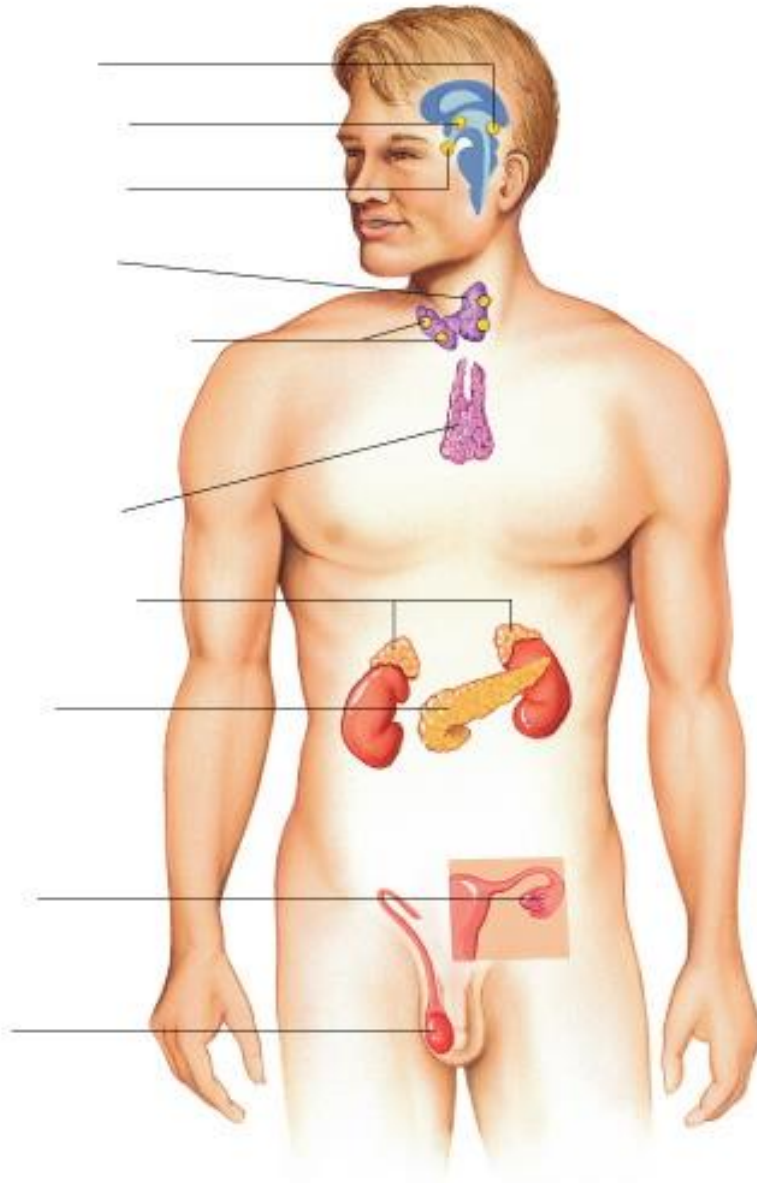


## ENDOCRINE SYSTEM CLASS NOTES

The endocrine system is a collection of glands that secrete hormones directly into the circulatory system to be carried toward a distant target organ. These hormones will be received by specific receptors on the target cells in the organism. The major endocrine glands include the pituitary gland, pancreas, ovaries, testes, thyroid gland, parathyroid gland, hypothalamus, and adrenal glands.



The endocrine system is the \_\_\_\_\_ system in the body. It uses chemicals (\_\_\_\_\_) that are released into the \_\_\_\_\_. Hormones control:

- 
- 
- 
- 
- 

Hormones are produced by \_\_\_\_\_ cells and secrete the hormones into the \_\_\_\_\_ fluid. The \_\_\_\_\_ will transfer the hormones around the body to \_\_\_\_\_ sites. These hormones can \_\_\_\_\_ other cells. **Not all hormones will affect every cell.**

Hormones are \_\_\_\_\_ based. They include:

- 
- 
- 

Steroids are made from \_\_\_\_\_ and prostoglandins are made from highly active \_\_\_\_\_.

