

## CHAPTER 28 REPRODUCTIVE SYSTEM

**CHAPTER OVERVIEW:** This chapter describes the location, structure and function of the organs of the male and female reproductive systems. The hormonal control of spermatogenesis, oogenesis, the uterine cycle, and male and female sexual behavior is described in detail. The changes associated with puberty (in both males and females), pregnancy and menopause are explained.

**OUTLINE** (four to six fifty-minute lectures):  
Seeley, A&P, 5/e

**t. Topic Outline, Chapter 28**

**ct.**

I. Male Reproductive System, p. 923

A. Scrotum

1. Contains Testes
2. Divided by Connective Tissue Septa, Marked by Raphe
3. Outer Surface skin
4. Dartos Muscle and Cremaster Muscle
  - a. Smooth Muscle Layer
  - b. Temperature Regulation of Testes

B. Perineum

1. Area Between Thighs
2. Anterior Triangle
  - a. Urogenital Triangle
  - b. Contains Base of Penis and Scrotum
3. Posterior Triangle
  - a. Anal Triangle
  - b. Contains Anal Opening

C. Testes

1. Testicular Histology
  - a. Tunica Albuginea
  - b. Septa Divide Testes into 300-400 Lobules
    - 1). Seminiferous Tubules, Combined Length about 1/2 Mile
    - 2). Interstitial Cells (aka Cells of Leydig)
  - c. Seminiferous Tubules Empty into Rete Testis
  - d. Rete Testes into 15 to 20 Efferent Ductules
2. Descent of the Testes
  - a. Develop Retroperitoneally
  - b. Connected to Scrotum by Gubernaculum
  - c. Move into Scrotum Through Inguinal Canal
  - d. Remnant of Peritoneum is Tunica Vaginalis
3. Sperm Cell Development
  - a. Seminiferous Tubules Become Functional at 12-14 yrs.
  - b. Process of Sperm Development = Spermatogenesis
  - c. Sertoli Cells (aka Sustentacular Cells)
    - 1). Provide Nourishment for Germ Cells
    - 2). Form Blood-Testis Barrier
    - 3). Convert Testosterone from Cells of Leydig to
      - a). Dihydrotestosterone
      - b). Estradiol
    - 4). Secrete Androgen-Binding Protein

**Figures & Tables**

Fig. 28.1a, p.925  
System Interactions, p.956

**Transpare Acetates**

TA-564

Fig. 28.1b, p.925

Fig. 28.2, p.926 TA-565

Fig. 28.3, p.927 TA-566

Clinical Note, p.925

Fig. 28.4, p.926 TA-567

	<ul style="list-style-type: none"> <li>a). Binds Testosterone and Dihydrotestosterone</li> <li>b). Carries Hormones to Epididymis</li> </ul>		
	d. Germ Cells <ul style="list-style-type: none"> <li>1). Spermatogonia Divide by Mitosis</li> <li>2). Some Become Primary Spermatocytes <ul style="list-style-type: none"> <li>a). Undergo Meiosis</li> <li>b). Two Secondary Spermatocytes after First Division</li> <li>c). Four spermatids after Second division</li> <li>d). Finish Maturation Process to Become Spermatozoa</li> </ul> </li> <li>e. Mature Sperm Cells have <ul style="list-style-type: none"> <li>1). Acrosome with Enzymes</li> <li>2). Head</li> <li>3). Tail (Flagellum)</li> </ul> </li> <li>f. Mature Sperm Released into Lumen of Seminiferous Tubule</li> </ul>	Fig. 28.A, p.929 Clinical Focus, pp.929-930	
D. Ducts	1.Epididymis <ul style="list-style-type: none"> <li>a. Sperm Maturation in Body of Epididymis</li> <li>b. Pseudostratified Columnar Epithelium with Stereocilia</li> </ul>	Fig. 28.5, p.931	TA-568
	2. Ductus Deferens <ul style="list-style-type: none"> <li>a. Ascends along Posterior Side of Testes</li> <li>b. Part of Spermatic Cord <ul style="list-style-type: none"> <li>1). ductus Deferens</li> <li>2). Testicular Artery &amp; Venous Plexus</li> <li>3). Lymph Vessels</li> <li>4). Nerves</li> <li>5). Fibrous Remnants of the Process Vaginalis</li> <li>6). External Spermatic Fascia, Cremaster Muscle and Internal Spermatic Fascia</li> </ul> </li> <li>c. Passes through Inguinal Canal into Pelvic Cavity</li> <li>d. Loops over Ureter and Posterior Surface of Urinary Bladder</li> <li>e. Enlarges into Ampulla</li> <li>f. Composition <ul style="list-style-type: none"> <li>a). Pseudostratified Columnar Epithelium</li> <li>b). Surrounded by Smooth Muscle</li> </ul> </li> </ul>	Fig. 28.1, p. 925 Fig 28.2, p. 926 Fig. 28.5, p. 931	TA-564 TA-565 TA-568
	3. Ejaculatory Duct <ul style="list-style-type: none"> <li>a. Projects into Prostate</li> <li>b. Ends at Urethra</li> </ul>		
	4. Urethra <ul style="list-style-type: none"> <li>a. About 20 cm Long from Urinary Bladder to End of Penis</li> <li>b. Three Parts <ul style="list-style-type: none"> <li>1). Prostatic Urethra - Starts Lined with Transitional Epithelium</li> <li>2). Membranous Urethra - Stratified Columnar Epithelium</li> <li>3). Spongy (Penile) Urethra - Ends Lined with Stratified Squamous Epithelium</li> </ul> </li> <li>c. Mucus Secreting Urethral Glands</li> </ul>	Fig. 28.6, p.932	TA-569
	6. Penis = Male Organ of Copulation <ul style="list-style-type: none"> <li>a. Columns of Erectile Tissue <ul style="list-style-type: none"> <li>1). Two Corpora Cavernosa</li> </ul> </li> </ul>	Fig. 28.6, p.932	TA-569

