Objectives
To identify the major anatomical features of the male reproductive system.
To identify the major anatomical features of the female reproductive system.
To identify the hormones involved with gamete production.
To outline the steps of the ovarian and uterine cycles.

Male Anatomy
Testes - lie within the scrotum, where sperm are produced. Need a lower temperature than body.
Seminiferous Tubules - Tubes within the testes where spermatogenesis occurs.
Epididymis - Tube located just outside the testis where sperm mature. Stored here prior to ejaculation.
Vas (Ductus) deferens - The connective tube that joins to the epididymis and empties out the urethra, that transports sperm.

Anatomy of the Male

Glands of Male
Seminal vesicles - located at base and just slightly dorsal of bladder.
Prostate Gland - Surrounds the urethra just inferior to the bladder.
Bulbourethral (Cowper’s) gland - Lie just inferior to the prostrate on either side of urethra.
Specialized Cells of Male Reproductive System

**Sperm** - Sex cells produced in the testes. Has three parts: a tail, middle piece and head. Acrosome contains enzymes that facilitate penetration of the egg.

**Interstitial Cells** - Cells that lie between the seminiferous tubules that produce androgen hormones, most importantly is testosterone.

Anatomy of the Sperm

Semen

Composition:
- 2-5 ml of fluids
- Sperm (20-150 million/ml)
- Secretions of three glands
  - Alkaline components (buffering)
  - Fructose/citrate (energy)
  - Enzymes (coagulating)
  - Prostaglandins

The Penis

Structure associated with:
- Penetration (into female repro tract)
- Sperm Delivery
Composition:
- Erectile tissue – under parasym control.
  - Corpus spongiosum (surrounds urethra)
  - Corporus cavernosa (paired/dorsal)
- Ejaculation – sympathetic response

Hormones

Significant to Male Reproduction

**Hypothalamus** has ultimate control of the testes’ sexual function.
- Gonadotropic releasing hormone (GnRH) - stimulates pituitary to release FSH & LH.
  **Anterior pituitary**
- Follicle stimulating hormone (FSH) - Promotes spermatogenesis i.e. sperm formation.
- Luteinizing hormone (LH) - Promotes testosterone in the interstitial cells.
Hormones (continued)

**Testes** (interstitial cells)
- Testosterone - Function of the primary sex organs, also necessary for sperm production
  - Promotes and maintains male secondary sexual characteristics.
  - Sex drive & to some degree aggressiveness.

Spermatogenesis

The process of sperm formation occurs in seminiferous tubules of the testes.

**Spermatogonia** - cells from which sperm originate.

By process of meiosis 4 haploid sperm are produced for each spermatogonia.

Secondary Sexual Characteristics (for men)
- Under influence of testosterone
- Initiated during puberty.
  - Facial & pubic hair
  - Stimulates bone & muscle growth
  - Deepening of voice
  - Skin changes (thicker & more oil)
  - Sex drive

Female Anatomy

**Ovaries** - Gonads where oogenesis occurs.

**Uterine Tubes** aka fallopian tubes or oviducts - Tubes that are near, but not in direct contact with ovaries, catch the egg and propel it towards the uterus with cilia that beat towards the uterus. Fertilization usually occurs here.

**Uterus** - Thick- walled muscular organ about the size and shape of an inverted pear.

**Vagina** - Tube with mucosal lining that extends from the cervix of the uterus to the outside of the body.
The ovaries (external view)

The ovaries:
- Produce eggs.
- Produce hormones
- The fimbriae capture the ovulated egg.
The uterine tube a.k.a fallopian tube conducts the egg to the uterus.

Interesting facts about Ovaries

- Almond sized (paired)
- Retroperitoneal
- Held in place by suspension of ovarian ligaments.
- A human female is born with 400,000 primary follicles (in suspended state of meiosis).
- Maturation of follicles depends upon hormonal signals, initiated after puberty.

The Ovarian Cycle

Stages:
- Follicular
- Ovulation
- Luteal

The role of the Corpus luteum

Corpus luteum translated means "yellow body."
- This structure forms after the egg is expelled from the follicle.
- The corpus luteum is responsible for hormonal communication to the uterus. (progesterone & estrogen)
- If pregnancy does not occur it will degenerate.

Hormones

Significant to Female Reproduction

Hypothalamus – GnRH

Anterior Pituitary –
- FSH – stimulates growth of follicle (in ovary)
- LH – influences ovulation (release of ova) – peaks just prior to release. LH influenced by high estrogen.

Ovaries –
- When high levels are in blood prevents ovulation.
- Secondary female sexual characteristics.

Eggs form by meiosis.

A special process called oogenesis
Effects of Estrogens
- Promote oogenesis and follicle growth in the ovary.
- Exert anabolic effects on the female reproductive tract.
- Support the rapid but short-lived growth spurt at puberty.
- Promotes & Induces secondary sex characteristics
  - Growth of the breasts
  - Increased deposit of subcutaneous fat (hips and breasts)
  - Widening and lightening of the pelvis

Uterine Cycle
I. Includes menses/menstruation that begins the uterine cycle at day 1 or 0. 
   *Menstrual phase*
II. During days 6-13 estrogen production by the ovarian follicle causes the endometrium to thicken *Proliferative phase.*
III. *Ovulation* occurs on day 14.
IV. During days 15-28, progesterone production by the corpus luteum increases causing the endometrium to double in thickness (in preparation for possible pregnancy).
V. When both estrogen and progesterone levels fall then Menstruation (bleeding) begins. *Secretory phase*

Fertilization
Occurs in the **oviduct**.
When the “winner” sperm penetrates the egg, a chemical reaction occurs that creates a barrier called the ..... "Fertilization Membrane"
Only 1 sperm will fertilize → restores the diploid state.

Pregnancy
Occurs when the developing embryo embeds itself in the endometrial lining.
Occurs several days following fertilization.
During implantation the embryonic membrane surrounding the embryo begins to produce **human chorionic gonadotropic hormone (HCG)**, which stimulates the corpus luteum to increase progesterone output to maintain endometrium.
Placenta

The placenta is both maternal and fetal tissue, and the site where nutrients and gases are exchanged between the embryo and the mother.

Composed of numerous layers, most significantly chorion and amnion.

> Chorionic gonadotropin (HCG) hormone produced by placenta – used in pregnancy tests.

Specialized cells of the Female Reproductive System

Follicles - sac like structures which contains immature eggs, within the ovary.

Corpus Leuteum - The sac like, glandular structure, found within the ovary, after ovulation occurs.

Secretes BOTH

> Estrogen
> Progesterone.

The Corpus leuteum degenerates if pregnancy does not occur, but will maintain the uterine lining if it does.

Menopause

Declining estrogen levels →

- Atrophy of reproductive organs and breasts
- Irritability and depression in some
- Hot flashes as skin blood vessels undergo intense vasodilation
- Gradual thinning of the skin and bone loss
- Increased total blood cholesterol levels and falling HDL

Credits


Figure images from Image library of Biology Life on Earth, T. Audesirk and G. Audesirk, 2002.