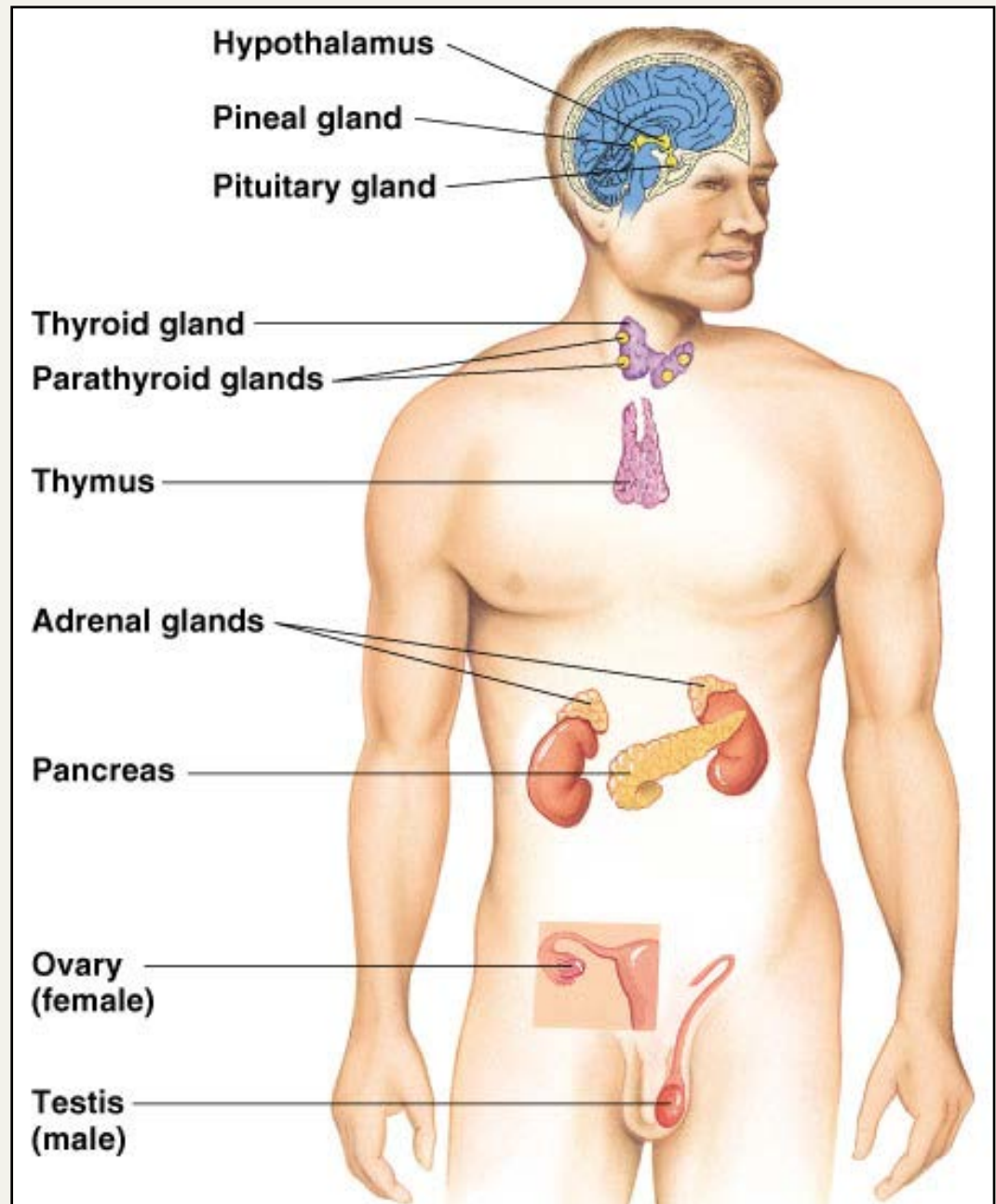


Regulation The Endocrine System



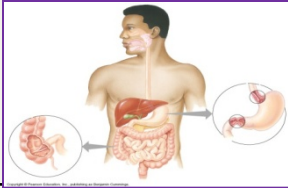
Do You Remember?