As stated earlier, hormones only affect certain \_\_\_\_\_ or \_\_\_\_\_

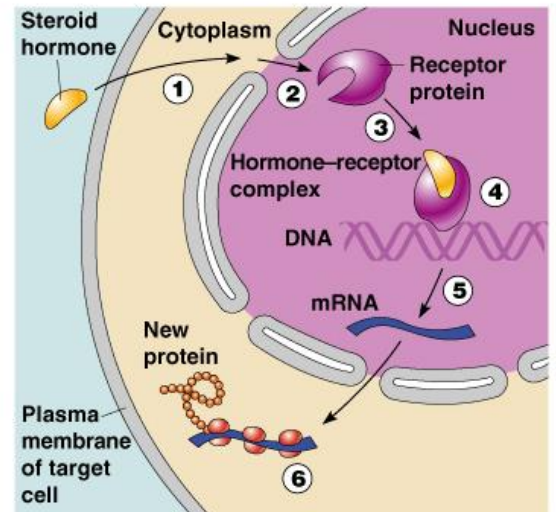
The target cell must have a specific \_\_\_\_\_ receptor. Hormone binding influences the \_\_\_\_\_ of the cell.

Hormones can have several effects on the cell:

- Changes in plasma membrane \_\_\_\_\_ or \_\_\_\_\_
- Synthesis of \_\_\_\_\_ such as \_\_\_\_\_
- Activation or inactivation of \_\_\_\_\_
- Stimulation of \_\_\_\_\_

## STEROID HORMONE ACTION

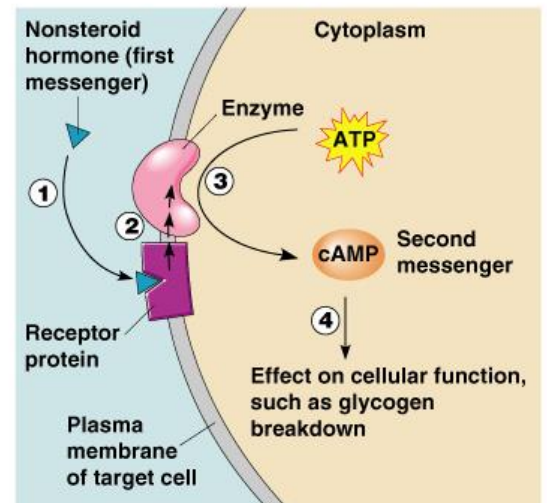
Diffuse through the \_\_\_\_\_  
and enter the \_\_\_\_\_. Once there, they  
bind to specific sites on the cell's \_\_\_\_\_ and  
activates \_\_\_\_\_ that result in the synthesis  
of new \_\_\_\_\_.



(a) Steroid hormone action

## NONSTEROID ACTION

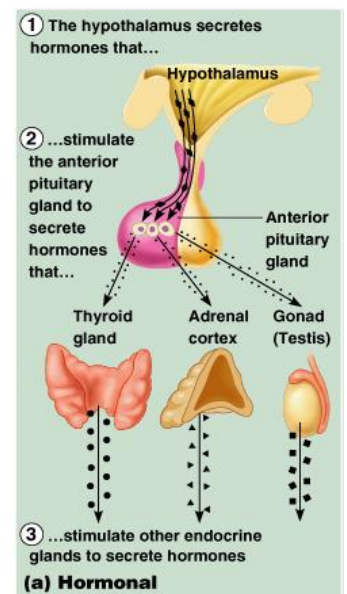
Hormones bind to a membrane  
\_\_\_\_\_. The hormones do not  
enter the \_\_\_\_\_. They set of a series of  
reactions that activates \_\_\_\_\_. Nonsteroid  
hormones \_\_\_\_\_ a reaction that  
produces a second messenger molecule and  
\_\_\_\_\_ additional intracellular changes to  
promoted a specific \_\_\_\_\_



(b) Nonsteroid hormone action

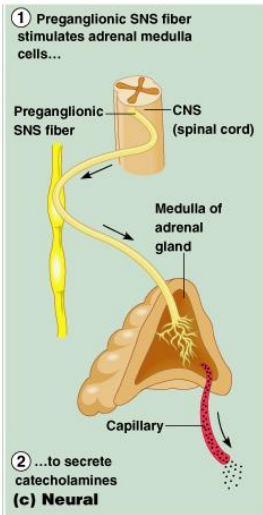
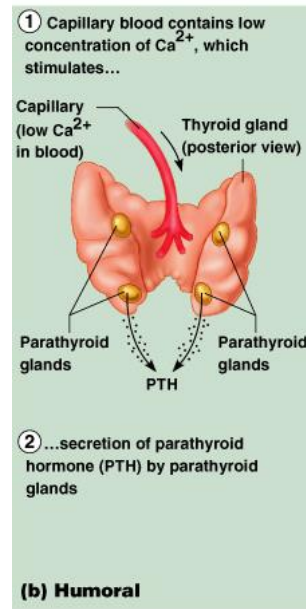
The hormone levels in the \_\_\_\_\_ are maintained by a  
\_\_\_\_\_ feedback. A stimulus or \_\_\_\_\_ hormone levels in  
the blood triggers the release of more \_\_\_\_\_.  
Hormone release \_\_\_\_\_ once the appropriate level in the  
blood is reached.

