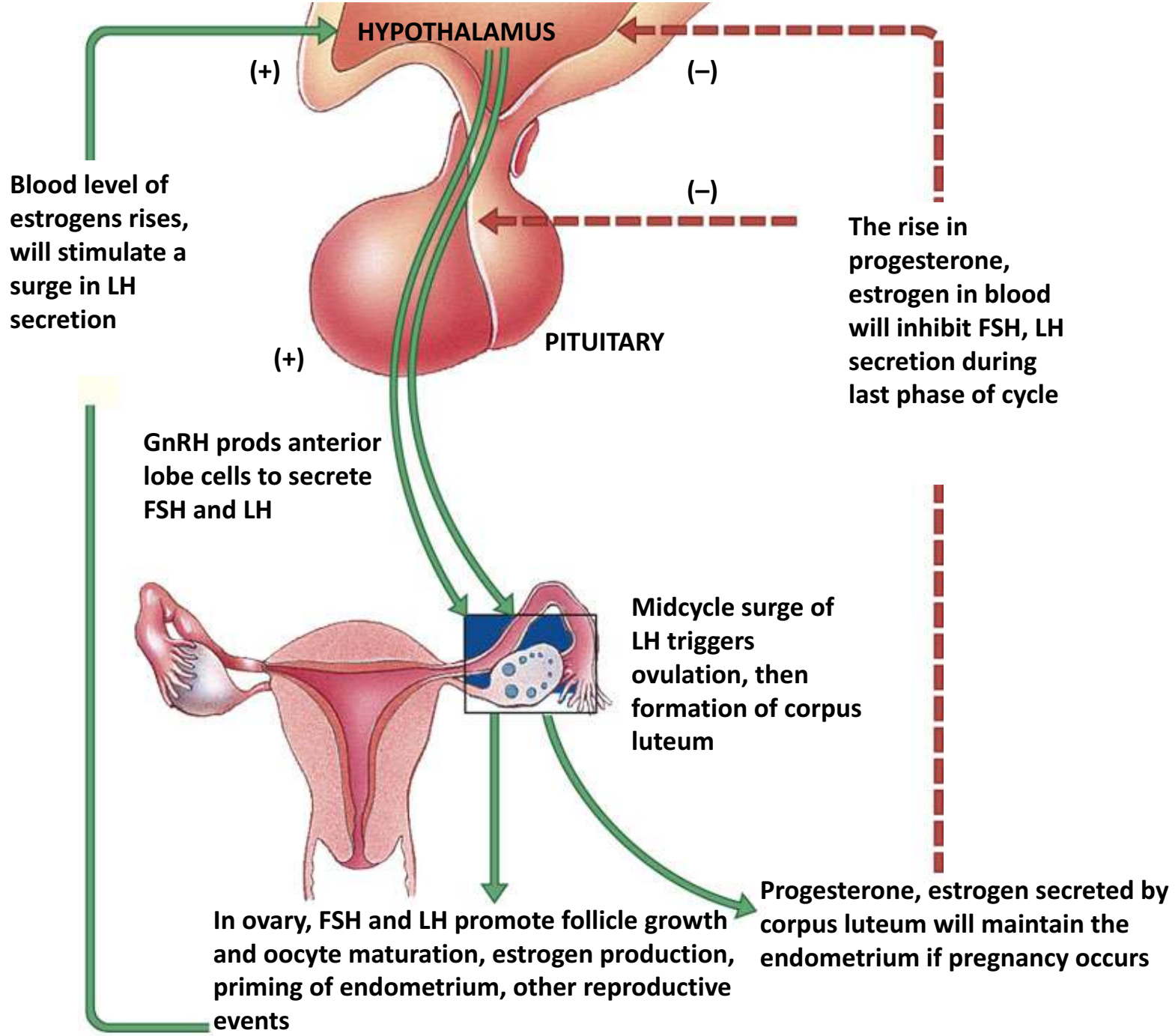


Fig. 44-9, p.779

Fertilization

- Sperm penetrates to egg cytoplasm
- Secondary oocyte undergoes meiosis II; forms mature egg
- Egg nucleus and sperm nucleus fuse to form diploid zygote

Birth Control Options

Prevent fertilization

Prevent ovulation

Block implantation

Contraception

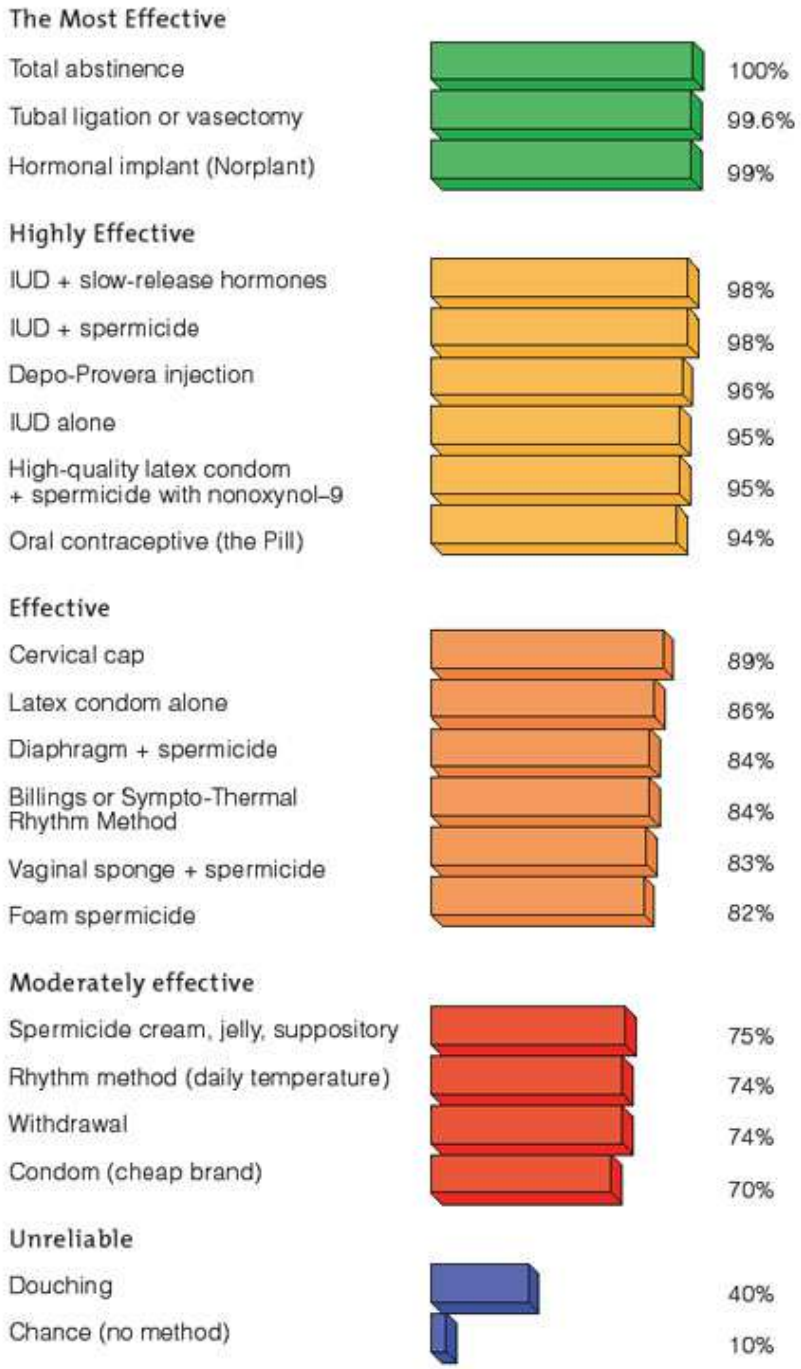


Fig. 44-12, p.782

Abortion

- Removal of blastocyst, embryo, or fetus
- First trimester abortions are painless, and relatively complication free
- Later abortions are more difficult and more controversial

Safer Sex

- Use a latex condom
- Limit partners
- Get to know a prospective partner before sex
- Be alert to signs of ailments of the genitals
- Avoid abuse of alcohol and drugs

Bacterial STDs

- All can be cured with antibiotics
- Syphilis
- Gonorrhea
- Chlamydial infection
  - Most common reported STD in U.S.