	2). Single Corpus Spongiosum Expands to form Glans Penis		
	b. Engorgement of Erectile Tissue with Blood Causes Erection.		
	c. Root of Penis Attaches Penis to Coxae		
	d. Skin Covering Glans Penis = Prepuce or Foreskin	Clinical Note, p.932	
	e. Main Arteries and Veins on Dorsal Surface; Deep Artery in Corpora Cavernosa		
E. Accessory Glands		Fig. 28.1, p.925	TA-564
		Fig. 28.5, p.931	TA-568
		Fig. 28.6, p.932	TA-569
	1. Seminal Vesicles		
	a. Sac-Shaped Glands		
	b. Mean Ampullae of Ductus Deferens		
	c. About 5 cm Long, Tapering to Duct		
	2. Prostate Gland	Fig. 28.1, p. 925	TA-564
		Clinical Note, p.933	TA-568
		Predict Quest. 1	
	a. Glandular and Muscular Tissue		
	b. 4 cm Long X 2 cm Wide		
	c. Dorsal to Symphysis Pubis		
	d. At Base of Bladder		
	e. Ducts Lead Secretions to Prostatic Urethra		
	3. Bulbourethral Glands		
	a. Paired Glands near Membranous Urethra		
	b. Regress in Size with Age		
	4. Secretions		
	a. Semen Composed of Sperm Cells and Secretions from Many Sources		
	1). 60 % from Seminal Vesicles		
	a). Thick Mucoïd Secretion		
	b). Contains Fructose		
	2). 30 % from Prostate		
	a). Thin, Milky Secretion		
	b). High pH Neutralizes Acidic Urethra		
	c). Clotting Factors and Fibrinolysin	Predict Quest. 2	
	3). 5 % from Testes		
	a). Include Sperm Cells		
	b). Fluid		
	c). Metabolic By-Products		
	4). 5 % from Bulbourethral Glands		
	a). Mucous Secretion		
	b). Produced Just Before Ejaculation		
	b. Emission = Discharge of Semen into the Prostatic Urethra		
	1). Contractions of		
	a). Ductus Deferens		
	b). Seminal Vesicles		
	c). Ejaculatory Ducts		
	2). Mixing of Sperm Cells and Testicular Fluid with		
	a). Seminal Fluid		
	b). Prostatic Secretions		
	c. Ejaculation = Forceful Expulsion of Semen from Urethra		
	1). Contractions of		
	a). Urethra		
	b). Pelvic Floor Muscles		
	c). Base of the Penis		

