Lecture Outline

- The Basics
  - Gametogenesis
  - Gender determination
- The Pituitary-Gonad Axis
- Female Reproductive Physiology
  - Ovarian Cycle
  - Uterine Cycle
  - Hormonal control and changes
- Male Reproductive Physiology

Male Reproductive Physiology

Basic Functions

- Function
  - Produce, maintain & transport viable spermatozoa
    - Testes
    - Epididymis
    - Ductus deferens
    - Accessory glands
      - Prostate
      - Seminal vesicles
      - Bulbourethral glands
  - Hormone production that
    - develops secondary sexual characteristics
    - Involved in feedback mechanisms relating to spermatogenesis

Male Reproductive Physiology

Testes

- Site of Sperm production
  - Divided into lobules, each with seminiferous tubules.
  - Seminiferous tubule functions to
    - Maintain environment for spermatogonia by the basal lamina and the Sertoli cells
      - Sertoli cells separate the lumen from the basal lamina and create a blood-testis barrier
      - Creates three compartments
        - » Lumen – low glucose, high K^+ & steroid hormones
        - » Basal compartment – the baso-lateral side of the sertoli cells & containing the developing spermatogonia
        - » Interstitial fluid space – below the basal lamina and contains the Leydig cells
    - Produce hormones/paracrines
      - From Sertoli cells
      - From Leydig cells

Male Reproductive Physiology

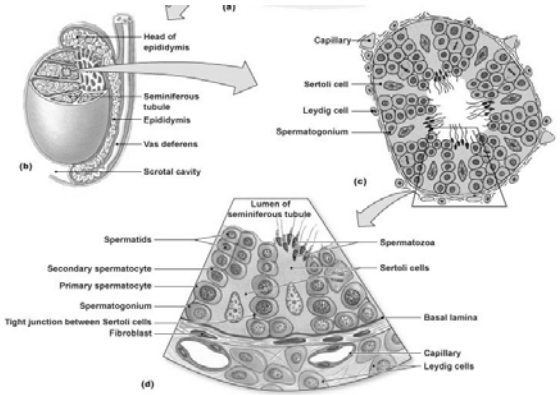
Testis

- Sertoli cells
  - Produce hormones & paracrines involved with control of hypothalamus-pituitary-gonad axis and the testes directly
    - Anti-Müllerian Hormone (AMH)
      - Secreted during embryogenesis
      - Prevents development of the Müllerian ducts
    - Inhibin & activin
      - Regulate FSH release from anterior pituitary
        - » inhibin decreases FSH release
        - » activin increases LH function & increases FSH release
    - Androgen Binding Protein (ABP)
      - Binds to testosterone and DHT, reduces the loses due to diffusion resulting in an increase in testicular testosterone levels
    - Estradiols & Aromatase
      - Support spermatogenesis

Male Reproductive Physiology
Testis

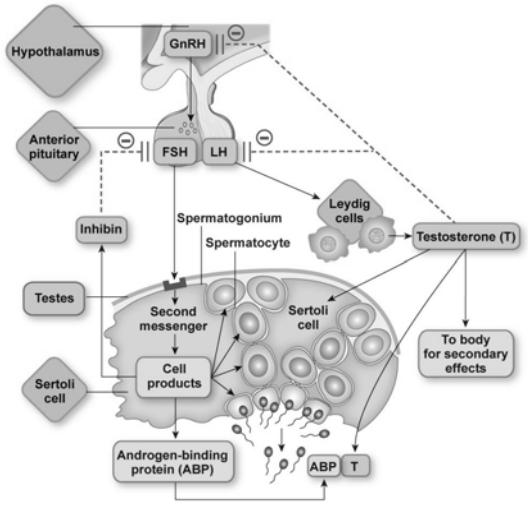
- Sertoli cells, cont…
  - GDNF (glial derived neurotrophic factor) & ERM transcription factor
    - Maintenance of the stem cell line
- Leydig cells
  - Produce androgens
    - testosterone, androstenedione and dehydroepiandrosterone (DHEA)
      - Increase spermatogenesis
      - Influence secondary sexual characteristics
  - Stimulated to produce androgens by luteinizing hormone (LH)
    - FSH increases the response to LH by Leydig cells