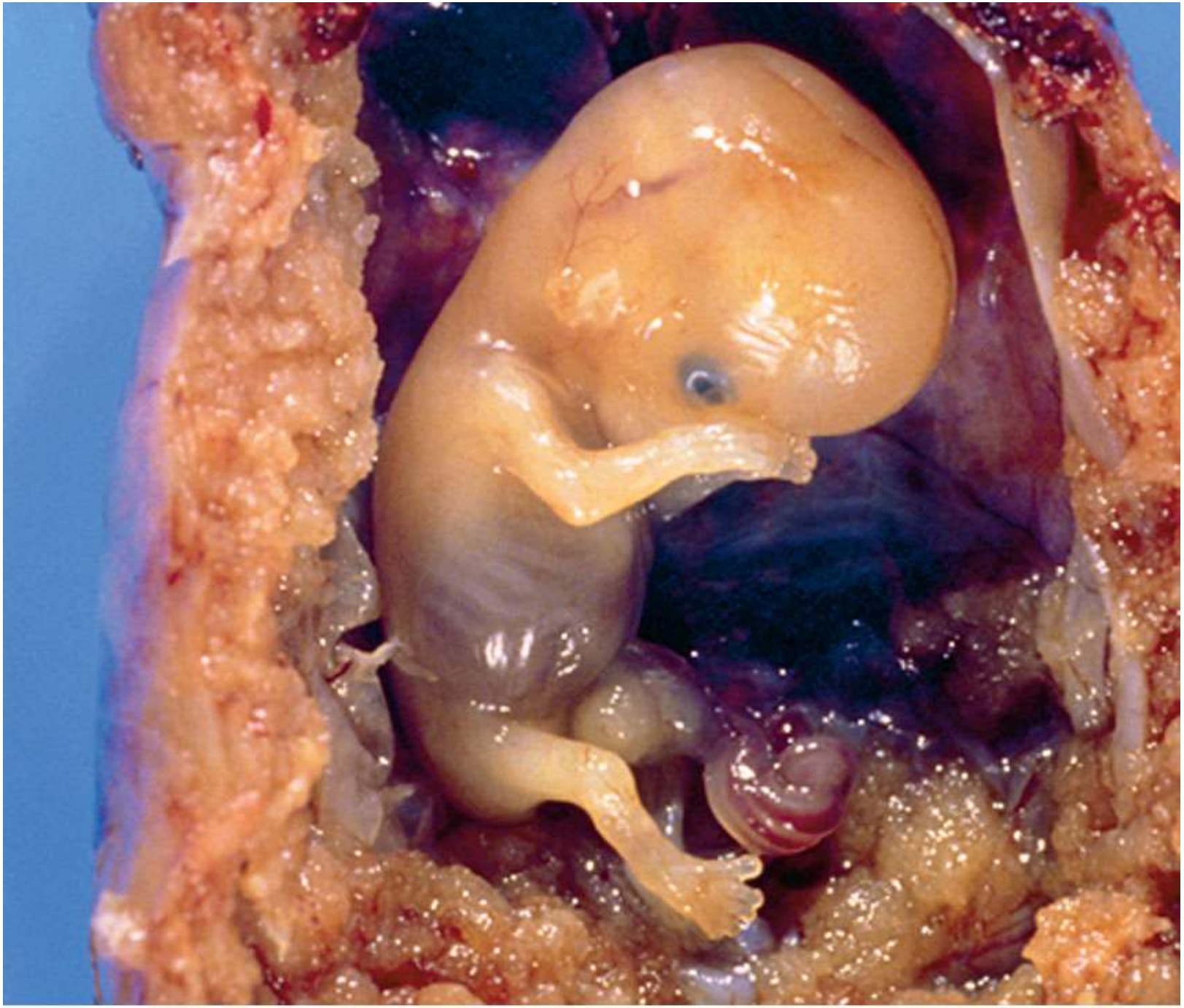


Fig. 44-14a, p.784

Fig. 44-14b, p.784

AIDS

- Combination of disorders that follows infection with HIV
- No vaccine or cure
- HIV spreads through anal, vaginal, and oral intercourse and by intravenous drug use

Fig. 44-16, p.785

Table 44.4 Estimated New STD Cases Per Year *

STD	U.S. Cases	Global Cases
HPV infection	5,500,000	20,000,000
Trichomoniasis	5,000,000	174,000,000
Chlamydia	3,000,000	92,000,000
Genital herpes	1,000,000	20,000,000
Gonorrhea	650,000	62,000,000
Syphilis	70,000	12,000,000
AIDS	40,000	4,900,000

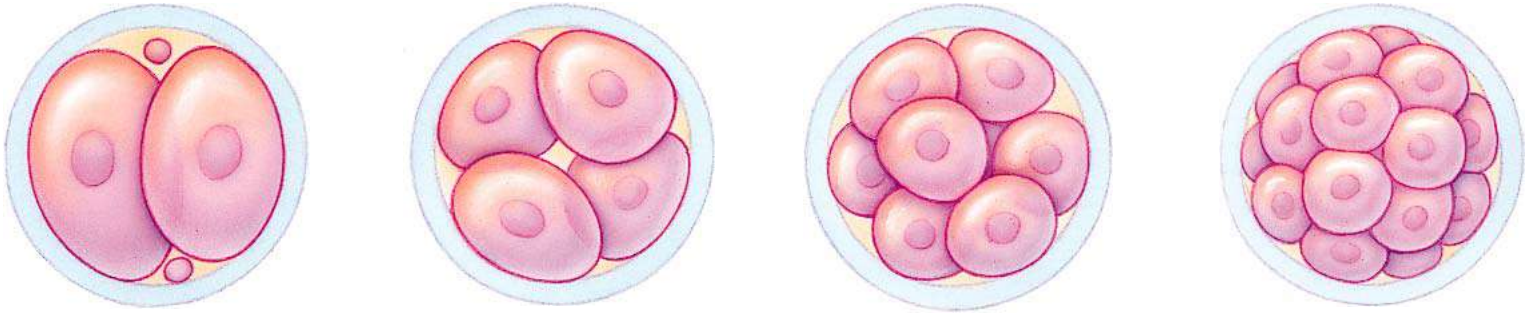
* Global data on HPV and genital herpes were last compiled in 1997.

Pregnancy

- Averages 38 weeks from fertilization
- Takes 2 weeks for blastocyst to form
- Weeks 3 to 8 - embryonic period
- Weeks 9 to birth - fetal period

Early Divisions

- Cleavage begins within 24 hours of fertilization



Day 1 Day 2 Day 3 Day 4 (morula)

Figure 44.17a-c
Page 786

Day 5 - Blastocyst Forms

- Cell secretions produce a fluid-filled cavity in center of ball of cells
- Layers of blastocyst
  - Inner cell mass
  - Trophoblast
  - Blastocoel