- 2). Volume of Ejaculate 2-5 ml
- 3). Contains 75-400 Million Sperm Cells /ml

Clinical Focus,  
p.935

## II. Physiology of Male Reproduction, p. 934

### A. Regulation of Sex Hormone Secretion

#### 1. Hypothalamus

- a. Releases Gonadotropin Releasing Hormone (GnRH, aka Luteinizing Hormone Releasing Hormone (LHRH))
- b. Travels in Hypothalamo-Hypophyseal Portal System to Anterior Pituitary

Fig. 28.7, p.934 TA-570  
Table 28.1, p.924

#### 2. Anterior Pituitary

- a. Respond to GnRH
- b. Secretes Gonadotropins
  - 1). Luteinizing Hormone (LH, aka Interstitial Cell Stimulating Hormone (ICSH))
  - 2). Follicle Stimulating Hormone (FSH)

Clinical Note,  
p.934

#### 3. Leydig Cells

- a. Respond to LH
- b. Increased Rate of Testosterone Synthesis and Secretion
  - 1). Stimulate Development of Reproductive Structures
  - 2). Stimulate Development of Secondary Sexual Characteristics

#### 4. Sertoli Cells

- a. Respond to FSH
- b. Promote Sperm Cell Development
- c. Secrete Inhibin
  - 1). Polypeptide Hormone
  - 2). Inhibits FSH Secretion

### B. Puberty

1. Human Chorionic Gonadotropin (HCG) from Maternal Placenta
  - a. Allows Secretion of Testosterone by Fetal Testes
  - b. Lost after Birth, Testes Regress
  - c. Low Testosterone Levels Inhibit GnRH Secretion
2. At 12-14 yrs Puberty Occurs
  - a. Hypothalamus Secretes GnRH
  - b. LH and FSH Levels Increase
    - 1). Elevated LH Stimulates Testosterone Secretion
    - 2). Elevated FSH Promotes Sperm Cell Development
  - c. Testosterone no Longer Completely Suppresses GnRH Secretion

### C. Effects of Testosterone

1. Enlargement and Differentiation of Male Genitalia
2. Required for Descent of Testes into Scrotum
3. Hair Development
  - a. Pubic Area Extending up the Linea Alba
  - b. Legs
  - c. Chest
  - d. Axillary Region
  - e. Face
  - f. Occasionally the Back
4. Roughness or Coarseness of Skin and Hair
5. Increases Melanin in Skin

Clinical Note,  
p.935

6. Increases Sebaceous Secretion, Especially in Face
7. Hypertrophy of the Larynx
8. Stimulatory Effect on Metabolic Rate and Increases RBC Count
9. Promotes Protein Synthesis and Increases Muscle Mass
10. Increases Rates of Bone Growth and Calcium Deposition

Clinical Note,  
p.935

#### D. Male Sexual Behavior and the Male Sex Act

1. Testosterone Required
  - a. Sex Drive Gradually Declines from Age 40 to 80
  - b. Influence of Testosterone on Brain Areas Determines Sex Behavior
2. Afferent Impulses and Integration
  - a. From Genitalia and Surrounding Tissues
  - b. From Hollow Organs
  - c. Psychic Stimuli Influence Reflex
  - d. Sacral Reflex
3. Erection, Emission, and Ejaculation
  - a. Neural Signals from Spinal Cord
    - 1). Parasympathetic Centers S<sub>2</sub> to S<sub>4</sub>
    - 2). Sympathetic Centers T<sub>2</sub> to L<sub>1</sub>
  - b. Dilation of Arteries
  - c. Partial Occlusion of Veins
  - d. Sinusoids in Erectile Tissue Engorge with Blood
  - e. Penis Becomes Enlarged and Rigid
  - f. Emission - Efferent Sympathetic Impulses Cause
    - 1). Peristaltic Contraction of Reproductive Ducts
    - 2). Stimulation of Secretion by Seminal Vesicles and Prostate Gland
    - 3). Constriction of Internal Urethral Sphincter
  - g. Semen Accumulates in Prostatic Urethra
  - h. Ejaculation -Somatic Motor Impulses to Skeletal Muscles of
    - 1). Urogenital Diaphragm
    - 2). Base of Penis
  - i. Several Rhythmic Contractions Force Semen out of the Urethra
  - j. Resolution - Penis Loses Rigidity
  - k. Overall Feeling of Satisfaction
  - l. Inability to Achieve Second Erection and Ejaculation for Variable Amount of Time

