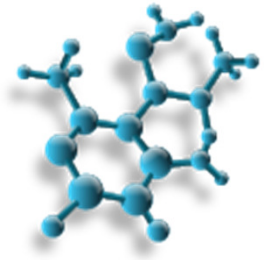
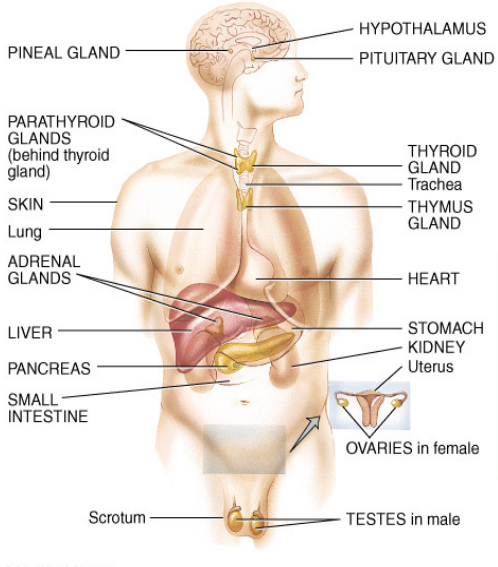
PTA/OTA 106
Unit 2 Lecture 4



Introduction to the Endocrine System



FUNCTIONS OF HORMONES

1. Help regulate:
   - chemical composition and volume of internal environment (extracellular fluid)
   - metabolism and energy balance
   - biological clock (circadian rhythms)
   - contraction of smooth and cardiac muscle fibers
   - glandular secretions
   - some immune system activities.
2. Control growth and development.
3. Regulate operation of reproductive systems.

Anterior Pituitary or Adenohypophysis

Corticotrophs

Adrenocorticotropic hormone (ACTH)

Hypothalamic Control

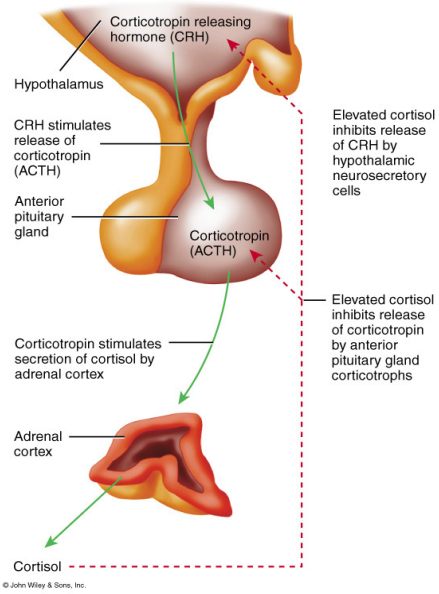
Corticotropic releasing hormone (CRH)

Target Tissue

Adrenal cortex, Zona Fasciculata

Hormone affects:

control production of glucocorticoids such as cortisol



Adrenal Cortex

Zona Fasciculata

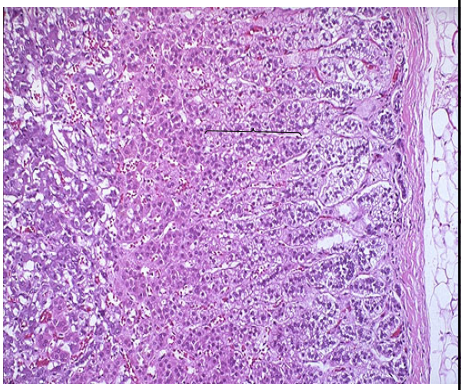
Glucocorticoids such as cortisol and cortisone

Hormone control:

ACTH

Target tissue:

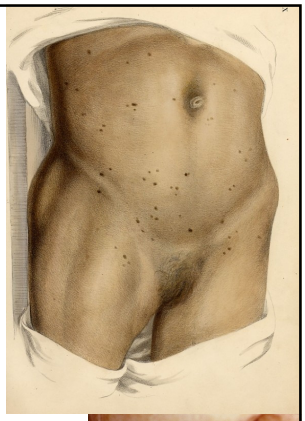
Liver and general body cells



Hormone affects:

- helps maintain blood pressure and cardiovascular function
- helps slow the immune system's inflammatory response
- helps balance the effects of insulin in breaking down sugar for energy
- helps regulate the metabolism of proteins, carbohydrates, and fats
- helps maintain proper arousal and sense of well-being