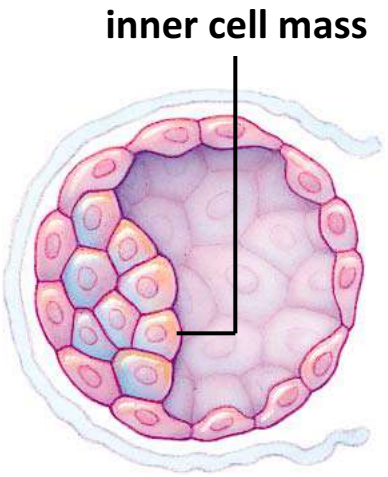
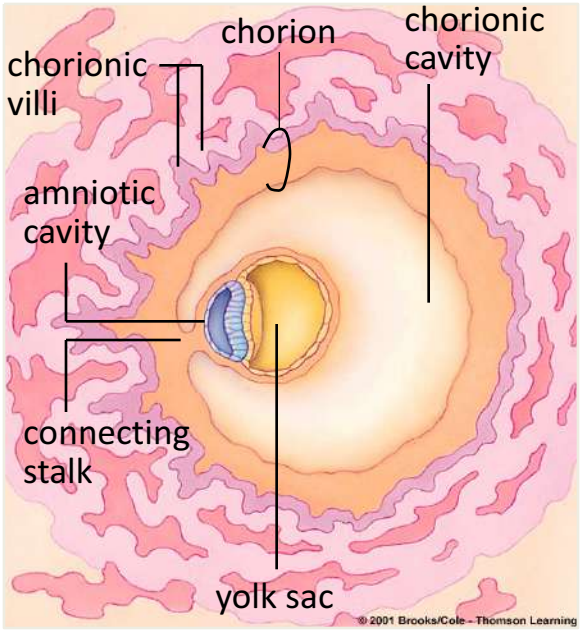


Figure 44.17d
Page 786

Extraembryonic Membranes

- Ø The amniotic membrane will enclose embryo
- Ø Yolk sac forms
- Ø Chorion begins to form fingerlike villi



DAY 14

Figure 44.17f
Page 786

Gastrulation - Day 15

- Primitive streak forms along one axis of the inner cell mass
- Cells migrate inward here to form endoderm and mesoderm

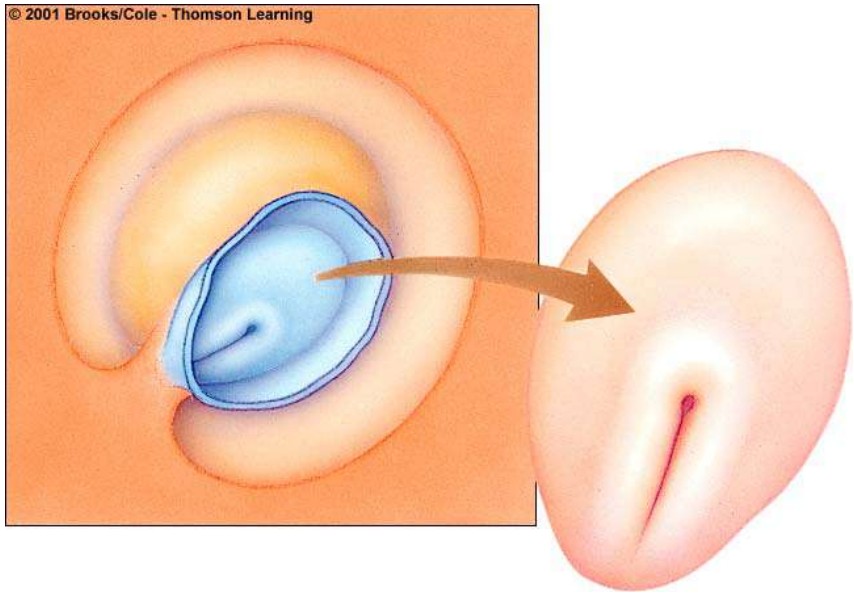


Figure 44.18a
Page 788

Vertebrate Body Plan Emerges

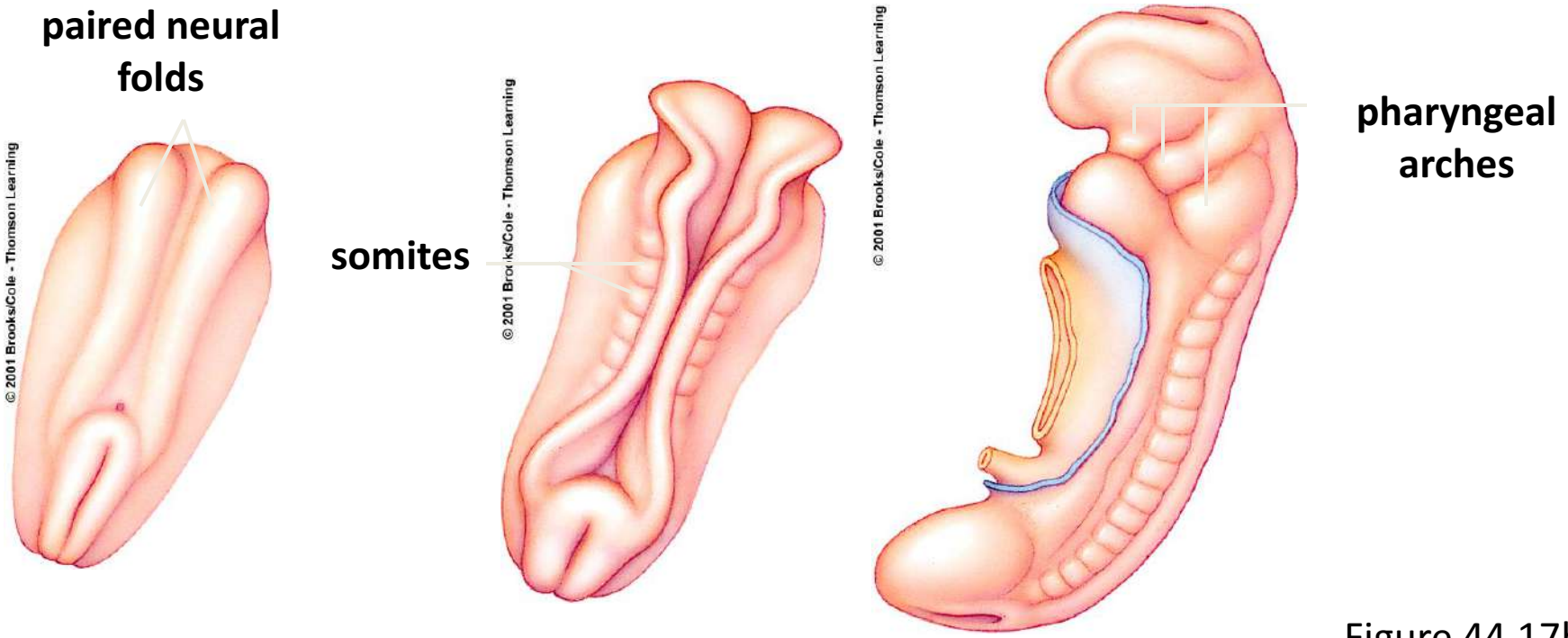


Figure 44.17b
Page 788

The Placenta

- Interlocking fetal and maternal tissues
- Performs digestive, respiratory, and urinary functions for the fetus
- Materials exchanged across membrane that separates bloodstreams