Clinical Note p.  
936

### III. Female Reproductive System, p. 937

Fig. 28.8, p.937 TA-571  
System  
Interactions, p.  
938  
Fig. 28.9, p.938 TA-572

#### A. Ovaries

1. Size = 2-3.5 cm X 1-1.5 cm
2. Held in Position by Ligaments
  - a. Mesovarium Attaches to Broad Ligament
  - b. Suspensory Ligament
  - c. Ovarian Ligament
3. Ovarian Histology
  - a. Peritoneal Covering = Ovarian Epithelium
  - b. Tunica Albuginea
  - c. Dense Outer Portion = Cortex
  - d. Loose Inner Portion = Medulla
  - e. Vessels and Nerves Enter Medulla from Mesovarium
  - f. Follicles Contain Oocytes Scattered Throughout
4. Follicle and Oocyte Development
  - a. Oogenesis

Fig. 28.10, p.939 TA-573

Fig. 28.11, p.940 TA-574

- 1). Oogonia
  - a). Most Present Before Birth
  - b). All Start Meiosis
- 2). Primary Oocytes
  - a). About 2 Million at Birth
  - b). Surrounded by Granulosa Cells of Primordial Follicles
  - c). 300,000 -400,000 Left by Puberty
  - d). 400 or so Actually Ovulate
- 3). Become Primary Follicle
  - a). Oocyte Enlarges
  - b). Granulosa Cells Become Enlarged and Cuboidal
  - c). Zona Pellucida Forms
- 4). Becomes Secondary Follicle
  - a). Multiplication of Granulosa Cells
  - b). Formation of Vesicles which Fuse into Antrum
  - c). Surrounding Cells Become Theca
- 5). Becomes Mature or Graafian Follicle
  - a). Single Antrum Increases in Size
  - b). Fills with Additional Fluid Produced by Granulosa Cells
  - c). Oocyte in Cumulus Mass (Cumulus Oophorus)
- 6). Usually one Graafian Follicle Ovulates
  - a). Just Prior to Ovulation First Meiotic Division is Completed
  - b). Secondary Oocyte and Polar Body Formation
  - c). Second Meiotic Division Stops in Metaphase II

Fig. 28.12, p.941 TA-575

b. Ovulation

- 1). Graafian Follicle Swells, Forms Translucent Blister on Ovary
- 2). Follicle Eventually Bursts Followed by Expulsion of
  - a). Secondary Oocyte
  - b). Cumulus Mass
  - c). Zona Pellucida
- 3). Process of Expulsion = Ovulation
- 4). If Fertilization Occurs Second Meiotic Division is Completed
  - a). Second Polar Body Formed
  - b). Fertilized Oocyte Called Zygote

Fig. 28.11, p.940 TA-574

c. Fate of Follicle

- 1). After Ovulation Becomes Corpus Luteum (CL)
- 2). Former Granulosa and Theca Cells
  - a). Become Enlarged Luteal Cells
  - b). Secrete Steroids, Especially Progesterone
- 3). If Pregnancy Occurs CL of Pregnancy Remains
- 4). If no Pregnancy CL Degenerates
  - a). Lasts 10-12 Days
  - b). Becomes Corpus Albicans

B. Uterine Tubes

Fig. 28.9, p.938 TA-572

1. Paired Uterine Tubes (aka Fallopian Tubes or Oviducts)
  - a. Superior Margin of Broad Ligament
  - b. Held in Place by Mesosalpinx
  - c. Length about 10 cm

2. Open at one End to Peritoneal Cavity
  - a. Receives the Oocyte
  - b. Expanded Region = Infundibulum
  - c. Osteum Surrounded by Fimbriae
  - d. Luminal Surface Lined with Ciliated Mucous Membrane
3. Next Region Ampulla
4. Region Nearest Uterus = Isthmus
5. Intramural Part of the Tube
  - a. Passes through Uterine Wall
  - b. Very Small Opening
6. Wall of Tube
  - a. Serosal Layer
  - b. Muscular Layer
  - c. Mucosal Layer
    - 1). Simple Ciliated Columnar Epithelium
    - 2). Numerous Longitudinal folds