Adrenal Cortex



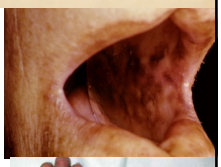
Hypo-secretion

Addison's disease –

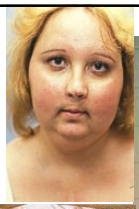
Failure to produce adequate levels of cortisol

Symptoms

chronic, worsening fatigue , muscle weakness , loss of appetite , weight loss , nausea , vomiting ,diarrhea
Other symptoms include
low blood pressure that falls further when standing, causing dizziness or fainting
hyperpigmentation, or dark tanning;
this darkening of the skin is most visible on scars; skin folds; pressure points such as the elbows, knees, knuckles, and toes; lips; and mucous membranes



Adrenal Cortex



Hyper-secretion:

Cushing's Syndrome

Symptoms

- Upper body obesity, rounded face, increased fat around the neck, and thinning arms and legs. Children tend to be obese with slowed growth rates.
- Skin, becomes fragile and thin. bruises easily and heals poorly. Purplish pink stretch marks may appear on the abdomen, thighs, buttocks, arms and breasts
- Women usually have excess hair growth on their faces, necks, chests, abdomens, and thighs

Endocrine activity of the Adrenal Cortex

- **Zona glomerulosa**

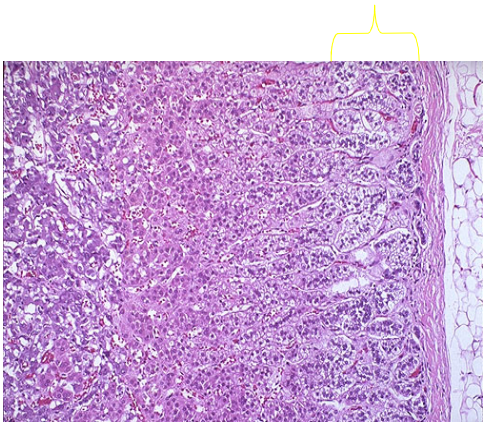
  Mineralocorticoids such as Aldosterone
- **Hormonal control**

  renin-angiotensin pathway

  permissive effect of ACTH
- **Target Tissue:**

  Principal cells of the DCT and collecting duct
- **Hormone Affects:**

  increases reabsorption of Na+ and water



Endocrine activity of the Adrenal Cortex

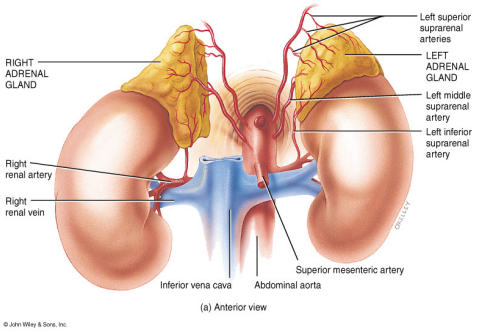
- **Hyper-secretion:**

  Aldosteronism:

  Hypokalemia, increase in extracellular fluid and blood volume,and hyertension, may also have peroid of muscular paralysis
- **Hypo-secretion:**

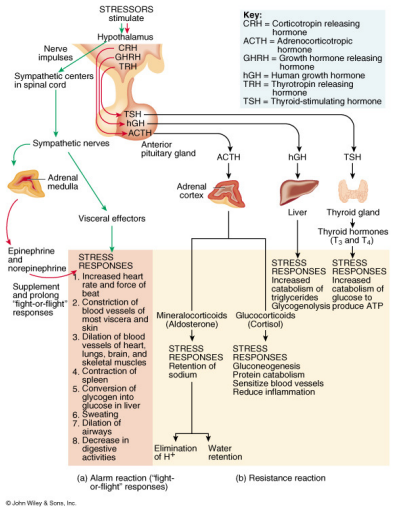
  Addison's disease

  mineralocorticoids deficiency, death occurs in four days to two weeks if untreated