- What does it mean to be alive? Once you are alive, how do you stay alive?
- There are **eight** life functions/activities.

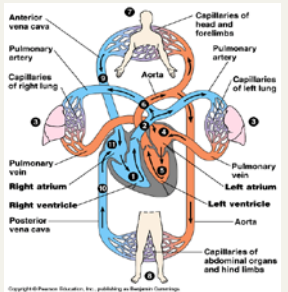
Life Activity

Definition



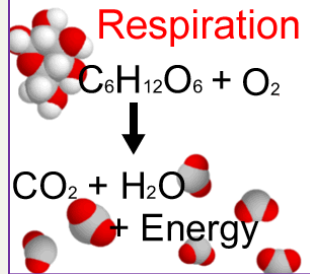
NUTRITION

Organisms **obtain** and **process food**



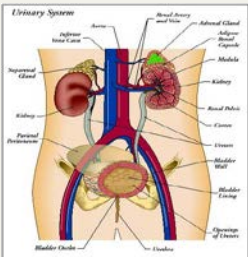
TRANSPORT

Circulation and absorption of nutrients



RESPIRATION

The **release of energy** from food

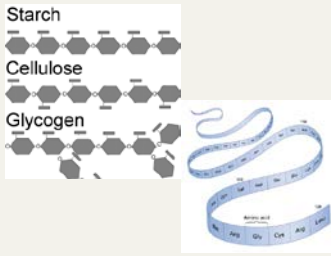


EXCRETION

Removal of harmful cellular waste

Life Activity

Definition



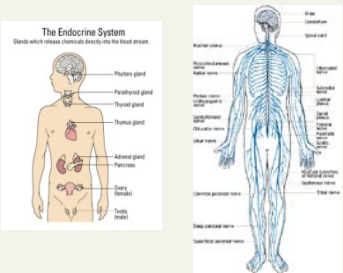
SYNTHESIS

Producing **complex** substances from **simple** substances



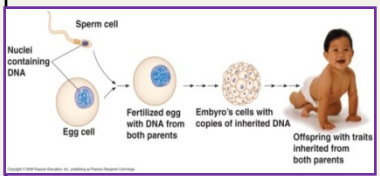
GROWTH

An **increase in size** and/or **number of cells** of an organism



REGULATION

Control and **coordination** of all activities in an organism



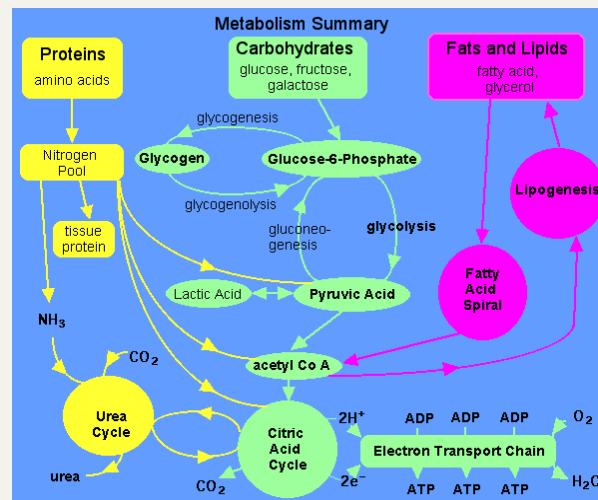
REPRODUCTION

The **production** of new **individuals**

Metabolism

Metabolism

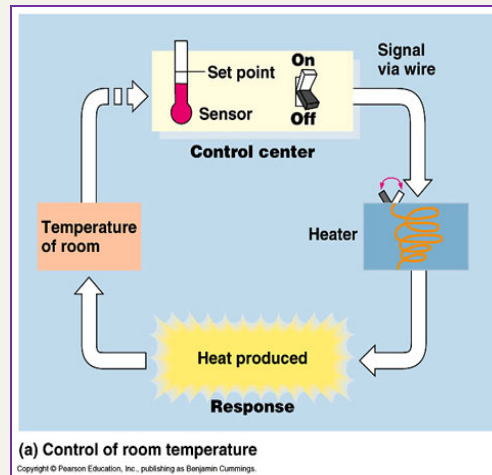
- **sum** total of all the chemical reactions occurring in an organism
- Controlled by **enzymes (organic catalysts)**



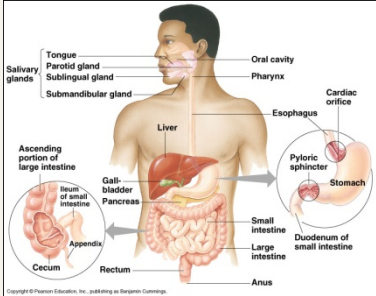
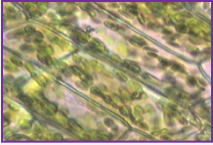
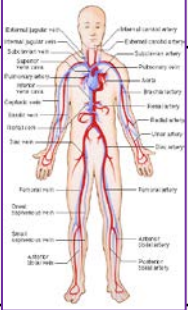
Homeostasis

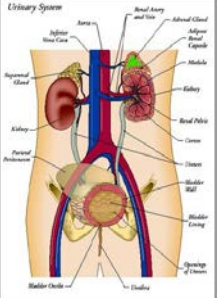
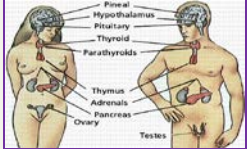
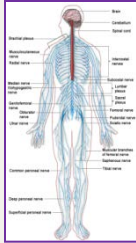
Homeostasis

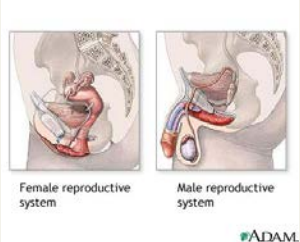
- State of **balance**
- Organisms maintain homeostasis by using **feedback**