#### C. Uterus

Fig. 28.9, p.938 TA-572

1. Size and Shape
  - a. 7.5 cm X 5 cm
  - b. Pear-Shaped
  - c. Slightly Flattened Anterio-Posteriorly
2. Regions
  - a. Larger, Rounded Fundus
  - b. Main Section = Fundus
  - c. Isthmus
  - d. Narrower Cervix
3. Uterine Cavity Continuous with Cervical Canal through Osteum into Vagina
4. Ligaments Holding Uterus in Place
  - a. Broad Ligament
  - b. Round Ligament
  - c. Uterosacral Ligament
5. Antiverted Position Normal
  - a. Retroverted = Tipped Posteriorly
  - b. Prolapses = Extends Inferiorly into Vagina
    - 1). Weak Pelvic Floor Muscles
    - 2). Can be Caused by Childbirth
6. Uterine Wall
  - a. Perimetrium = Serous Membrane = Peritoneum
  - b. Myometrium = Muscle Layer
  - c. Endometrium = Mucous Membrane
    - 1). Thin Deep Basal Layer
      - a). Part of Lamina Propria
      - b). Continuous with Myometrium
    - 2). Thicker, Superficial Functional Layer
      - a) Most of Lamina Propria
      - b). Endothelium Lining Cavity
  - d. Cervical Lining of Columnar Epithelium
    - 1). Contains Cervical Mucous Glands
    - 2). Consistency of Mucus Changes During Cycle

Clinical Note,  
p.941

Fig. 28.9, p.938 TA-572

#### D. Vagina

Fig. 28.9, p.938 TA-572

1. Length about 10 cm from Uterus to Outside of body
2. Female Organ of Copulation, Receives Penis During Intercourse
3. Allows Menstrual Flow and Normal Passage for Child Birth
4. Structure
  - a. Longitudinal Ridges = Columns
  - b. Transverse Ridges = Rugae
  - c. Superior Domed Portion = Fornix
  - d. Cervix Attaches to and Extends into the Vagina

5. Wall Composition
  - a. Outer Muscular Layer
    - 1). Smooth Muscle
    - 2). Allows Vagina to Increase in Size
  - b. Inner Mucous Membrane
    - 1). Moist Stratified Squamous Epithelium
    - 2). Vaginal Mucous Membrane Produces Lubricating Secretions
6. Vaginal Opening or Orifice
  - a. Covered by Mucous Membrane = Hymen
  - b. Usually One or Two Small Perforations Allow Menstrual Flow
  - c. Opening Greatly Enlarged During First Sexual Intercourse
  - d. Can also be Perforated or Torn by Strenuous Physical Exercise Before First Intercourse

#### E. External Genitalia

Fig. 28.13, p.942

1. Vestibule
  - a. Vaginal Opening Posterior
  - b. Urethral Opening Anterior
  - c. Bounded by Labia Minora
  - d. Corpus spongiosum Analog
    - 1). Bulb of the Vestibule
    - 2). Lateral Margins of Vestibular Floor
2. Clitoris at Anterior Margin
  - a. Covered by Prepuce
  - b. Contains Corpus Cavernosa
  - c. < 2 cm Length
  - d. Crus of Clitoris Attaches Clitoris to Coxae
3. Glands
  - a. Greater Vestibular Gland
  - b. Lesser Vestibular Gland
4. Labia Majora
5. Mons Pubis
6. Pudendal Cleft

#### F. Perineum

Fig. 28.14, p.943 TA-576

1. Anterior Triangle
  - a. Urogenital Triangle
  - b. Contains External Genitalia
2. Posterior Triangle
  - a. Anal Triangle
  - b. Contains Anal Opening
3. Triangles Separated by Clinical Perineum
  - a. May Tear During Childbirth
  - b. Episiotomy Performed Here

#### G. Mammary Glands

Fig. 28.15, p.944 TA-577  
Clinical Note, p. 944

1. Sweat Gland Modified for Milk Production
2. Nipple and Areola
  - a. Sensitive to Tactile Stimulation
  - b. Smooth Muscle Contraction Causes Nipple Erection
  - c. Areolar Glands
3. Breast Enlargement at Puberty in Females
4. Internal Structure
  - a. 15-20 Glandular Lobes and Adipose Tissue Between
  - b. Single Lactiferous Duct from Each Lobe
    - 1). Lactiferous Sinus Near surface
    - 2). Subdivisions Supply Lobules