Endocrine glands are \_\_\_\_\_ by other hormones.



(a) Hormonal

Changing blood levels of certain \_\_\_\_\_ stimulate \_\_\_\_\_ release.

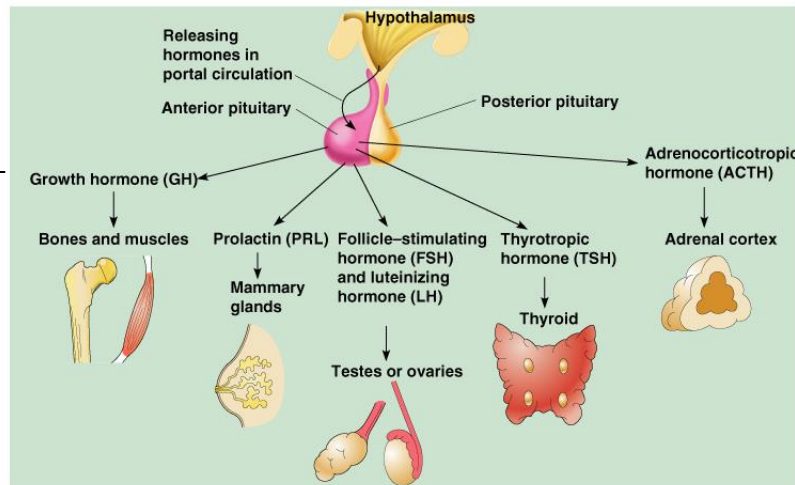


Nerve impulses \_\_\_\_\_ hormone release. Most are under the control of the \_\_\_\_\_ nervous system.

### PITUITARY GLAND

#### The Pituitary Gland

- Size of a \_\_\_\_\_
- Hangs from the \_\_\_\_\_
- Protected by the \_\_\_\_\_ bone
- Has two lobe
  - 
  -



#### The hormones of the anterior pituitary gland

- Six anterior hormones
  - \_\_\_\_\_ affect non-endocrine targets
  - \_\_\_\_\_ stimulate other glands (\_\_\_\_\_)
- All anterior pituitary hormones are:
  - \_\_\_\_\_ (or \_\_\_\_\_)
  - act through \_\_\_\_\_
  - regulated by \_\_\_\_\_ stimuli, mostly \_\_\_\_\_ feedback.

## Growth Hormone

- General \_\_\_\_\_ hormone
- Major effects on the growth of \_\_\_\_\_ muscles and \_\_\_\_\_ bones
- Causes \_\_\_\_\_ to be built into proteins
- Causes fat to be broken down as a source of \_\_\_\_\_.

## Prolactin (PRL)

- \_\_\_\_\_ and maintains milk production following c \_\_\_\_\_
- Function in males is \_\_\_\_\_

