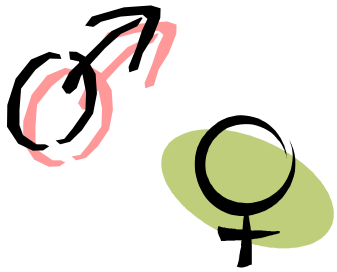
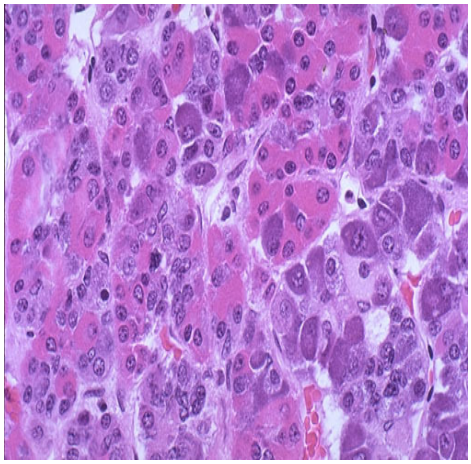
Bio& 242 A&P
Unit 4 / Lecture 1B



Hormones Released from the Anterior Pituitary or Adenohypophysis

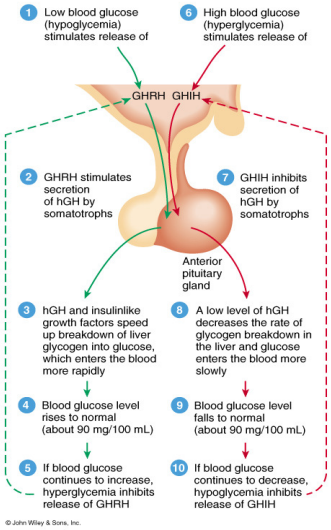
- ***Somatotrophs***
  Human Growth Hormone (hGH)
- ***Hypothalamic control***
  hGH releasing hormone
  hGH inhibiting hormone
- ***Target Tissues*:**
  General body cells, particularly bone, muscle, cartilage, and the liver.



Hormones Released from the Anterior Pituitary or Adenohypophysis

Hormone affects:

1. **promotes the synthesis of insulin-like growth factors**
2. **Controls normal growth patterns by increasing protein synthesis, lipolysis, ATP production, and carbohydrate metabolism**
3. **In adults, it help maintain muscle and bone mass and promote healing and tissue repair**



Hormones Released from the Anterior Pituitary or Adenohypophysis

***Hypo-secretion*:**

During childhood causes pituitary Dwarfism

Hyper-secretion:

During childhood causes

Gigantism

During Adulthood causes

Acromegaly: Enlargement of the small bones of the hand and feet

Enlargement of the cranium, nose, and lower jaw

Tongue, liver, and kidneys become enlarged

Pituitary Dwarfism

Dwarfism is a condition in which the growth of the individual is very slow or delayed. Decreased bodily growth is due to hyposecretion of hGH. The end result is a proportionate little person, because height as well as growth of other structures are also decreased.

Can be caused by gene mutations:

Appears to be disruption on different areas of chromosome 3 and 7. Some studies have isolated defects for the production of pituitary hormones to the short arm (the "p" end) of chromosome 3 at a specific location of 3p11. Other studies have found changes on the short arm of chromosome 7.

Or tumors:

Most commonly craniopharyngioma (a tumor near the pituitary gland), children and adolescents.

Symptoms: headaches, vomiting, problems with vision (double vision), excessive drinking behaviors (polydipsia) and sleep disturbances may be common.

Pituitary Gigantism

Hyper secretion of human growth hormone (hGH) *before* the end of adolescence. People with pituitary gigantism can truly be giants. They can sometimes end up over 7 or 8 feet in height.

Typically caused by an adenoma (tumor) of the pituitary.

Acromegaly

- Results from hypersecretion of growth hormone (GH). Usually the excess GH comes from benign, or noncancerous, adenoma (tumor) of the pituitary.
- Acromegaly is most often diagnosed in middle-aged adults.
- If not treated, acromegaly can result in serious illness and premature death.
- Because of its slow and often "sneaky" onset, it often is not diagnosed early or correctly.