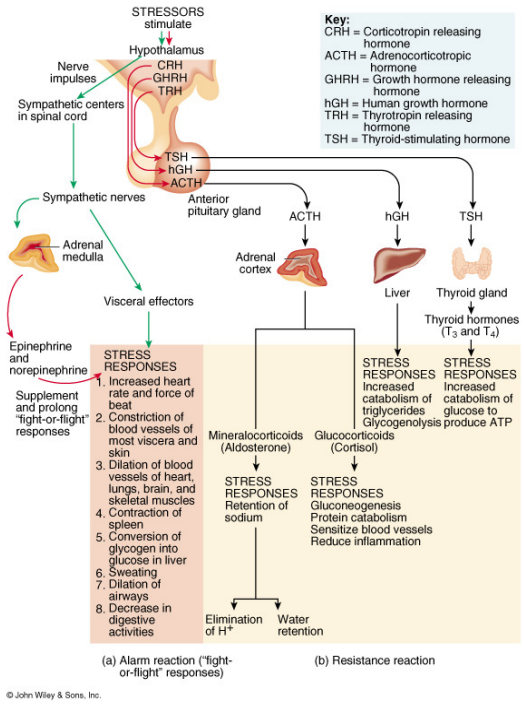


Endocrine activity of the Adrenal Cortex

- **Hormone Affects:**
  - **Elevated blood glucose levels**
  - **Reduction of protein stores in all body cells except the liver**
  - **increased plasma protein levels**
  - **promote lipolysis and beta oxidation of fat**
  - **Helps body recover from stress**
  - **Prevention of inflammation**



Overview of the interactions of hormones in response to stress



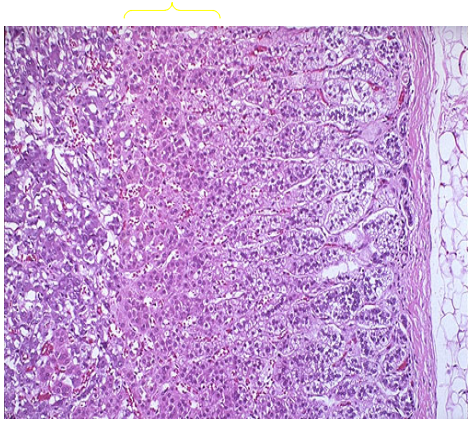
Endocrine activity of the Adrenal Cortex

- **Zona reticularis**

  Produces small anounts of androgens, mostly dehydroepiandrosterone (DHEA), DHEA may be converted into estrogens
- **Hormone Control:**

  Believed to be ACTH
- **Target tissue:**

  General body cells



Endocrine activity of the Adrenal Cortex

- **DHEA:** in normal physiology is responsible for energy levels and sex drive in both male and women.
- **Hyper-secretion** may lead to Precocious puberty is appearance of secondary sexual characteristics in children, before the age of 8 years

Adrenogenital Syndrome

- In Adult females DHEA causes beard growth, deeper voice, masculine distribution of body hair (hirsutism), and growth of the clitoris to resemble a penis.

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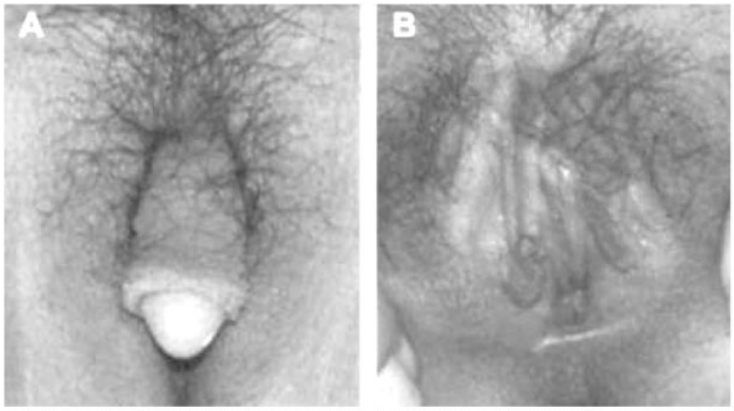
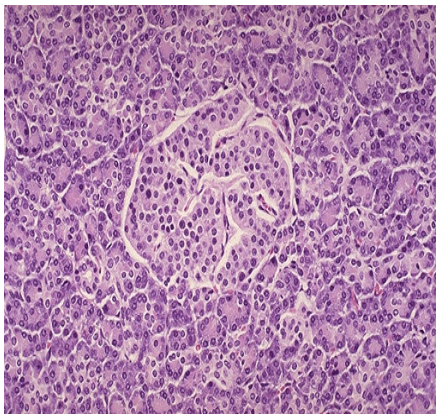
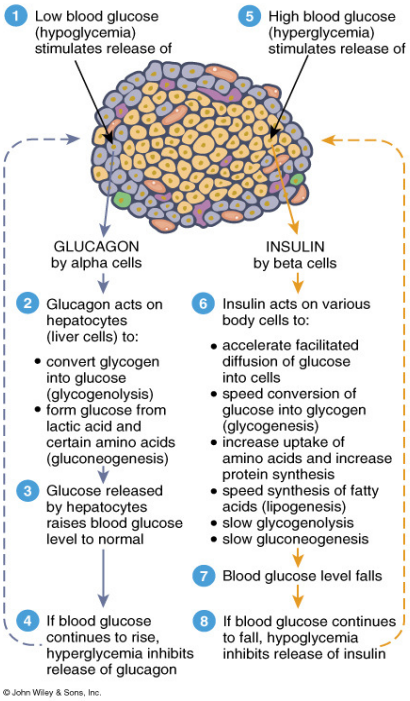