How do single celled and multi-celled organisms perform these life functions?

Life Function	Single Celled Organism	Multi-cellular Organism
<p>Nutrition</p> <ul style="list-style-type: none"> • Ingestion • Digestion 	<p>Diffusion through the cell membrane</p> <p>Intracellular (within the cell)</p> <p>Extracellular (outside the cell)</p>	<p>Digestive system- Extracellular followed by intracellular digestion</p> 
<p>Transport</p>	<p>Cyclosis -movement or streaming of the cytoplasm</p> 	<p>Circulatory system</p> 

<i>Life Function</i>	<i>Single Celled Organism</i>	<i>Multi-cellular Organism</i>
Respiration	Diffusion through the cellular membrane	Respiratory system
Excretion	Diffusion out cellular membrane	Excretory system 
Regulation	Chemically responds to environment	Endocrine system  Nervous systems 

<i>Life Function</i>	<i>Single Celled Organism</i>	<i>Multi-cellular Organism</i>
Reproduction	Mitosis (Binary Fission)	Reproductive system  <p>The image contains two anatomical diagrams. The left diagram shows the female reproductive system, including the uterus, fallopian tubes, and ovaries. The right diagram shows the male reproductive system, including the testes, vas deferens, and ureters. Below the diagrams are the labels 'Female reproductive system' and 'Male reproductive system'. The ADAM logo is located at the bottom right of the image area.</p>

Introduction

A. Regulatory Systems

1. **Function** -to respond to stimuli, both external and internal
2. There are **two** systems we use to respond to our environment. These systems are the **nervous** system and the **endocrine** system.

