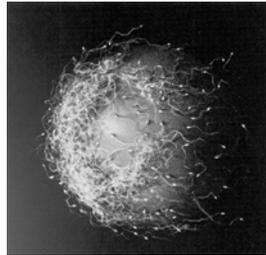


Reproduction

BIOS 6130
Animal Physiology



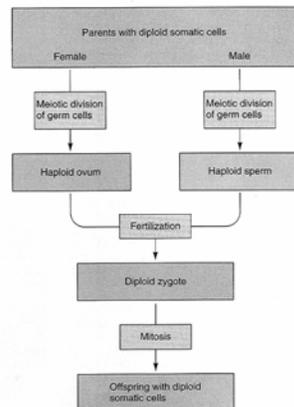
The reproductive system

- The reproduction of a new individual is accomplished by the act of a sperm penetrating a female's egg. In the process, a new individual is produced that contains $\frac{1}{2}$ of the chromosomes donated by the male and $\frac{1}{2}$ by the female. Each new individual will be a unique combination of these chromosomes.



Reproductive cells
Normal body tissues contain 46 chromosomes that contain DNA (diploid).

Gametes contain 23 chromosomes: haploid cells



Animals employ a variety of reproductive strategies to ensure survival of the species

Ecological Approaches

Physiological Approaches

Seasonal Breeding

Synchronized reproduction between the sexes



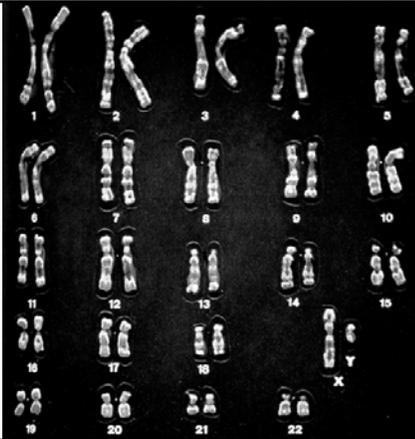
What determines the sex of an animal?

- **Sex Chromosomes**
- **Environmental Stimuli**

Reproductive cells

- Normal body tissues contain 46 chromosomes that contain DNA (diploid)
- Gametes contain 23 chromosomes: haploid cells

What would be the genetic sex of the mammal with this DNA?



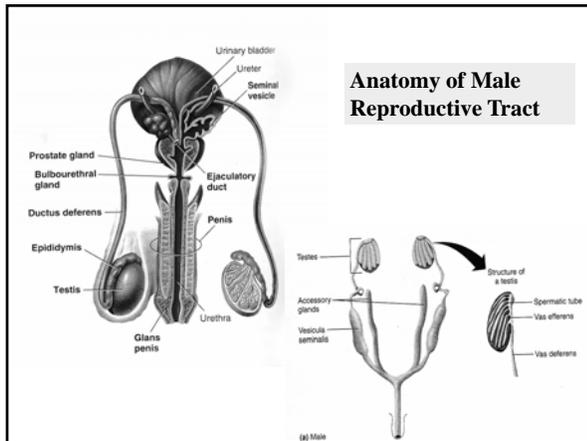
Reproductive Terminology: Gonads

Produce gametes (germ cells)

Function to secrete sex hormones

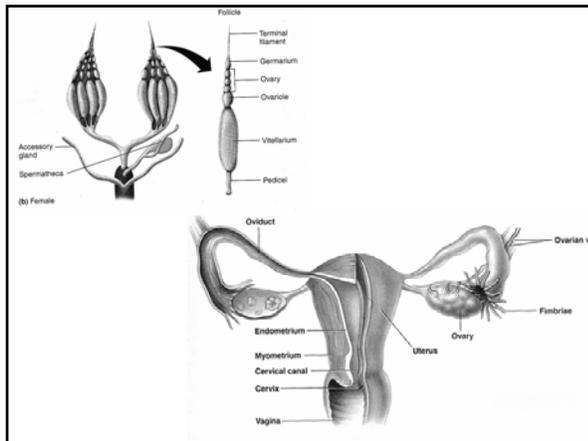
Male reproductive functions

- Production of sperm
- Delivery of sperm to female



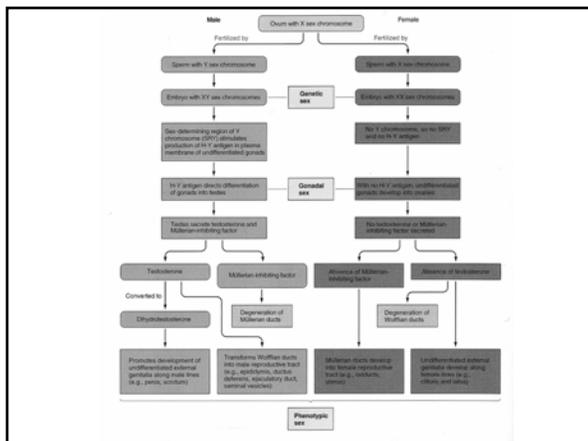
Female reproductive functions

- Production and storage of eggs for ova
- Reception of sperm from the male
- Maintains developing fetus
- Giving birth
- Nourish baby; produce milk



What determines the development of male or female reproductive systems in mammals?