Figure 2 - External genitalia of patient with congenital adrenal hyperplasia before (A) and after (B) genitoplasty - cosmetic result classified as good

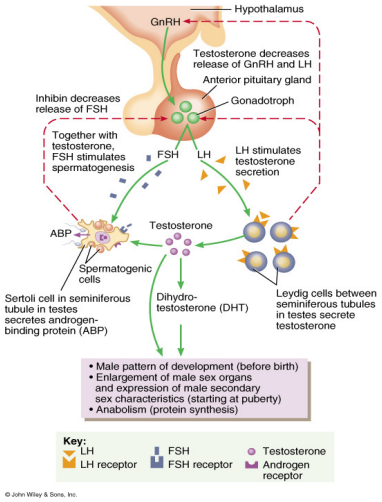
Interaction of 2 Pancreatic Hormones





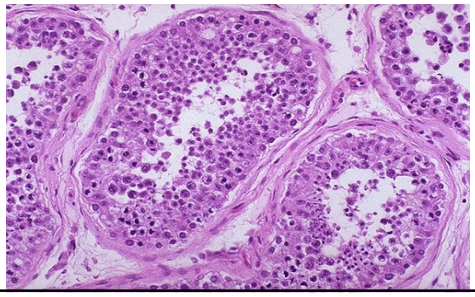
Hormonal control of the Male Reproductive System

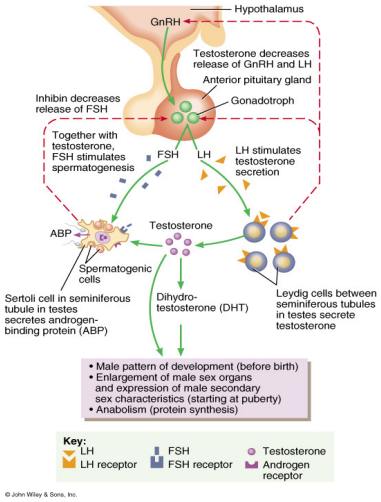
- **Hypothalamus releases GnRH**
- **GnRH stimulates the Gonadotrophs of the adenohypophysis to release FSH and LH**
- **FSH stimulates Sertoli cells to secrete Androgen-binding protein (ABP) and stimulates spermatogenesis.**



Hormonal control of the Male Reproductive System

- **LH stimulates the Leydig cells to secrete testosterone**
- **Inhibin secreted by Sertoli cells controls the release of FSH by gonadotrophs**