Figure 44.19
Page 789

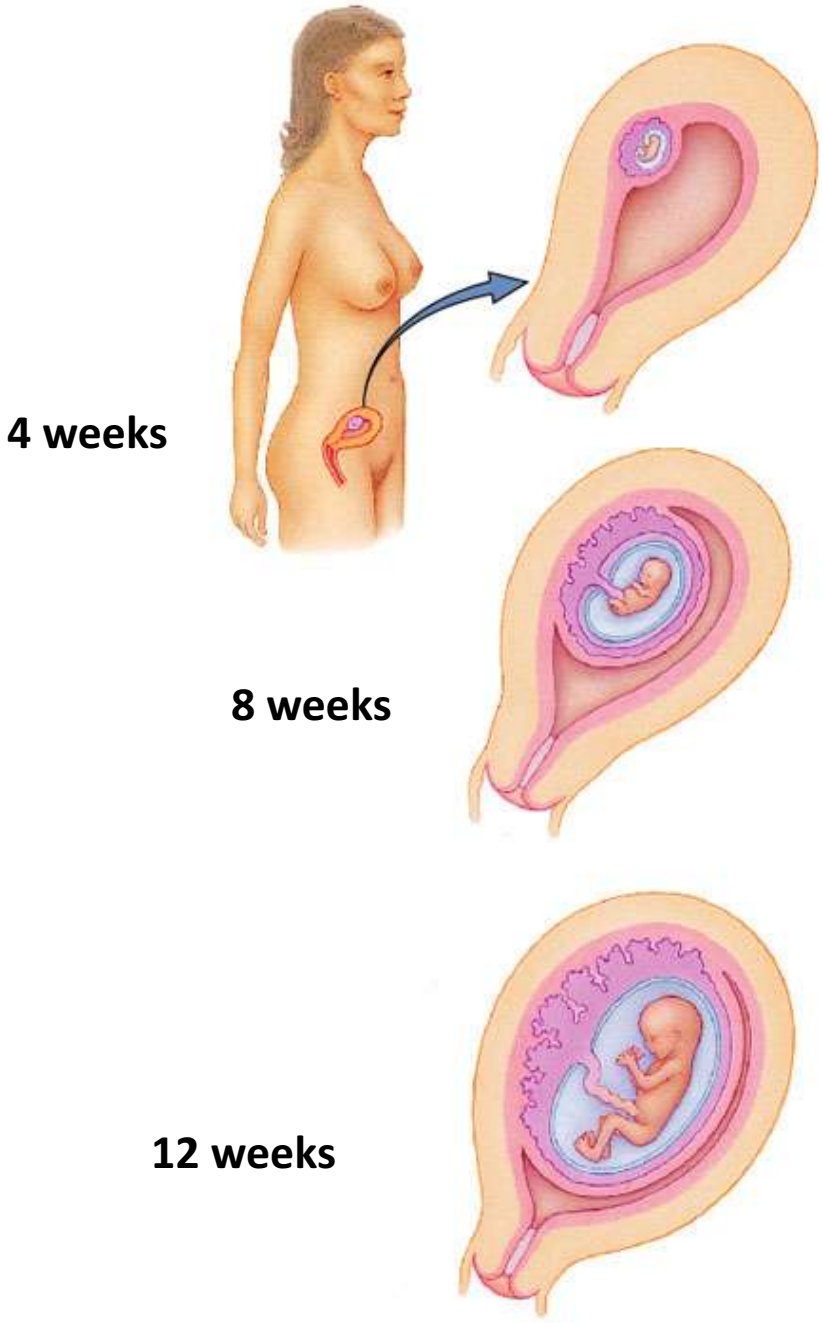


Fig. 44-19a, p.789

appearance of the placenta at full term

MATERNAL CIRCULATION

FETAL CIRCULATION

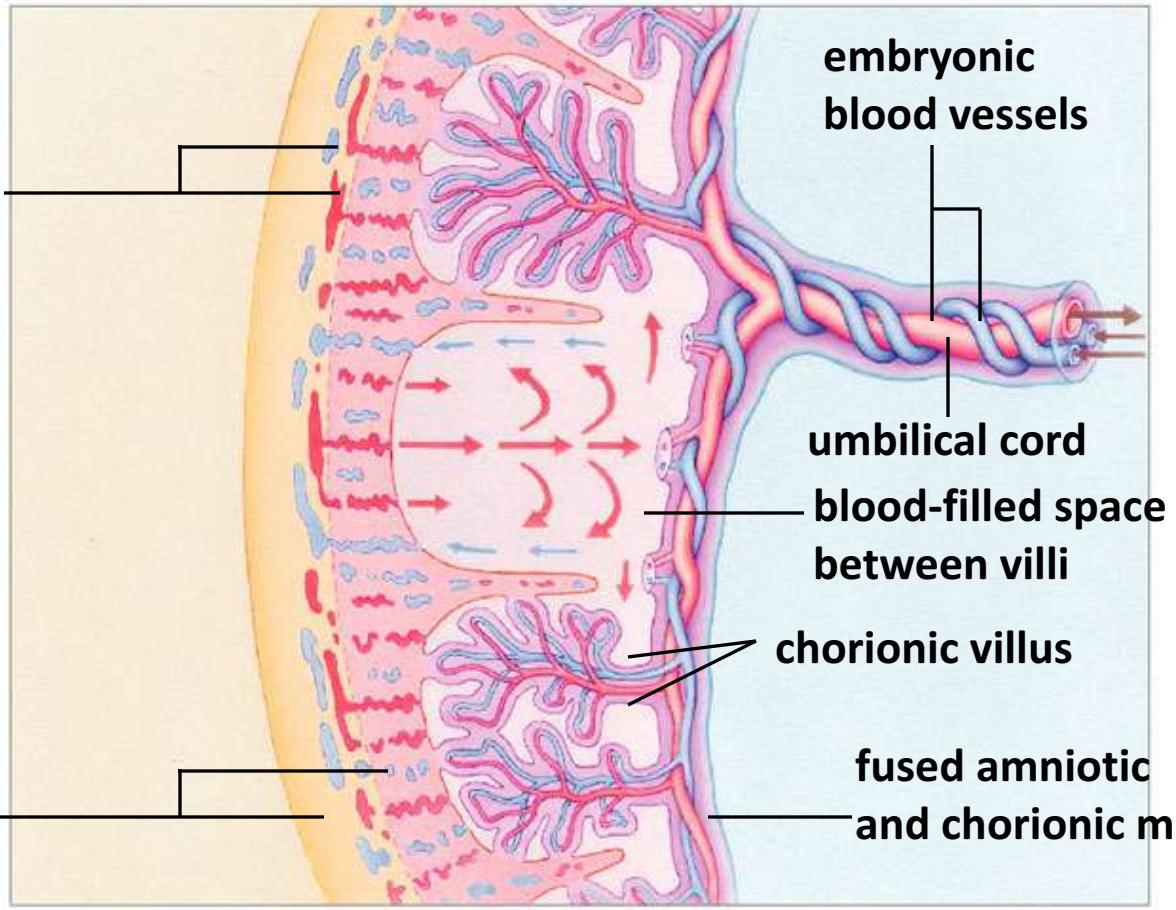


Fig. 44-19b, p.789

Embryonic Period

- Weeks 3 to 8
- By the close of embryo period
  - Appears human
  - Primordial tissues of all internal and external structures have formed