Introduction (2)

	<i>NERVOUS</i>	<i>ENDOCRINE</i>
Similarities	Regulate Homeostasis	Regulate homeostasis
	Secrete Chemicals neurotransmitter	Secrete Chemicals hormone

Introduction (2)

	<i>NERVOUS</i>	<i>ENDOCRINE</i>
Differences	Electrical impulses which travel quickly	Hormone which travel in the blood which is a slower method of transport
	Neuron	Blood
	Quick response	Slower response
	Short lasting	Long lasting

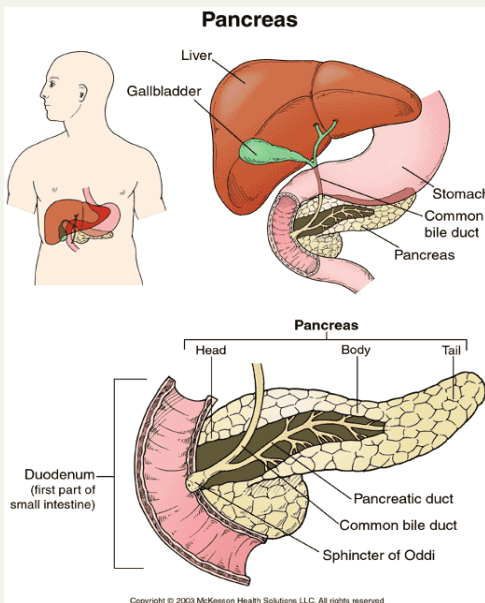
Nervous & Endocrine System Movies

[The Nervous and Endocrine Systems](#)

[How the Nervous and Endocrine Systems
work together](#)

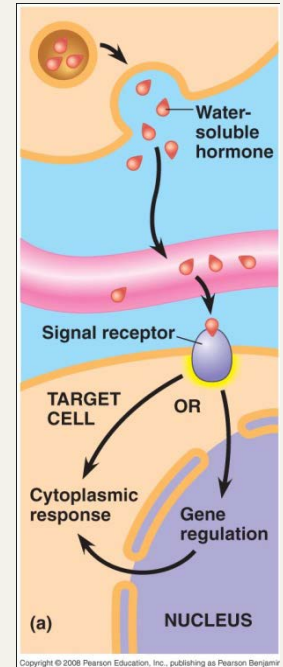
Introduction (Glands)

B There are two types of glands in your body, **exocrine** glands and **endocrine** glands



Exocrine glands have
ducts or
tubes

Endocrine glands
do not have
ducts or tubes.
They use the
circulatory system



Endocrine vs. Exocrine Glands

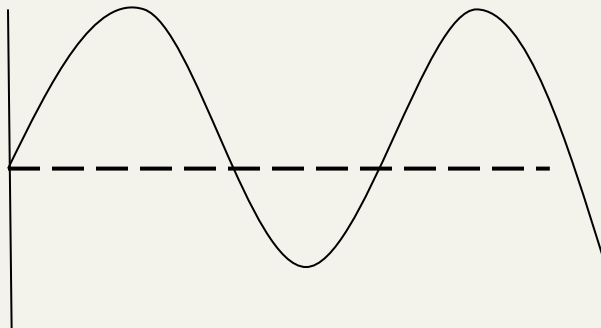
	Endocrine	Exocrine
Definition	Ductless glands	Duct glands
Secretions	Hormones	Usually digestive enzymes
Transport	Through the blood to a target tissue	Through a duct directly to the target structure
Example	Adrenal gland (adrenalin) Pancreas (insulin)	Gall bladder (bile) Pancreas (digestive secretions)

Homeostasis

How Do Hormones Maintain Homeostasis?