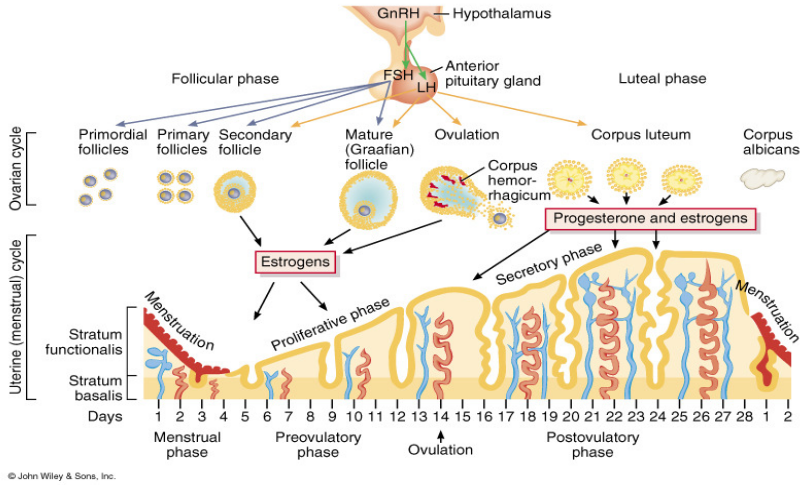


Male Menopause Myth or Reality? Andropause

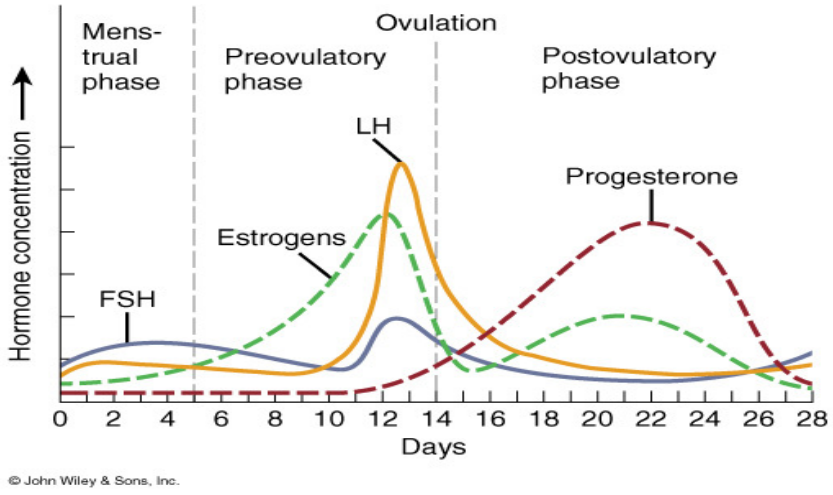
- At 40 testosterone levels begin to decline
- Between 45 and 50 there is a steep drop in blood levels
- By 80 50% of men have low testosterone levels

- Signs and symptoms
- 1. Reduced sex drive
- 2. Infertility
- 3. Decrease spontaneous erections (during sleep)
- 4. Swollen/tender breast (gynecomastia)
- 5. Loss of body and pubic hair
- 6. Small or shrinking testes
- 7. Decrease in muscle mass
- 8. Hot flushes
- 9. Decrease energy, motivation, and self-confidence
- 10. Poor concentration and memory
- 11. sleep apnea
- 12. Mild anemia

Action of Hormones on the Ovaries and Uterus

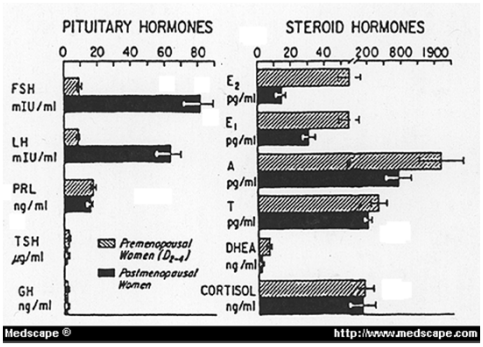


Cyclic Patterns of Hormone Production during the Ovarain Cycle



- Hormonal Changes during Menopause

1. Blood levels of FSH increase
2. Blood levels of Inhibin decrease
3. Blood levels of estradiol decrease
4. Blood levels of progesterone decrease
5. Blood levels of DHEA decrease



Menopause

- The degree to which each woman's body responds to these normal hormonal changes varies.
- 25% of women do not have any problems with menopause and manage the transition without assistance
- 50% of women experience some menopausal symptoms, varying from mild to moderate
- 25% of women have more severe problems
- Common Menopausal Symptoms:;
- 1. Hot flushes (last 30sec to 5min)
- 2. Menstrual irregularities
- 3. Sleep disturbances
- 4. Genital changes
- 5. Urinary problems
- 6. Joint/muscle aches and pain
- 7. Skin /hair changes
- 8. Neurological Brain function changes

Menopause

- Positive action to decrease symptoms
- 1. Eat a well balanced diet
- 2. Exercise regularly
- 3. Stress management (Tai chi, yoga, meditation, relaxation)
- 4. Making sex comfortable (water based lubricants, vaginal hormone therapy)
- 5. Pelvic floor exercises
- 6. Trial hormone replacement therapy
- 7. Quit smoking