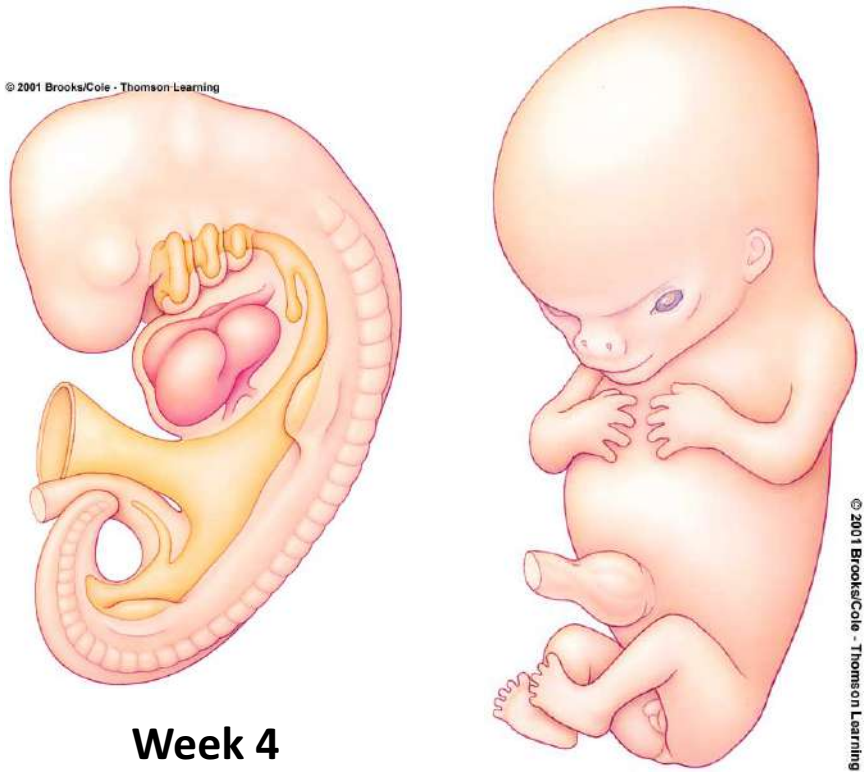


Figure 44.20
Page 790

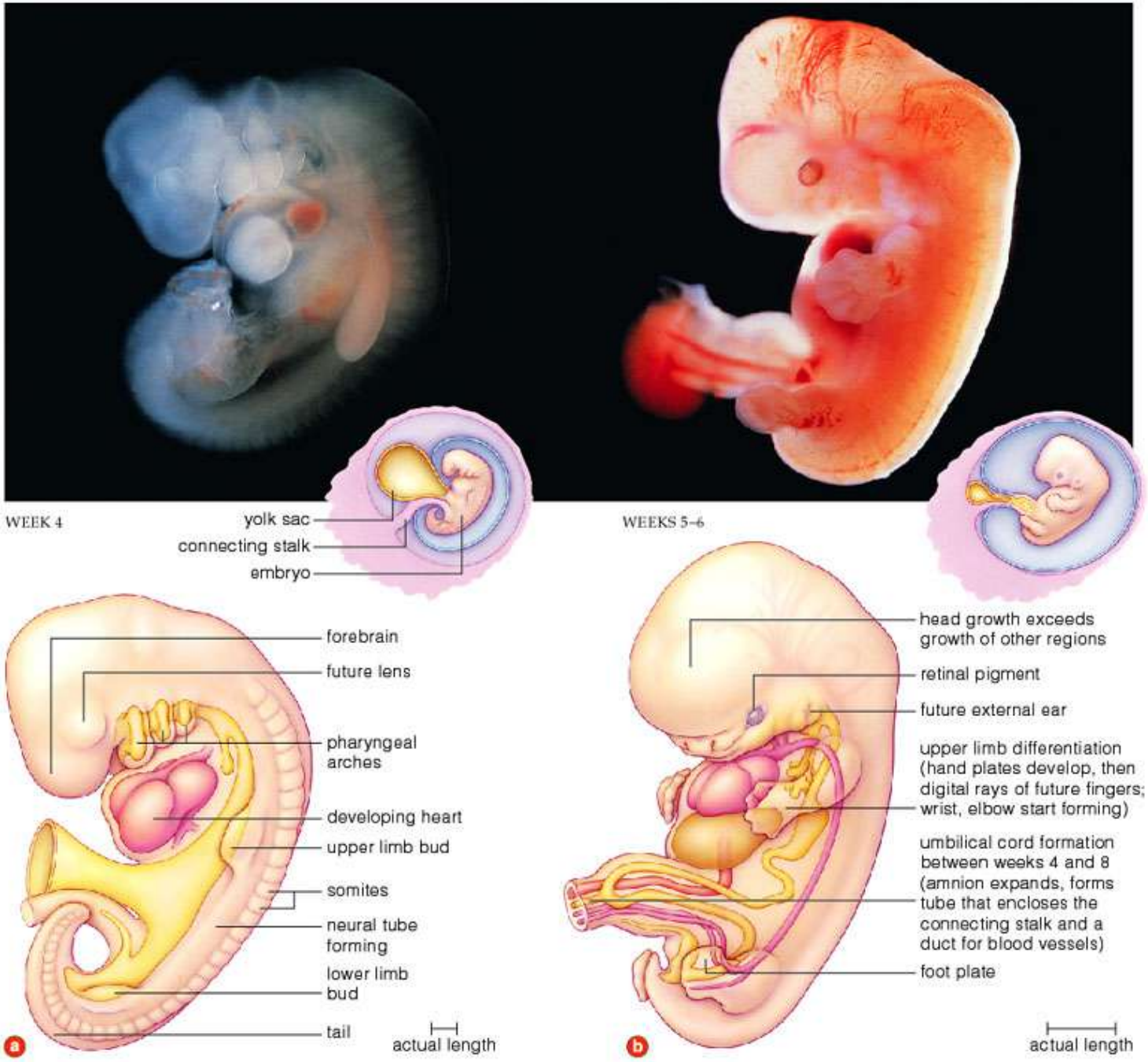


Fig. 44-20a,b, p.790

WEEK 8

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

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

actual length

WEEK 16
Length: 16 centimeters (6.4 inches)
Weight: 200 grams (7 ounces)

WEEK 29
Length: 27.5 centimeters (11 inches)
Weight: 1,300 grams (46 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).

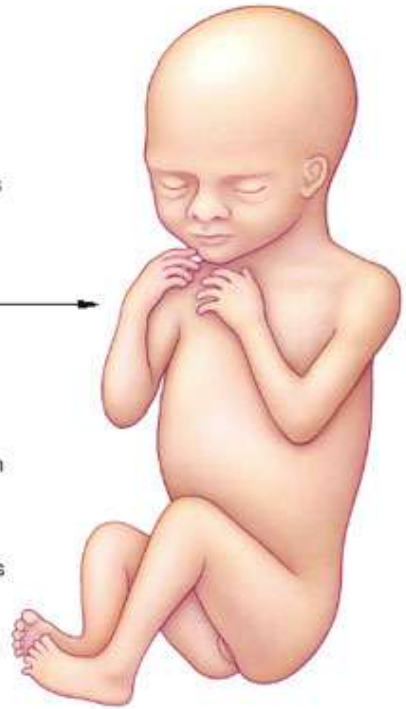


Fig. 44-20c,d, p.790

Fetal Period

- Weeks 9 to birth
- Fetus is initially about 1 inch long
- Fetus born before 22 weeks cannot survive
- Survival is poor before 28 weeks because lungs are not fully formed
- By 36 weeks, survival is 95 percent