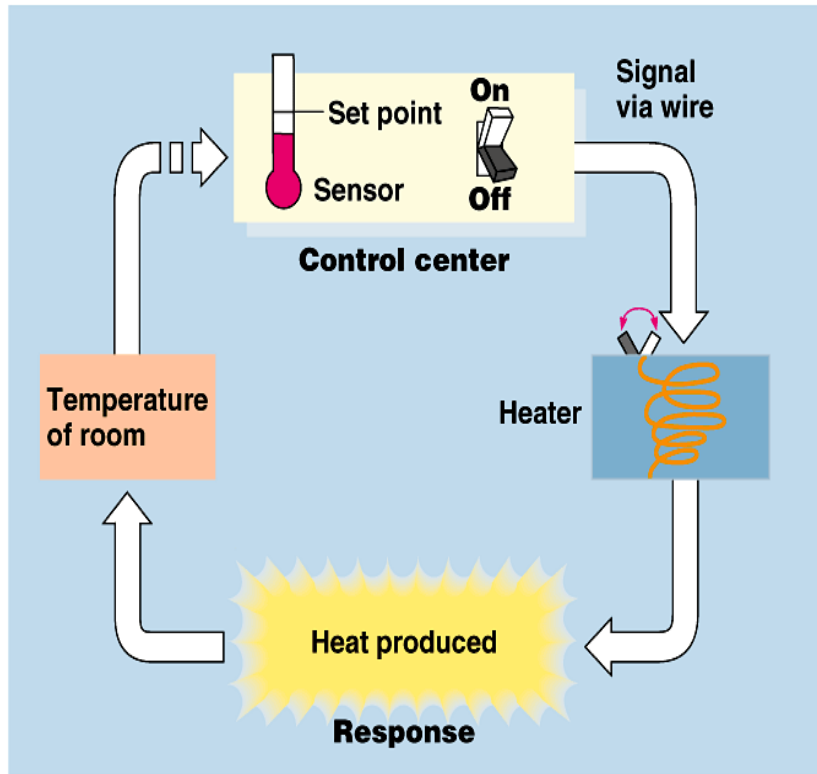
Feedback: mechanism of self-regulation that allows the organism to maintain homeostasis.

The body has a “ **Set Normal Range** ”. If levels go above or below the set normal range feedback will bring the range back to **normal** .



Set Normal Range

Homeostasis (2)

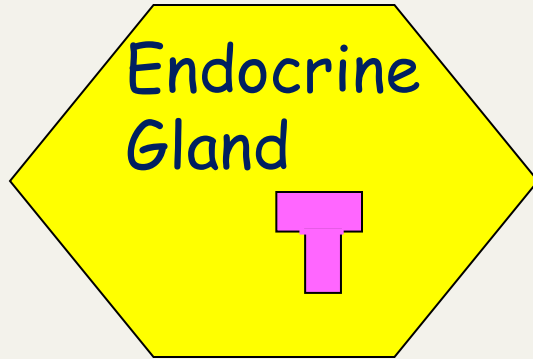


- Levels of a substance are low or **below** set normal range- **endocrine gland responds** so as to raise the levels
- Levels of the substance become high or **above** set normal range- **endocrine gland responds** so as to lower the levels