## Adrenocorticotrophic hormone (ACTH)

- Regulates endocrine activity of the \_\_\_\_\_

## Thyroid-stimulating hormone (TSH)

- Influences growth and activity of the \_\_\_\_\_

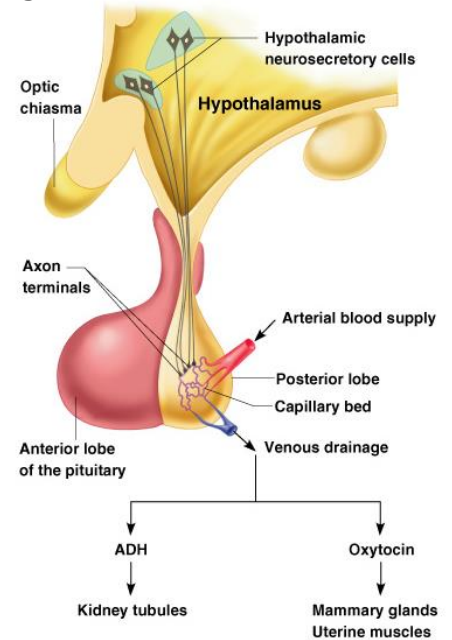
## Gonadotropic hormones

- Regulate hormonal activity of the \_\_\_\_\_
- Follicle-stimulating hormone (FSH)
  - Stimulates follicle development in \_\_\_\_\_
  - Stimulates sperm development in \_\_\_\_\_
- Luteinizing hormone (LH)
  - Triggers \_\_\_\_\_
  - Causes ruptured follicle to become the \_\_\_\_\_
  - Stimulates \_\_\_\_\_ production in males
  - Referred to as interstitial cell-stimulating hormone (ICSH)

## PITUITARY-HYPOTHALAMUS RELATIONSHIP

- Release of hormones is controlled by releasing and inhibiting hormones produced by the \_\_\_\_\_
- \_\_\_\_\_ produces two hormones that are transported to neurosecretory cells of the posterior pituitary
- The posterior pituitary is not strictly an \_\_\_\_\_ gland, but does release hormones

- Oxytocin
  - Stimulates contractions of the \_\_\_\_\_ during labor
  - Causes \_\_\_\_\_ ejection
- Antidiuretic hormone (ADH)
  - Can inhibit \_\_\_\_\_ production
  - In large amounts, causes vasoconstriction leading to increased blood pressure (\_\_\_\_\_)



## THE GLANDS/ORGANS

### THYROID

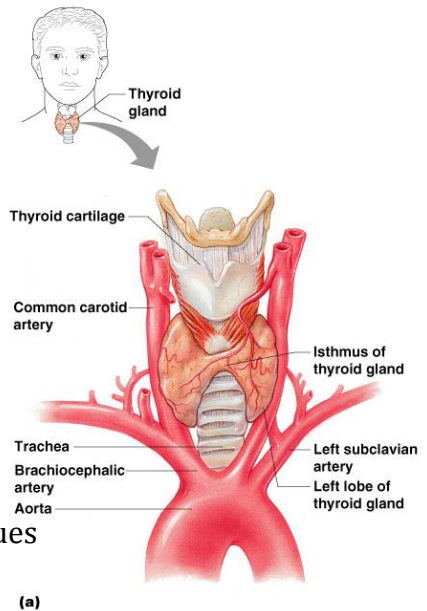
Found at the base of the \_\_\_\_\_

Consists of two lobes and a connecting isthmus

Major metabolic hormone

Composed of two active \_\_\_\_\_-containing hormones

- \_\_\_\_\_ (T<sub>4</sub>) – secreted by thyroid follicles
- \_\_\_\_\_ (T<sub>3</sub>) – conversion of T<sub>4</sub> at target tissues



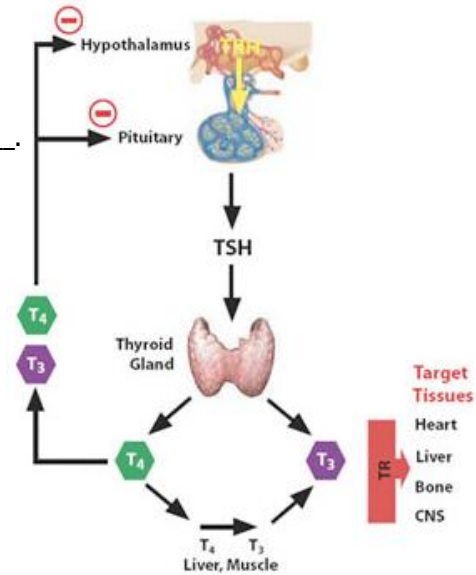
### FUNCTIONS OF THE THYROID HORMONES

- Controls the rate at which your body \_\_\_\_\_ calories (\_\_\_\_\_)
- Slow or speed up \_\_\_\_\_
- Raise or lower body \_\_\_\_\_
- Regulate the speed at which food moves through the \_\_\_\_\_
- Affect muscle strength
- Regulate the speed at which body replaces \_\_\_\_\_ cells

## THYROID AND PITUITARY

- The pituitary and the thyroid work \_\_\_\_\_.
- The pituitary gland produces \_\_\_\_\_ (thyroid stimulating hormone). This in turn causes the thyroid to release more \_\_\_\_\_ and \_\_\_\_\_.
- Blood tests can reveal if levels of TSH are adequate.