Male Reproductive Phsyiology
Testes



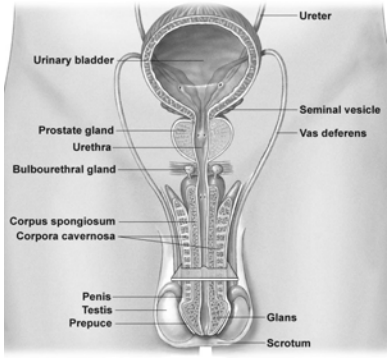
Male Reproductive Physiology
Testes

Spermatogenesis
Hormonal Control
Flow Chart



Male Reproductive Physiology
Accessory Gland Function

- Job of the accessory glands is to
  - Secrete seminal fluid (99% of semen volume)
    - Components of seminal fluid
      - Mucus
      - Water
      - Nutrients
      - Buffers
      - Enzymes
      - Prostaglandins
      - Zinc?
  - Accessory Glands
    - Prostate
    - Seminal vesicles
    - Bulbourethral glands



Male Reproductive Physiology

Accessory Gland Function

Seminal Fluid Components, Function and Location (source)

From Table 26-3

Mucus	Lubricant	Bulbourethral glands
Water	Provides liquid medium	All accessory glands
Buffers	Neutralize acidic environment of the vagina	Prostate, bulbo-urethral glands
Nutrients	Nourish sperm	
Fructose		Seminal vesicles
Citric acid		Prostate
Vitamin C		Seminal vesicles
Carnitine		Epididymis
Enzymes	Clot semen in vagina, then liquefy the clot	Seminal vesicles and prostate
Zinc	Unknown; possible association with fertility	Unknown
Prostaglandins	Smooth muscle contraction; may aid sperm transport	Seminal vesicles

Male Reproductive Physiology

The sexual response

- Remember
  - Function of the reproductive system is to reproduce
  - Males contribution is
    - Deliver viable sperm into the vagina
    - Requires a complex neural reflex – the erection reflex
      - Creates changes in vascular condition within the penile arterioles
        - » Initiated by erotic stimuli (visual, auditory, tactile, cerebral)
        - » the parasympathetic division of the ANS causes vasodilation of the penile arterioles
        - » Erectile tissue fills with blood creating an erection

Male Reproductive Physiology

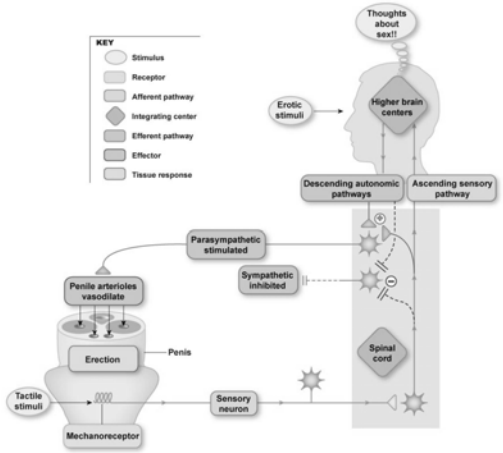
The sexual response

- Remember
  - Function of the reproductive system is to reproduce
  - Males contribution is
    - Deliver viable sperm into the vagina
    - Requires a complex neural reflexes
      - Starts with the erection reflex which creates changes in vascular condition within the penile arterioles
        - » Initiated by erotic stimuli (visual, auditory, tactile, cerebral)
        - » the parasympathetic division of the ANS causes vasodilation of the penile arterioles
        - » Erectile tissue fills with blood creating an erection
      - Emission & Ejaculation during climax
        - » Emission is the movment of sperm from vas deferens into the urethra adding seminal fluid along the way, this is under sympathetic control
        - » Ejaculation is the expulsion of semen due to strong muscular contractions – this is a spinal reflex

Male Reproductive Physiology

The sexual response

Erection Reflex Pathway



Male Reproductive Physiology

The sexual response

- Emission & Ejaculation during climax
  - Emission is the movement of sperm from vas deferens into the urethra adding seminal fluid along the way, this is under sympathetic control
  - Ejaculation is the expulsion of semen due to strong muscular contractions – this is a spinal reflex
    - » Started with the contraction of the bulbospongiosus muscle

- Disorders
  - Erectile dysfunction (ED)
  - Premature ejaculation
  - Prolonged ejaculation / anorgasmic