Other symptoms of acromegaly

- joint aches
- thick, coarse, oily skin
- skin tags
- enlarged lips, nose, and tongue
- deepening of the voice due to enlarged sinuses and vocal cords
- sleep apnea—breaks in breathing during sleep due to obstruction of the airway
- excessive sweating and skin odor
- fatigue and weakness
- headaches
- impaired vision
- abnormalities of the menstrual cycle and sometimes breast discharge in women
- erectile dysfunction in men
- decreased libido

Hormones Released from the Anterior Pituitary or Adenohypophysis

Thyrotrophs:

Thyroid Stimulating Hormone (TSH)

Hypothalamic Control

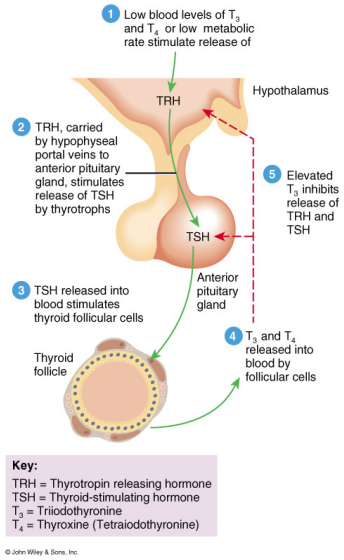
Thyrotropin Releasing Hormone (TRH)

Target Tissue

Follicular cells of the Thyroid gland

Hormone affects:

Controls the production of T3 and T4



Thyroid Gland

***Follicular cells*:**

T3 and T4

***Target Tissue*;**

Almost all body tissues

***Hormone effects*:**

Increases body metabolism

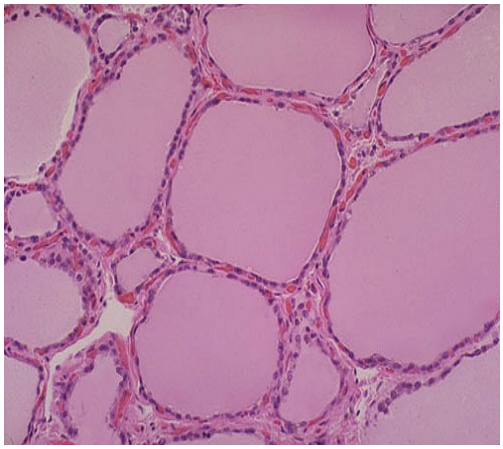
Increases gluconeogenesis

Increases glycolysis

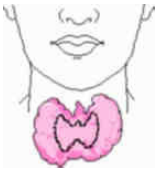
Increases lipolysis

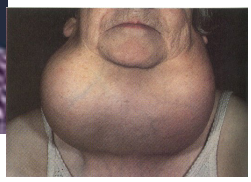
Increased basal metabolic rate (BMR)

Increases heart rate and force of contraction



Thyroid Gland





***Hypothyroidism*:**

***endemic goiter*: (due to I2 deficiency)**

***Myxedema*: bagginess under the eyes and swelling of the face.**

Arteriosclerosis: due to increase in blood cholesterol

Cretinism: extreme hypothyroidism during infancy and childhood

Symptoms of Hypothyroidism

Fatigue

Weakness

Weight gain or increased difficulty losing weight

Coarse, dry hair

Dry, rough pale skin

Hair loss

Cold intolerance (you can't tolerate cold temperatures like those around you)

Muscle cramps and frequent muscle aches

Constipation

Depression

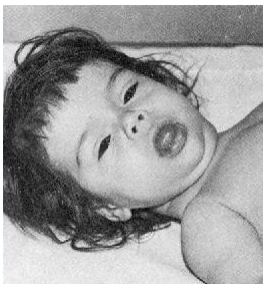
Irritability

Memory loss

Abnormal menstrual cycles

Decreased libido

Thyroid Gland



- ***Hypothyroidism*:**

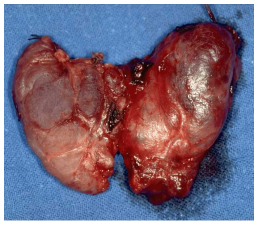
  Cretinism: Physical and mental growth and development is greatly retarded

- ***Hyperthyroidism***

  Toxic goiter

  Graves Disease with exophthalmos

  occurs when your immune system mistakenly attacks your thyroid gland and causes it to overproduce the hormone thyroxine.