Sex differentiation in mammals depends on the presence or absence of masculinizing determinants during critical periods of embryonic development



Male reproductive physiology

- Seminiferous tubules
Spermatogenesis
Testosterone

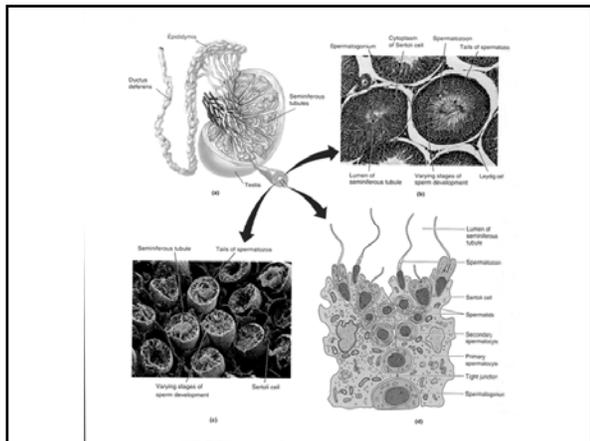


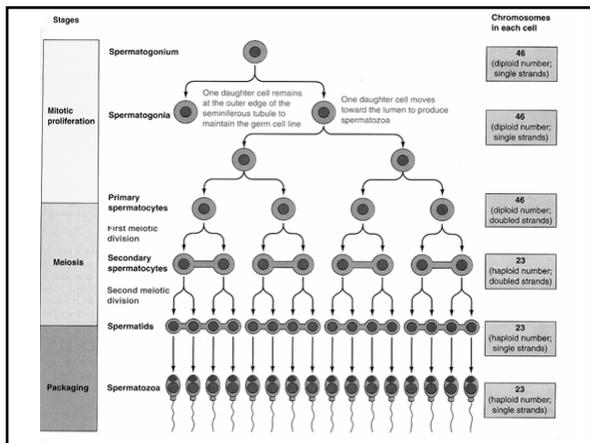
Testosterone's actions in the body

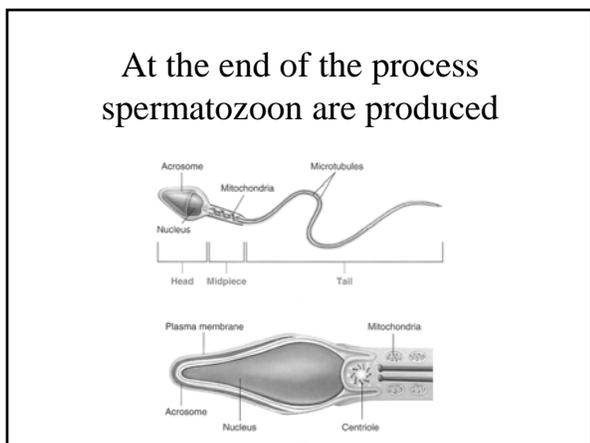
- Effects reproductive system before birth
- Effects sex-specific tissues during puberty
- Develops males sex drive
- Effects secondary sexual characteristics
- Has non reproductive actions

Spermatogenesis

- A process by which undifferentiated primordial germ cells proliferate and are converted into extremely specialized motile, spermatozoa.
- Each spermatozoa bears a randomly distributed haploid set of 23 chromosomes.







Sertoli cells:

Sertoli cells form a ring that extends from the outer membrane of the seminiferous tubules to the lumen of the tubule.

Each Sertoli cell spans the entire distance from the outer membrane towards the center and adjacent Sertoli cells are connected by tight junctions.

During spermatogenesis, developing sperm cells pass through these tight junctions and migrate toward the lumen.

The cytoplasm of the Sertoli cells envelop the migrating cells throughout their journey to the lumen.

Sertoli cells

Ensure that only selected molecules can pass through to sperm cells

Provide nourishment to sperm cells

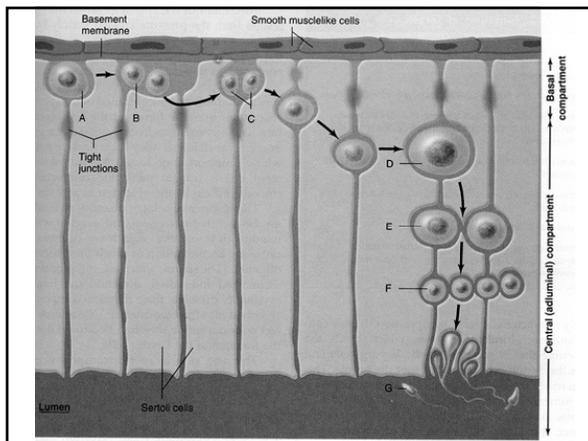
Phagocytotic function

Secrete fluid into lumen of the seminiferous tubules

Binds to testosterone

Site of action for two separate hormones

Release inhibin



Hormone regulation in the male reproductive system

- Luteinizing hormone (LH)
- Follicle-stimulating hormone (FSH)