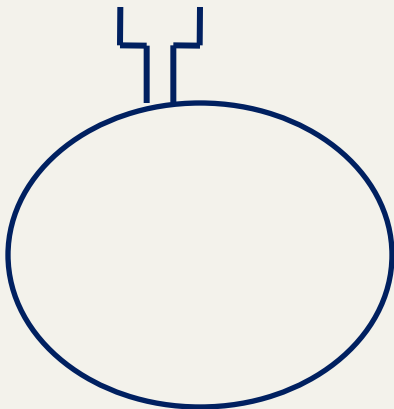
Movie

How Hormones Maintain a delicate balance

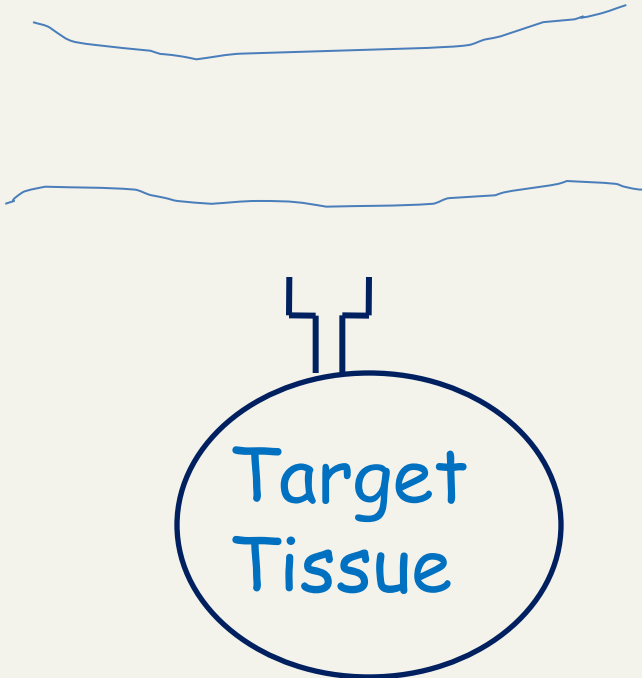
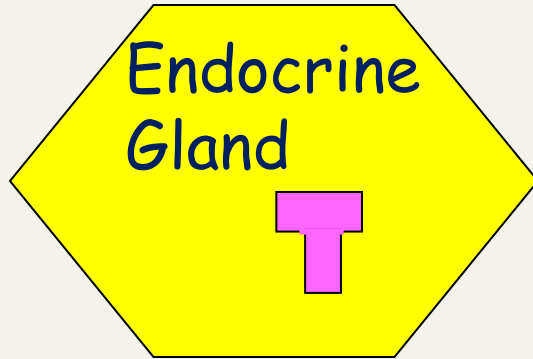
Target Tissue



- Endocrine gland releases the hormone into the **circulatory** system
- The hormone travels through the body
- The hormone will attach to cells that have the **correct receptor on their membrane** (hormone receptor)