Symptoms of Graves' disease

Graves' disease, also known as toxic diffuse goiter, is the most common cause of hyperthyroidism in the United States

Common symptoms of hyperthyroidism:

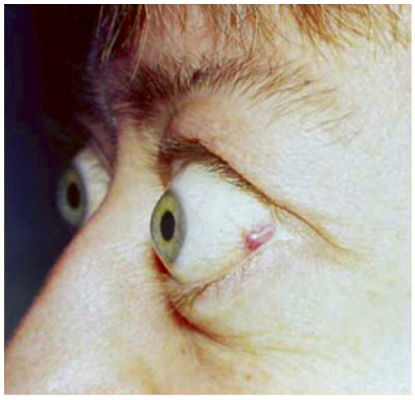
nervousness or irritability
fatigue or muscle weakness
heat intolerance
trouble sleeping
hand tremors
rapid and irregular heartbeat
frequent bowel movements or diarrhea
weight loss
goiter

Grave's ophthalmopathy

Occurs when cells from the immune system attack the muscles and other tissues around the eyes. The result is inflammation and a buildup in tissue and fat behind the eye socket, causing the eyeballs to bulge. In rare cases, inflammation is severe enough to compress the optic nerve that leads to the eye, causing vision loss.

Other symptoms of GO

dry, irritated eyes
puffy eyelids
double vision
light sensitivity
pressure or pain in the eyes
trouble moving the eyes



Anterior Pituitary or Adenohypophysis

Corticotrophs

Adrenocorticotropic hormone (ACTH)

Hypothalamic Control

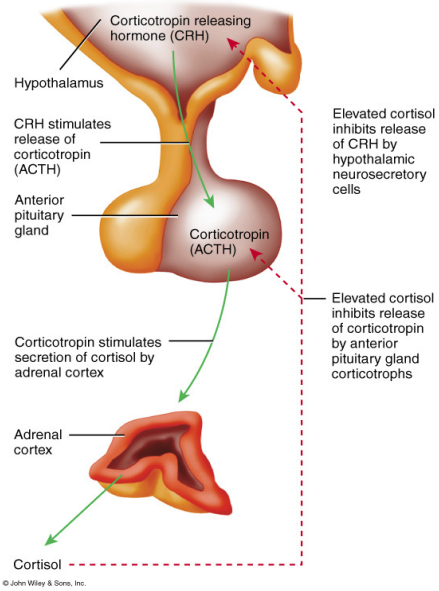
Corticotropic releasing hormone (CRH)

Target Tissue

Adrenal cortex, Zona Fasciculata

Hormone affects:

control production of glucocorticoids such as cortisol



Adrenal Cortex

Zona Fasciculata

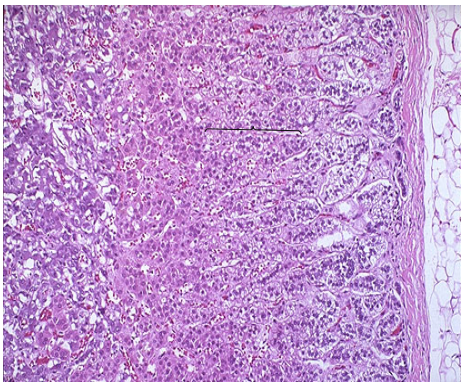
Glucocorticoids such as cortisol and cortisone

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

Hormone affects:

Elevated blood glucose levels

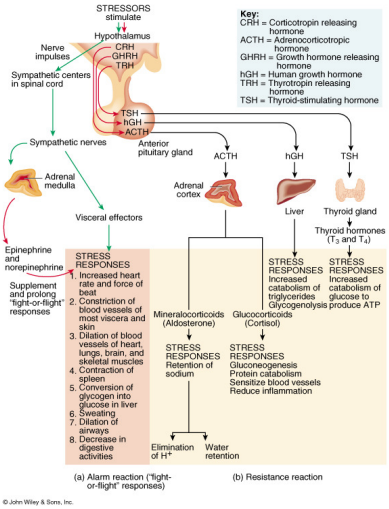
Reduction of protein stores in all body cells except the liver

increased plasma protein levels

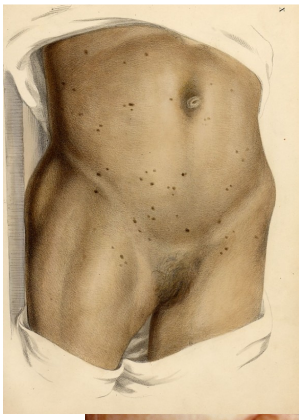
promote lipolysis and beta oxidation of fat