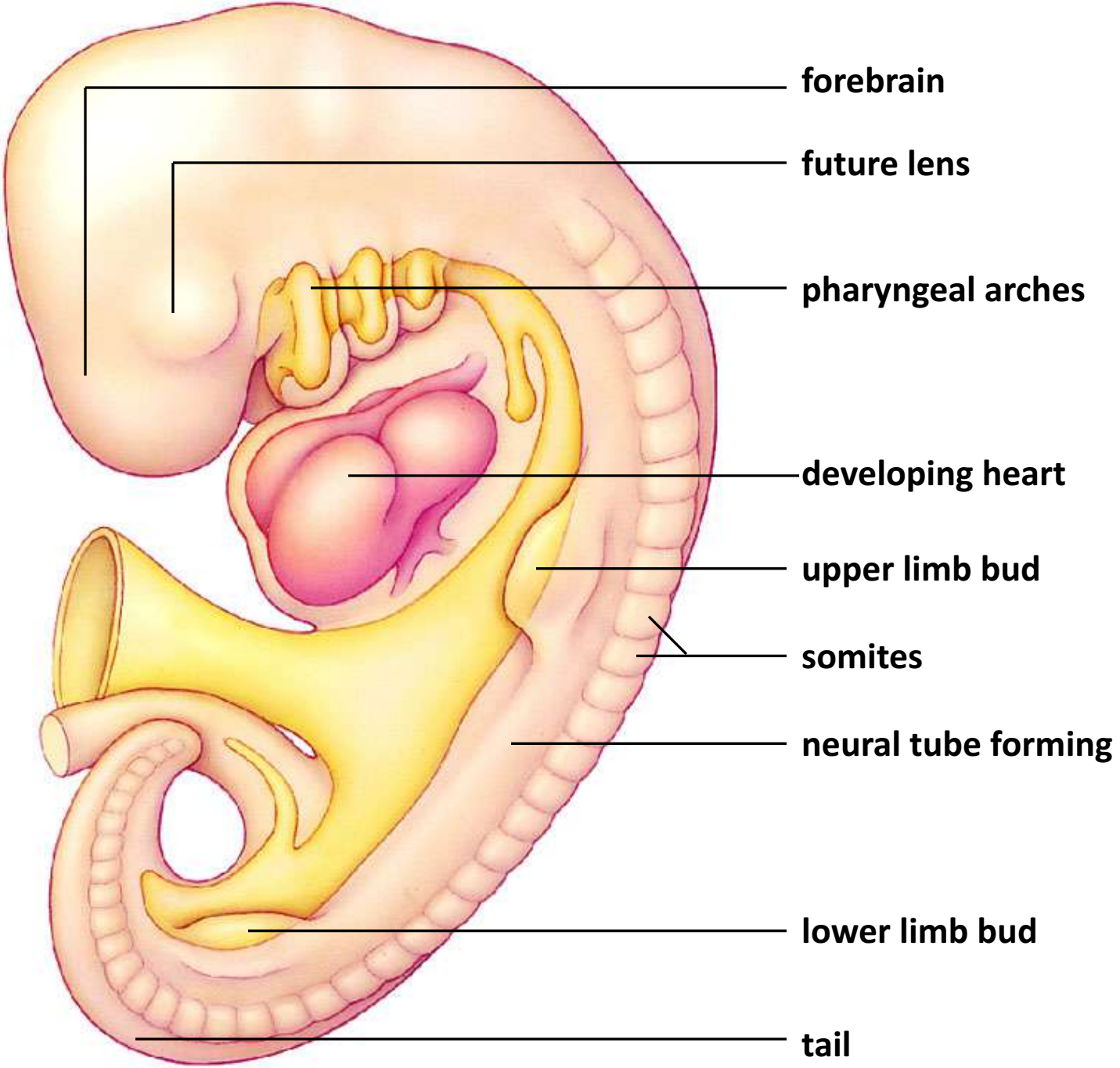


Fig. 44-20a, p.790

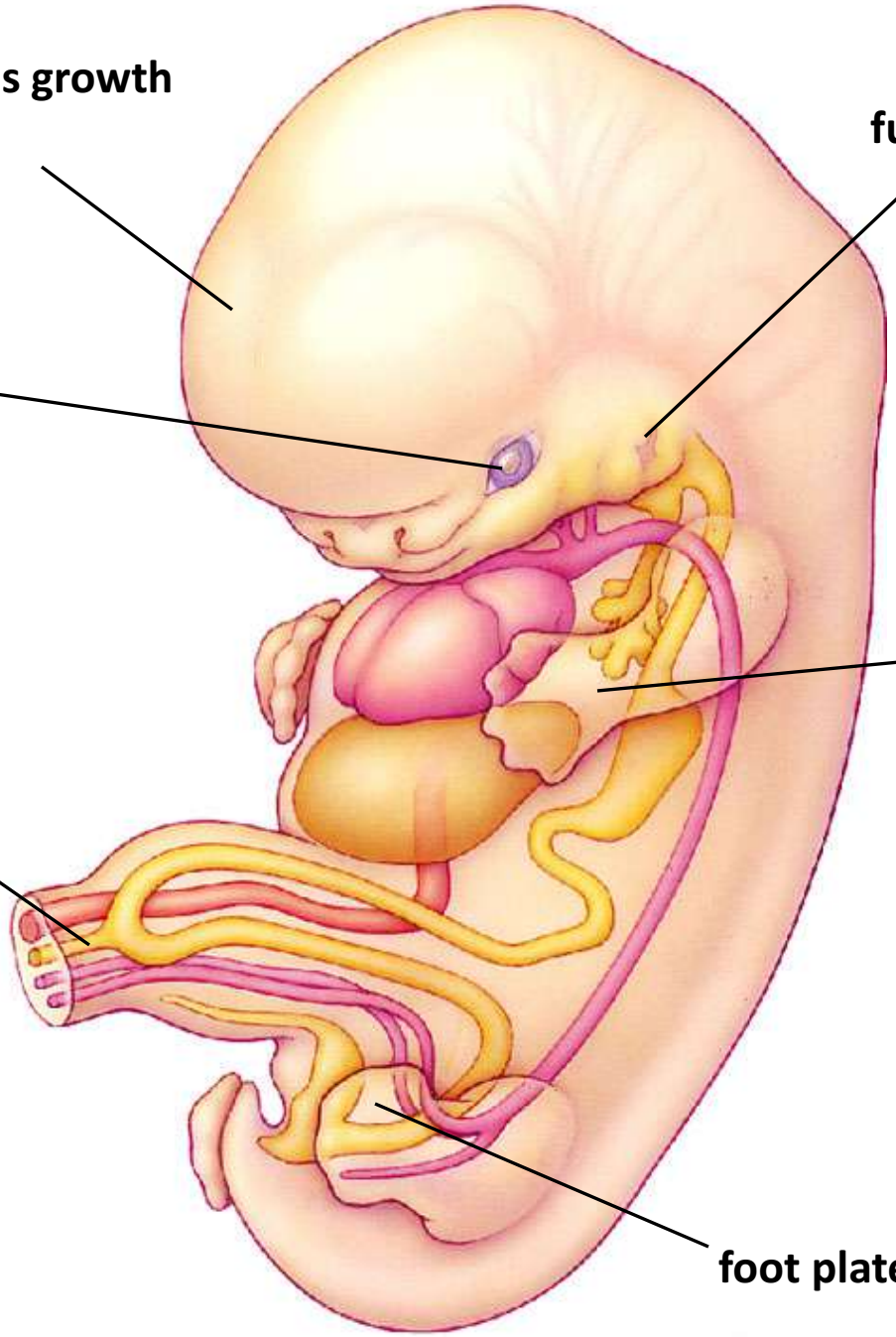


Fig. 44-20b, p.790

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

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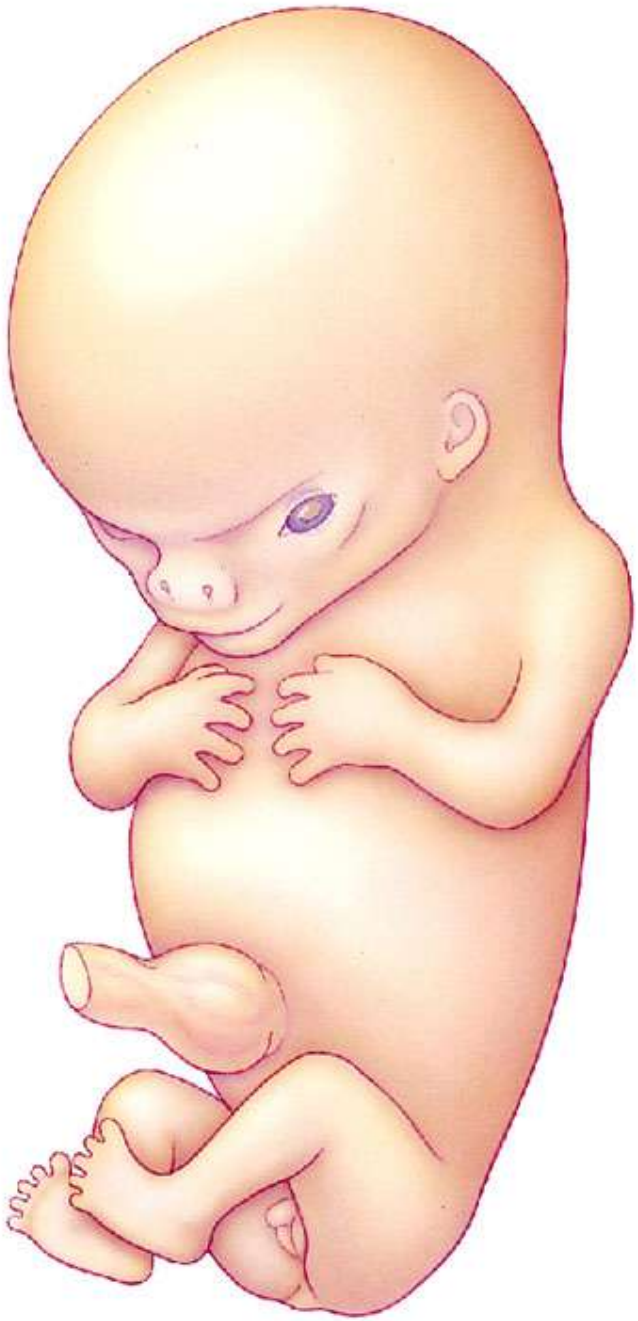