## Hypothalamic-Pituitary-Thyroid Axis



## TSH LEVELS

- If blood tests reveal the TSH levels are too high, that means the thyroid is not producing enough T3 or T4. That is bad because the pituitary can become \_\_\_\_\_ and \_\_\_\_\_.
- This can be prevented by taking medications like \_\_\_\_\_. This medication increases levels of T3 and T4 when the thyroid is not producing enough on its own.

## DISORDERS OF THE THYROID GLAND

Goiters-Enlargement of the thyroid gland due to a lack of \_\_\_\_\_. Iodine is necessary because T3 and T4 are iodine containing hormones. Iodine can be found in the soil in most areas of the world. However, some areas of the world have soil low in iodine. This led to many people developing goiters. We have an area right here in the USA near the Great Lakes. To combat this problem, iodine is added to \_\_\_\_\_ (iodized salt)



## PARATHYROID GLAND

- Located in the neck located \_\_\_\_\_ the thyroid gland.
- Humans have \_\_\_\_ of them, roughly the size of a grain of \_\_\_\_\_.
- They regulate the levels of calcium in the blood constantly using a hormone called PTH (\_\_\_\_\_).
- Regulation is done using \_\_\_\_\_ (parathyroid stimulating hormone)

## PARATHYROID STIMULATING HORMONE

- If blood calcium is too \_\_\_\_\_, PTH is released and calcium is removed from the \_\_\_\_\_ to increase calcium levels in the blood.
- If blood calcium is too high, the parathyroid shuts down and stops making PTH. A hormone called \_\_\_\_\_ also helps reduce blood calcium.

## IMPORTANCE OF CALCIUM

- Provides \_\_\_\_\_ energy for our nervous systems by helping the impulse travel along the nerve cells.
- Provide energy for muscle cells to \_\_\_\_\_.
- Helps provide \_\_\_\_\_ to the skeletal system.

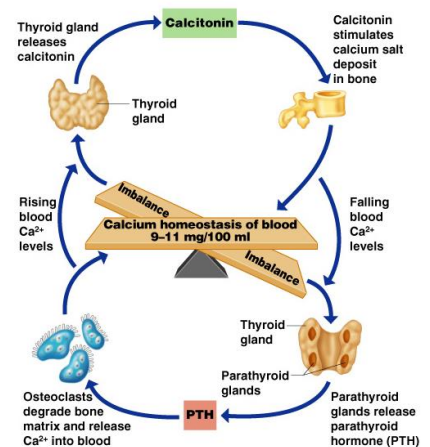
## DISORDERS OF THE PARATHYROID GLAND

Hyperparathyroidism-Too much \_\_\_\_\_ is present and blood calcium levels rise. This can cause \_\_\_\_\_ and/or \_\_\_\_\_.

Hypoparathyroidism-You will not have enough blood calcium and too much phosphorous. This is \_\_\_\_\_, but can cause damage to other endocrine glands.

### Calcitonin

- Decreases blood \_\_\_\_\_ levels by causing its deposition on bone
- Antagonistic to \_\_\_\_\_ hormone





## ADRENAL GLANDS

Sits on top of the \_\_\_\_\_ and is composed of \_\_\_\_\_ glands.

Cortex-

Medula-

## HOMONES OF THE ADRENAL CORTEX

Mineralocorticoids (mainly aldosterone)

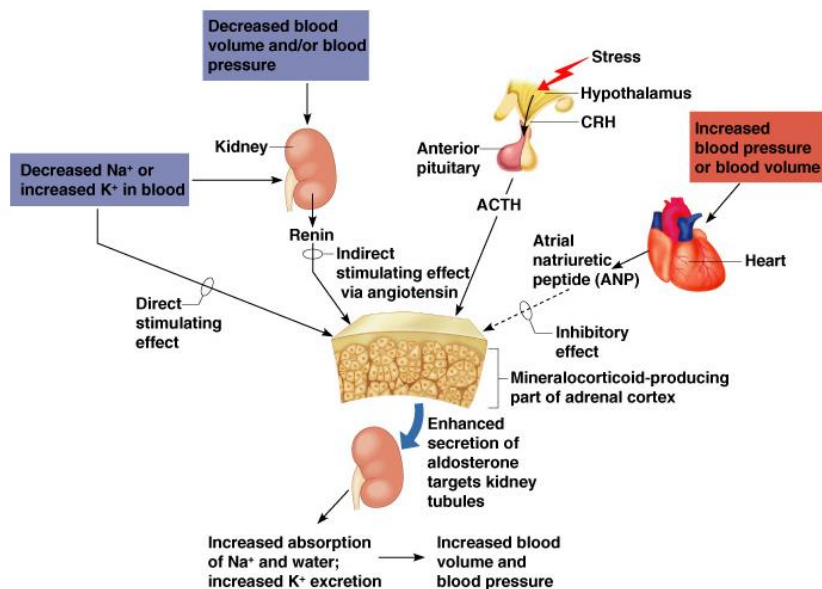
- Produced in outer \_\_\_\_\_
- Regulate mineral content in b\_\_\_\_\_, \_\_\_\_\_, and electrolyte balance
- Target organ is the \_\_\_\_\_
- Production stimulated by renin and aldosterone
- Production inhibited by atrial natriuretic peptide