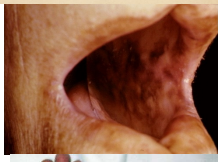
Helps body recover from stress

Prevention of inflammation



Adrenal Cortex





Hypo-secretion

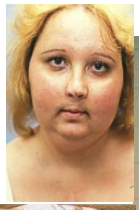
Addison's disease –

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

Adrenal Cortex

Zona glomerulosa

Mineralocorticoids such as Aldosterone

Hormonal control

renin-angiotensin pathway

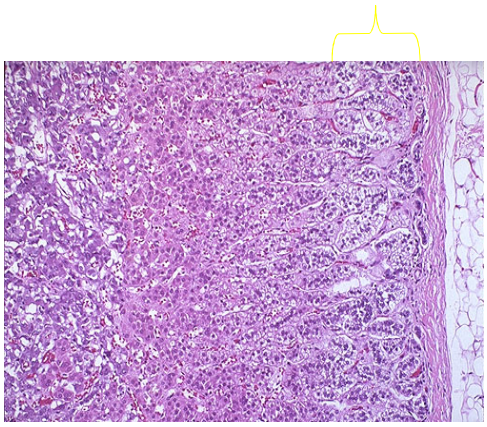
permissive effect of ACTH

Target tissue

Principle cells of the DCT and collecting duct

Hormone affects

increases reabsorption of Na+ and water



Adrenal Cortex

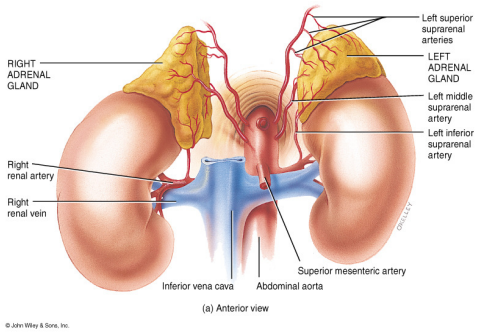
***Hyper-secretion*:**

***Aldosteronism*:**

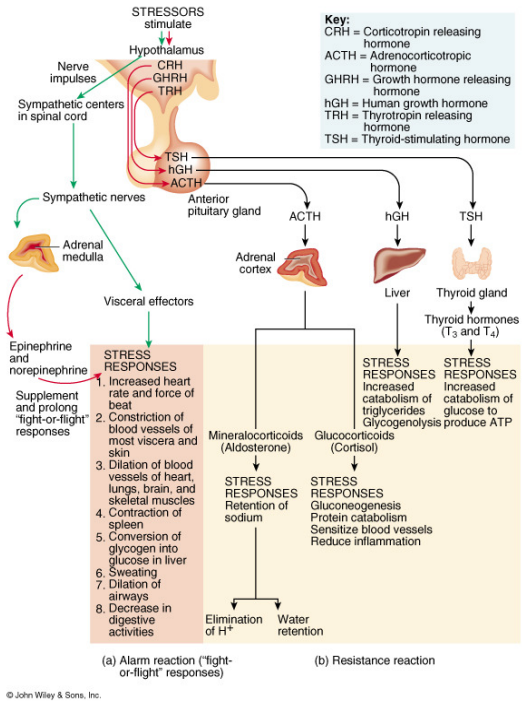
Hypokalemia, increase in extracellular fluid and blood volume,and hypertension, may also have period of muscular paralysis

Hypo-secretion:

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



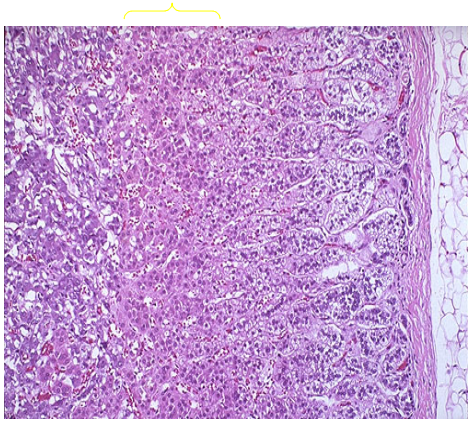
Overview of the interactions of hormones in response to stress