Fig. 44-20c, p.790

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Fig. 44-20d, p.790

Fetal Nutrition

- All nutrients for fetal growth and development must be delivered via the placenta
- Mother's diet affects fetal health
- Smoking may affect ability to absorb nutrients and to pass them to fetus

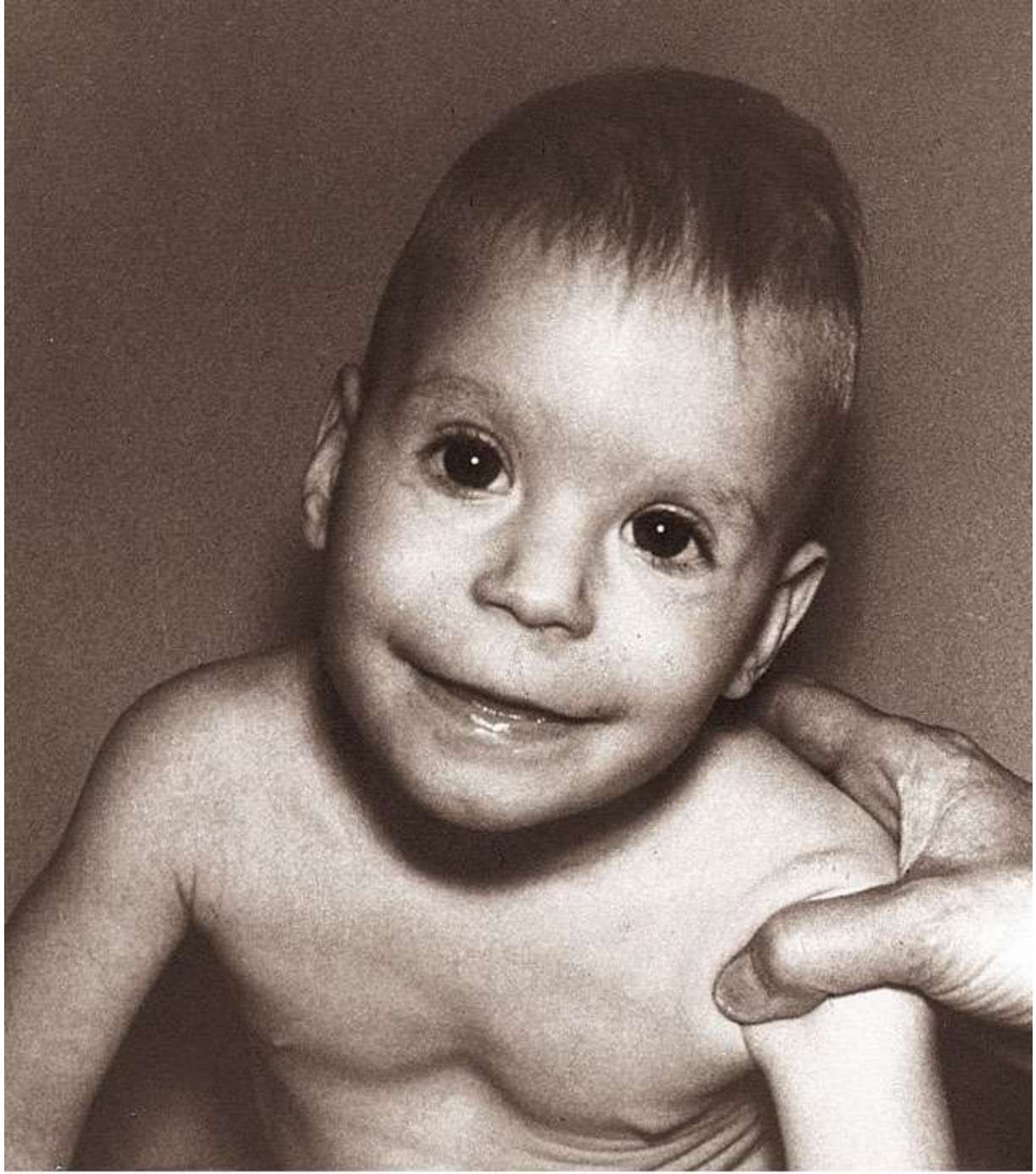

Fig. 44-22b, p.793

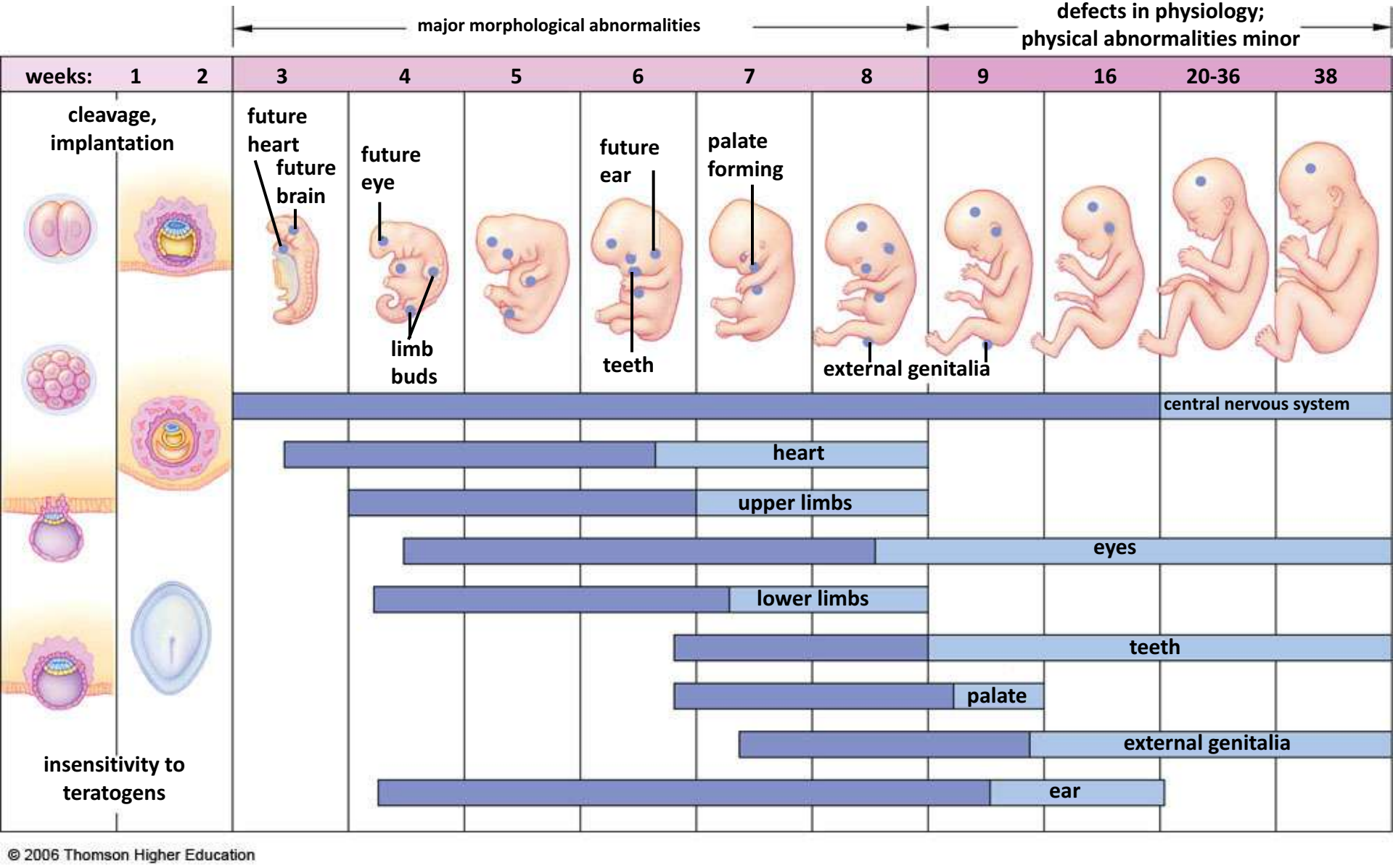

Fig. 44-21, p.792

Birth (Labor)