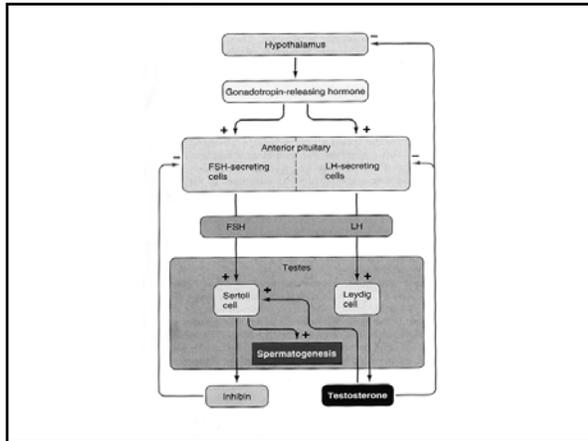
LH acts on Leydig cells to regulate testosterone secretion.

FSH acts on the Sertoli cells of the seminiferous tubules to enhance spermatogenesis

Testosterone and FSH play critical roles in controlling spermatogenesis by acting on Sertoli cells

FSH is required for spermatid remodeling

Testosterone is essential for both mitosis and meiosis of undifferentiated sperm cell. To ensure that high levels of testosterone remain at high levels in the seminiferous tubules, Sertoli cells secrete an androgen binding protein.



Regulation of male sex hormones

Secretion of both LH and FSH from the anterior pituitary is stimulated by gonadotropin-releasing hormone (GnRH)

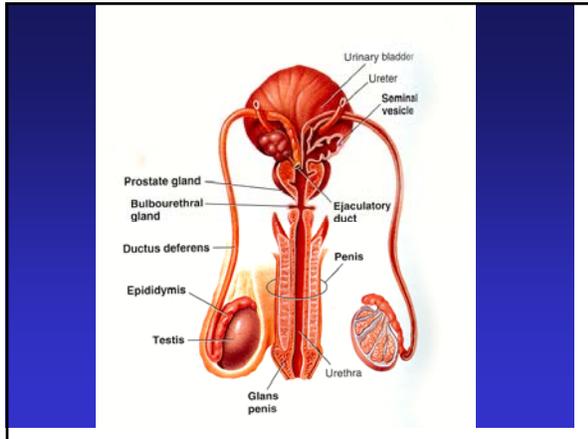
Route for sperm travel

- Epididymis
- Vas Deferens

Accessory glands

- Seminal vesicles
- Prostate gland

Bulbourethral gland



Contribution of Seminal Vesicles

Supplies fructose

Secrete prostaglandins

Dilutes sperm

Secrete fibrinogen

Contribution of prostate gland

Secretes alkaline fluid

Provides clotting enzymes and fibrinolysin

***Contribution of
bulbourethral gland***

Provides lubrication for sexual intercourse

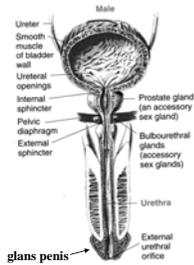
Male sex act

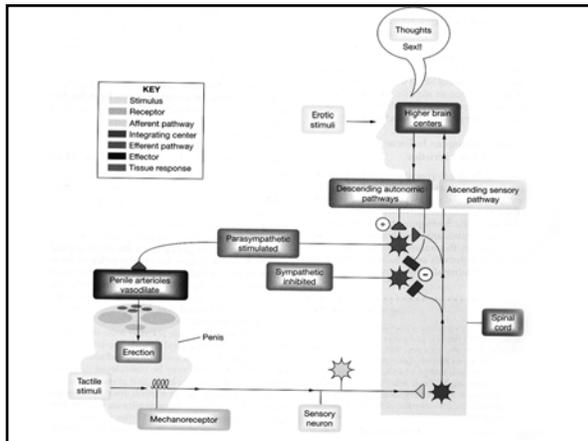
- Erection
- Ejaculation



Erection reflex

Spinal reflex triggered by stimulation of mechanoreceptors located in the tip of the penis





Two phases of ejaculation

Emission

Contraction of smooth muscles in the prostate, reproductive ducts and seminal vesicles that delivers semen into the urethra

Expulsion

Filling of the urethra with semen triggers nerve impulses that activates skeletal muscles at the base of the penis. Rhythmic contraction of these muscles occur, increases the pressure within the penis and forcibly expels semen through the urethra to the exterior.