Adrenal Cortex

Zona reticularis

Produces small amounts of androgens, mostly dehydroepiandosterone (DHEA), DHEA may be converted into estrogens

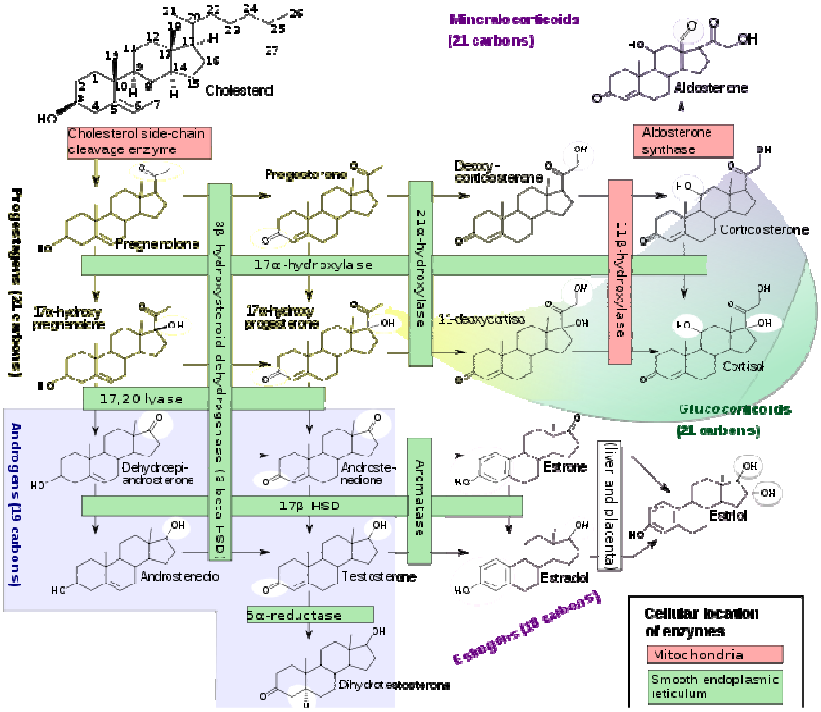


***Hormone Control*:**

Believed to be ACTH

Target tissue:

General body cells

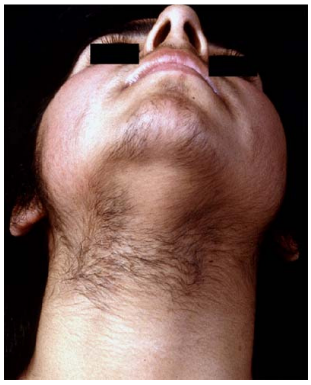


Adrenogenital Syndrome

Hyper-secretion:

Precocious puberty is appearance of secondary sexual characteristics in children, before the age of 8 years

Adrenogenital Syndrome



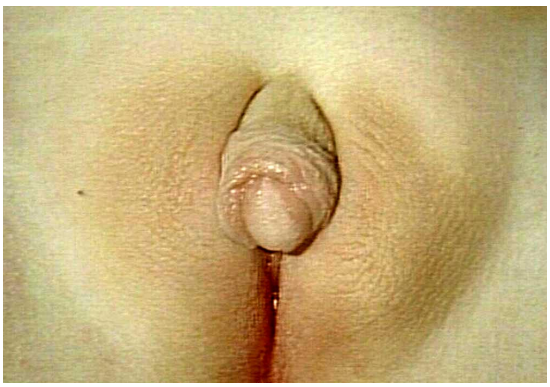
- In Adult females causes beard growth, deeper voice, masculine distribution of body hair (hirsutism), and growth of the clitoris to resemble a penis.