Glucocorticoids (including cortisone and cortisol)

- Produced in the \_\_\_\_\_ layer of the adrenal cortex
- Promote normal \_\_\_\_\_
- Help resist long-term stressors
- Released in response to increased blood levels of ACTH

Sex hormones

- Produced in the inner \_\_\_\_\_ of the adrenal cortex
- \_\_\_\_\_ (male) and some \_\_\_\_\_ (female)

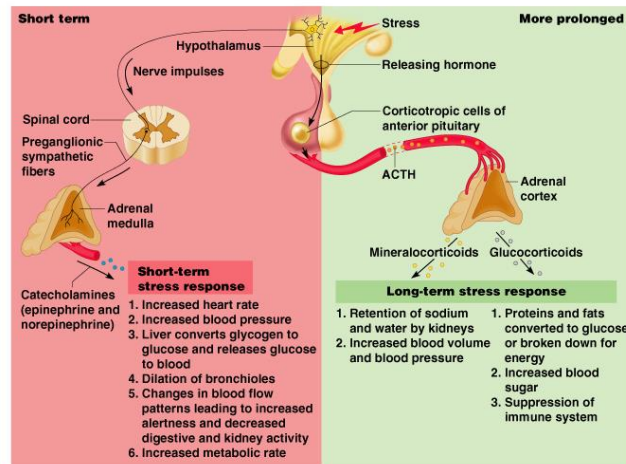


## HORMONES OF ADRENAL MEDULLA

Produces two similar hormones (catecholamines)

- 
- 

These hormones prepare the body to deal with \_\_\_\_\_ stress

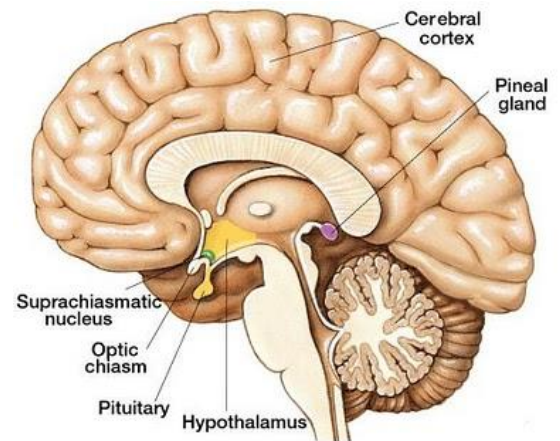


## PINEAL GLAND

Found on the \_\_\_\_\_ ventricle of the brain

Secretes \_\_\_\_\_

- Helps establish the body's wake and \_\_\_\_\_ cycles
- May have other as-yet-unsubstantiated functions

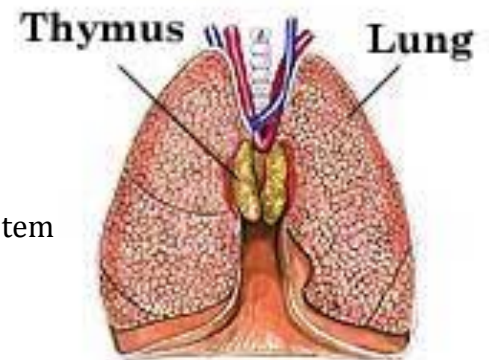


## THYMUS

Located posterior to the \_\_\_\_\_

Largest in \_\_\_\_\_ and \_\_\_\_\_

- Produces \_\_\_\_\_
- Matures some types of \_\_\_\_\_ blood cells
- Important in developing the \_\_\_\_\_ system