- Cervical canal dilates
- Amniotic sac ruptures
- Uterine contractions drive fetus from uterus
- Placenta is expelled as afterbirth

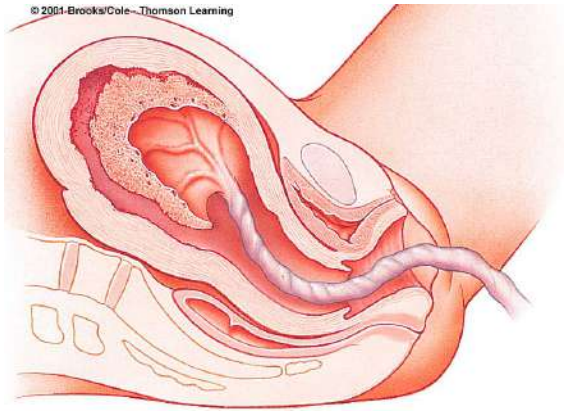

Figure 44.23a,c
Page 794

Lactation

- During pregnancy, progesterone and estrogen stimulate gland development
- After birth, prolactin induces synthesis of enzymes for milk production
- Oxytocin triggers contractions

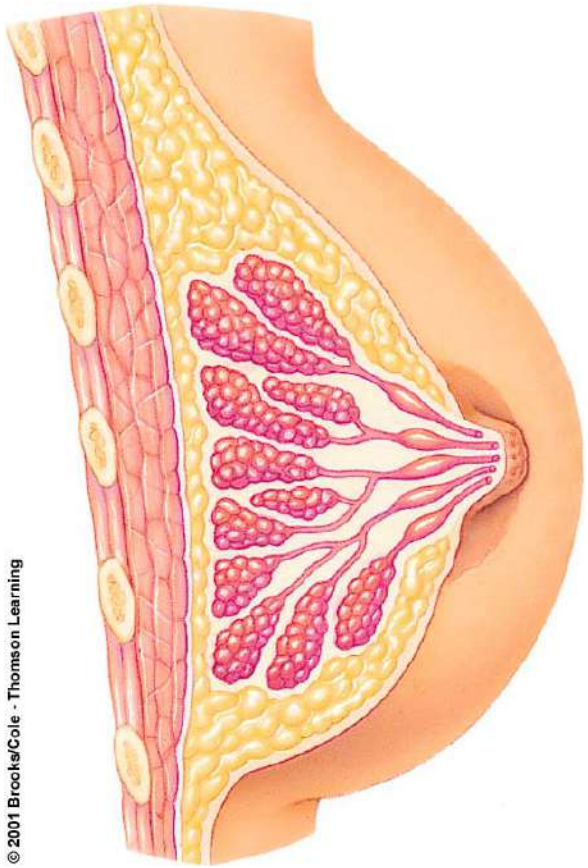

Figure 44.24
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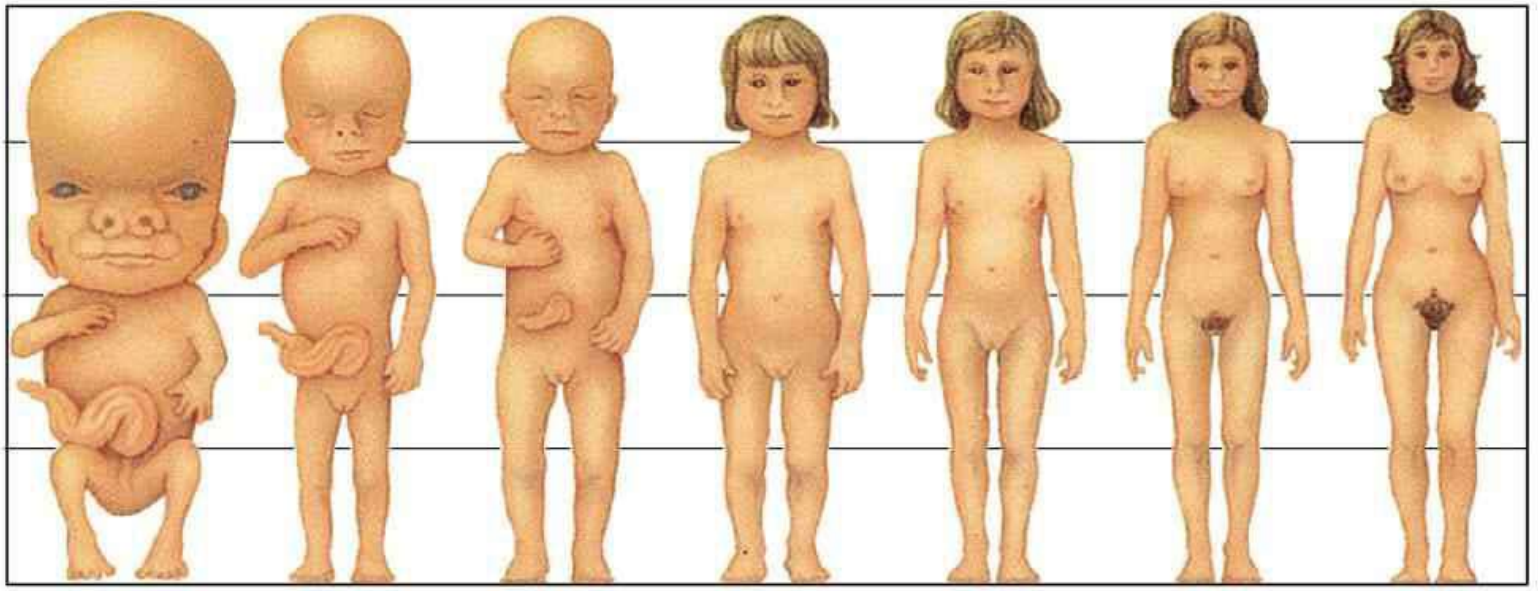
Stages of Human Development - Prenatal

- Zygote - Single cell
- Morula - Solid ball of cells
- Blastocyst - Ball with fluid-filled cavity
- Embryo - 2 weeks to 8 weeks
- Fetus - 9 weeks to birth

Stages of Human Development - Postnatal

- Newborn - First 2 weeks after birth
- Infant - 2 weeks to 15 months
- Child – To 10-12 years
- Pubescent - At puberty
- Adolescent - Puberty to maturation
- Adult
- Old age



embryo at 8 weeks

embryo at 12 weeks

newborn

2 years

5 years

13 years (puberty)

22 years

Fig. 44-25, p.795

Stages of Human Development

Table 44.6 Stages of Human Development

Prenatal period	
Zygote	Single cell resulting from fusion of sperm nucleus and egg nucleus at fertilization.
Morula	Solid ball of cells produced by cleavages.
Blastocyst (blastula)	Ball of cells with surface layer, fluid-filled cavity, and inner cell mass.
Embryo	All developmental stages from two weeks after fertilization until end of eighth week.
Fetus	All developmental stages from ninth week to birth (about 38 weeks after fertilization).
Postnatal period	
Newborn	Individual during the first two weeks after birth.
Infant	Individual from two weeks to about fifteen months after birth.
Child	Individual from infancy to about ten or twelve years.
Pubescent	Individual at puberty; secondary sexual traits develop; girls between 10 and 15 years, boys between 12 and 16 years.
Adolescent	Individual from puberty until about 3 or 4 years later; physical, mental, emotional maturation.
Adult	Early adulthood (between 18 and 25 years); bone formation and growth finished. Changes proceed slowly after this.
Old age	Aging processes result in expected tissue deterioration.