Endocrine Activity of the Adrenal Cortex

***Hyper-secretion*:**

Picture: Virilizing adrenal hyperplasia in a newborn female baby, DHEA was converted to testosterone

Condition: Clitoromegaly

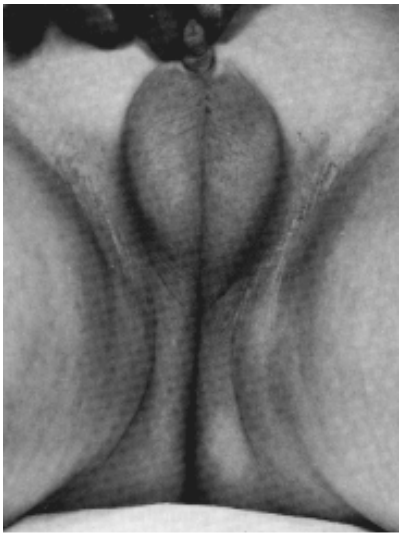


Hypopituitarism

Micropenis in a newborn baby boy.

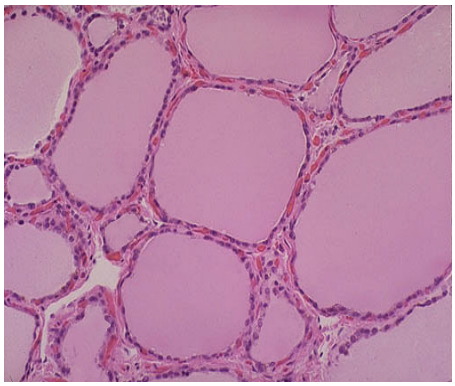
The result of the lack of production of LH and therefore testosterone by the cells of Leydig

- Normal newborn penis is 2.8 to 4.2cm
- with a circumference of 0.9 to 1.3cm
- Micro penis: Length less then 1.9cm



Other Thyroid Hormones

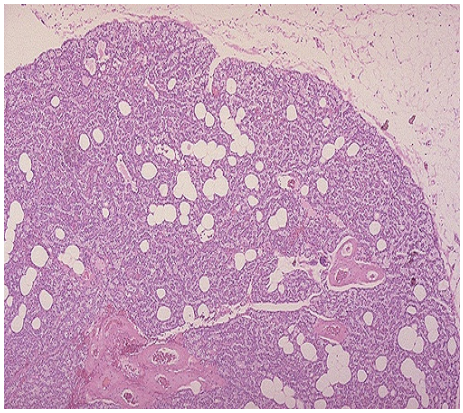
- **Parafollicular cells**
  Calcitonin



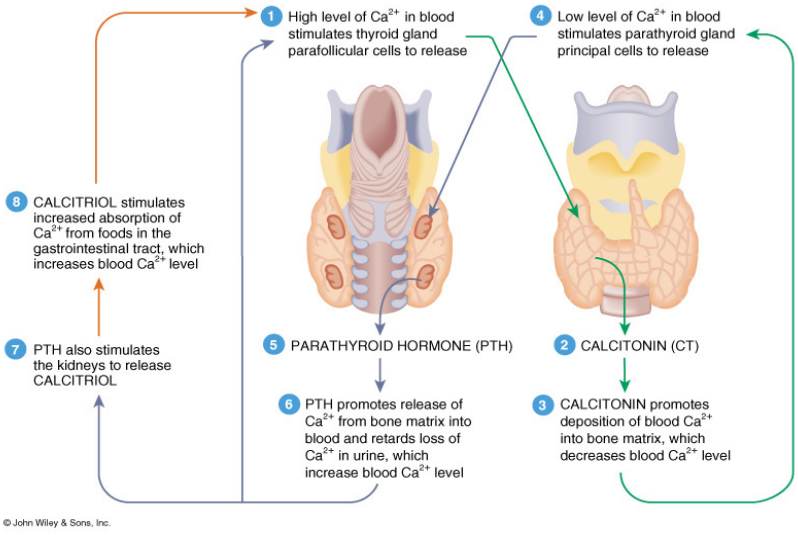
Parathyroid Hormones

<u>Principle Cells</u>: PTH

- **Five major actions:**
- **1) Activates and increases the number of osteoclasts, which mobilizes calcium from bone**
- **2) Increases renal tubular reabsorption of calcium**
- **3) Increases conversion of Vitamin D to active dihyoxy form in kidneys**
- **4) Increases urinary phosphate excretion, which reduces calcium loss**
- **5) Increases GI calcium absorption**



Interactions of PTH and Calcitonin



Interaction of 2 Pancreatic Hormones