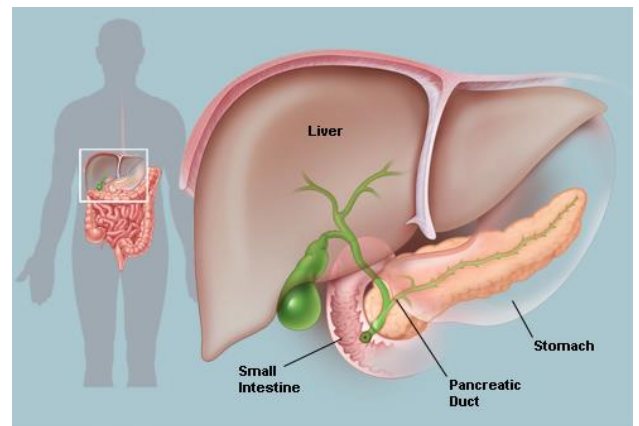
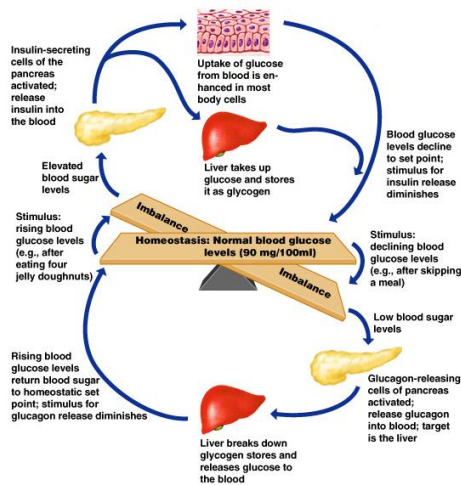
## PANCREAS

The pancreas is a mixed gland about \_\_\_\_\_ inches long.

- For its digestive function, it is connected via a duct to the duodenum and provides enzymes needed to break down food on its way to be absorbed by the small intestines.
- As an endocrine gland, it regulates blood sugar with the production of insulin and glucagon.

The islets of the pancreas produce hormones

- \_\_\_\_\_ - allows glucose to cross plasma membranes into cells from beta cells
- \_\_\_\_\_ - allows glucose to enter the blood from alpha cells
- These hormones are antagonists that maintain \_\_\_\_\_ homeostasis



## NORMAL BLOOD SUGAR

- Blood glucose is normally between \_\_\_\_\_ mg/dl and \_\_\_\_\_ mg/dl.
- When levels drop below 70 you are considered \_\_\_\_\_.
- When levels are above 180 you are considered \_\_\_\_\_.

## DIABETES

- e I diabetes-The body's immune system destroys insulin producing cells. Lifelong insulin injections are needed to maintain blood sugar levels.
- Type II diabetes-The body makes insulin its just not enough or the body cannot use it well enough. Some people can control type II diabetes with diet and exercise.

## HORMONES OF THE OVARIES

### Estrogens

- Stimulates the development of \_\_\_\_\_ characteristics
- Matures female reproductive organs
- Helps prepare the uterus to receive a \_\_\_\_\_ egg
- Helps maintain \_\_\_\_\_ and prepares the breasts to produce \_\_\_\_\_

### Progesterone

- Produced by the \_\_\_\_\_
- Acts with estrogen to bring about the \_\_\_\_\_ cycle
- Helps in the \_\_\_\_\_ of an embryo in the uterus

## HORMONES OF THE TESTES

Interstitial cells of testes are \_\_\_\_\_-producing

Produce several androgens

Testosterone is the most important androgen

- Responsible for adult male \_\_\_\_\_
- Promotes \_\_\_\_\_ and \_\_\_\_\_ of male reproductive system
- Required for \_\_\_\_\_ cell production

## FUNCTION OF THE PLACENTA

- Produces hormones that maintain the \_\_\_\_\_
- Some hormones play a part in the \_\_\_\_\_ of the baby
- Produces HCG in addition to estrogen, progesterone, and other hormones

## DEVELOPMENTAL ASPECTS

- Most endocrine organs operate smoothly until \_\_\_\_\_ age
- Menopause is brought about by lack of efficiency of the \_\_\_\_\_
- Problems associated with reduced estrogen are common
- \_\_\_\_\_ production declines with age
- Many endocrine glands \_\_\_\_\_ output with age