- 3). Ends of Finest Branches Form Enlarged Alveoli During Lactation
- 5. Breasts Held in Place by Mammary (Cooper's) Ligaments in Fascia and Skin

#### IV. Physiology of Female Reproduction

##### A. Puberty

Table 28.1, p.924

- 1. Menarche= First Period of Menstrual Bleeding
- 2. Changes Accompanying Puberty
  - a. Enlargement of Internal and External Genitalia
  - b. Deposition of Fat in Breasts and Around Hips
  - c. Mammary Ducts Develop
  - d. Growth of Pubic and Axillary Hair
  - e. Subtle Voice Changes
  - f. Development of a Sexual Drive
- 3. Physical Changes Caused by Hormonal Changes
  - a. Increased GnRH from Hypothalamus
  - b. LH and FSH from Anterior Pituitary
    - 1). Increased Amounts
    - 2). Cyclic Pattern Established
  - c. Increased Estrogen and Progesterone from Ovaries

##### B. Menstrual Cycle

Fig. 28.16, p.946 TA-578, 57  
Table 28.2, p.945

- 1. Menses
  - a. Sloughing of Endometrial Lining
  - b. Occurs Every 18-40 Days
- 2. Ovulation Occurs Day 14 (Half-Point of Cycle)
  - a. Varies from Individual to Individual
  - b. Varies from Cycle to Cycle
- 3. Phases
  - a. Between End of Last Menses and Ovulation
    - 1). Follicular Phase of Ovary
    - 2). Proliferative Phase of Uterus
  - b. From Ovulation to Menses
    - 1). Luteal Phase of Ovary
    - 2). Secretory Phase of Uterus

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- 4. Ovarian Cycle
  - a. Cyclic Events in Sexually Mature Ovary
  - b. Controlled by Hypothalamus and Anterior Pituitary
  - c. Many Follicles Begin Developing Each Cycle
    - 1). Normally only One Follicle Ovulates per Cycle
    - 2). Most Follicles do not Ovulate Until One or More Cycles After Beginning Development
  - d. Sequence of Events

Fig. 28.17, p. 947 TA-580  
Predict Quest. 3

- 1). Increase in GnRH Release
- 2). Increased Production and Release of LH and FSH
  - a). FSH's Main Effect on Granulosa Cells
  - b). Lh's Main Effect on Theca Cells
  - c). Theca Interna Cells Produce Androgens and Some Progesterone
  - d). Granulosa Cells Convert Androgens to Estrogens
  - e). Inhibin Produced by Follicles
- 3). Estrogen Levels Increase
  - a). Initial Negative Feedback on Anterior

Fig. 28.16, p.946 TA-578, 57  
Fig. 28.17, p. 947 TA-580

Pituitary

- b). Positive Feedback Effect Later in Cycle
- 4). Rapid Increase in LH and FSH
  - a) LH surge Initiates Ovulation and CL Formation
  - b). FSH Increases Follicular Sensitivity to LH and Stimulates Initial Development of New Follicles
- 5). CL Secretes Progesterone
- 6). Negative Feedback on GnRH Secretion and Decreased LH and FSH Secretion
- 7). If Fertilization Occurs Human Chorionic Gonadotropin (HCG) from Developing Embryo
- 8) If no Fertilization CL Degenerates after Day 25 or 26 of Cycle
- 9). Menses Occurs

Predict Quest. 3

5. Uterine Cycle

Fig. 28.16, p.946 TA-578, 57  
Predict Quest. 4

- a. Cyclic Changes Primarily in Endometrium
- b. Proliferation After Menses
  - 1). Epithelial Cells of Basal Layer Divide
  - 2). Epithelium Folds Form Tubular Spiral Glands
  - 3). Spiral Arteries Develop
- c. After Ovulation
  - 1). Epithelium Thickens
  - 2). Spiral Glands Secrete Glycogen
  - 3). Prepared for Implantation by 7 Days after Ovulation
- d. Effects of Estrogen
  - 1). Increase Proliferation
  - 2). Increase Progesterone Receptor Molecules
- e. Effects of Progesterone
  - 1). Hypertrophy of Endometrium and Myometrium
  - 2). Inhibits Contraction of Myometrium
- f. Uterine Lining Degenerates if CL Degenerates
  - 1). Spiral Arteries Constrict as Progesterone Levels Fall
  - 2). Spiral Glands Become Ischemic, then Necrotic
- g. Menstrual Flow
  - 1). Blood
  - 2). Necrotic Endometrium
  - 3). Mucous Secretions

Clinical Note, p. 949

C. Female Sexual Behavior and the Female Sex Act

- 1. Neural Pathways are Same as Males'
  - a. Ascending Paths Primarily through Spinothalamic Tracts
  - b. Descending Paths through Sacral Reflexes
    - 1). Parasympathetic Fibers
    - 2). Sympathetic Fibers
    - 3). Somatic Motor Fibers
- 2. The Sexual Response
  - a. Parasympathetic Stimuli Lead to Engorgement of Erectile Tissues
  - b. Mucous Secretions Decrease Friction During Intercourse
    - 1). Vestibular Glands Secrete Mucus
    - 2). Vaginal Wall Glands Secrete Mucus
  - c. Tactile Stimulation Together with Psychological

Stimuli Lead to Orgasm

- 1). Rhythmic Contraction of Vagina, Uterus and Perineal Muscles
- 2). General Increase in Overall Skeletal Muscle Tension

d. Resolution and Sense of Satisfaction and Relaxation Follows

- e. Multiple Orgasms Possible
- f. Orgasm Not Necessary for Successful Fertilization

D. Female Fertility and Pregnancy

1. Sperm Move from Ejaculate in Vagina to Ampulla of Uterine Tube
2. Require
  - a. Sperm Motility
  - b. Contractions of Uterus and Uterine Tubes
3. Capacitation of Sperm and Acrosomal Activation
  - a. Allows Penetration of Sperm
  - b. Must Traverse
    - 1). Cervical Mucus
    - 2). Cumulus Mass Cells
    - 3). Oocyte Cell Membrane
4. Oocyte can be Fertilized for up to 24 hrs. Following Ovulate
5. Sperm Viability in Female Reproductive Tract
  - a. up to 72 hrs.
  - b. Most Degenerate After 24 hrs.
6. Intercourse Between 3 Days Before Ovulation and 1 Day After Ovulation = Greatest Chance for Successful Fertilization
7. Fertilized Oocyte Divides into Trophoblast which Implants into Endometrium
8. Hormonal Profile
  - a. Trophoblast
    - 1). Secretes HCG
    - 2). Estrogens and Progesterone From Maternal CL
    - 3). HCG Secretion Peaks 8-9 Weeks Post Fertilization
  - b. After 120 Days Mature Placenta Secretes own Estrogen and Progesterone to Maintain Pregnancy

Clinical Focus,  
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Fig. 28.18, p.950 TA-581

Clinical Note,  
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Fig. 28.18, p.951 TA-581

E. Menopause

1. Begins at 40-50 yrs. of Age
2. Menstrual Cycles Become Irregular Then Ends Altogether
3. Time from Onset of Irregular Cycles to Cessation of Menstruation = Female Climacteric
4. Age-Related Changes in Ovary
5. Symptoms of the Female Climacteric
  - a. Hot Flashes
  - b. Irritability
  - c. Fatigue
  - d. Anxiety
  - e. Some Occasionally Suffer Emotional disturbances
6. Hormone Replacement Therapy
  - a. Treats Symptoms and Helps Prevent Osteoporosis
  - b. Prolongs Symptoms, Small Increase in Probability of Developing Breast and Uterine Cancers

Table 28.3, p.  
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**IMPORTANT CONSIDERATIONS:** There are three broad categories of topics here, the male reproductive tract and function, the female reproductive tract and function, and the changes associated with puberty, aging and pregnancy. Each of these can readily be expanded to two or more lecture presentations.

Some classes may find this set of topics to be uncomfortable to discuss in public. Be as sensitive to the discomfort level as possible and try to set an appropriate tone allowing the important information and concepts to be conveyed without being offensive.

Discussions of birth control are probably the most delicate.

Defining meiosis and gametogenesis at the outset helps students understand how the tracts are differently modified to facilitate gametogenesis, fertilization and/or development of the fetus.

**SEE INSTRUCTOR'S MANUAL AND COURSE SOLUTIONS MANUAL FOR ADDITIONAL RESOURCES.**