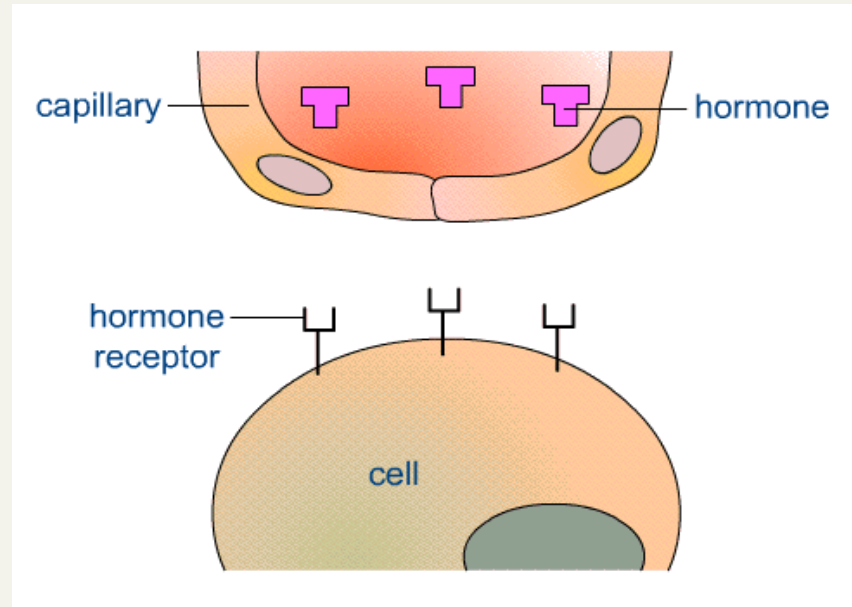


Target Tissue



- These cells (tissues) are called the **target tissue**

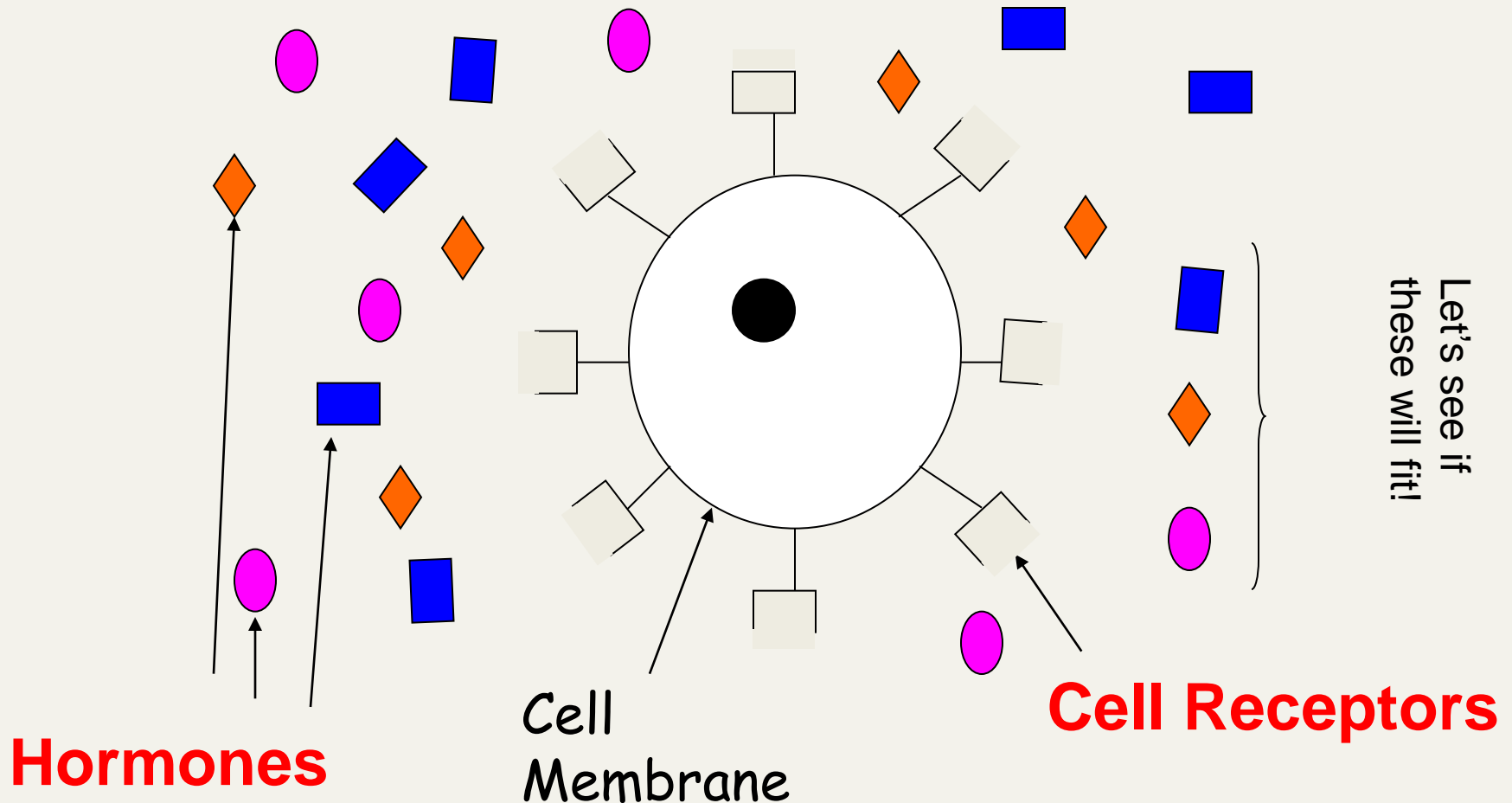
Target Tissue (2)



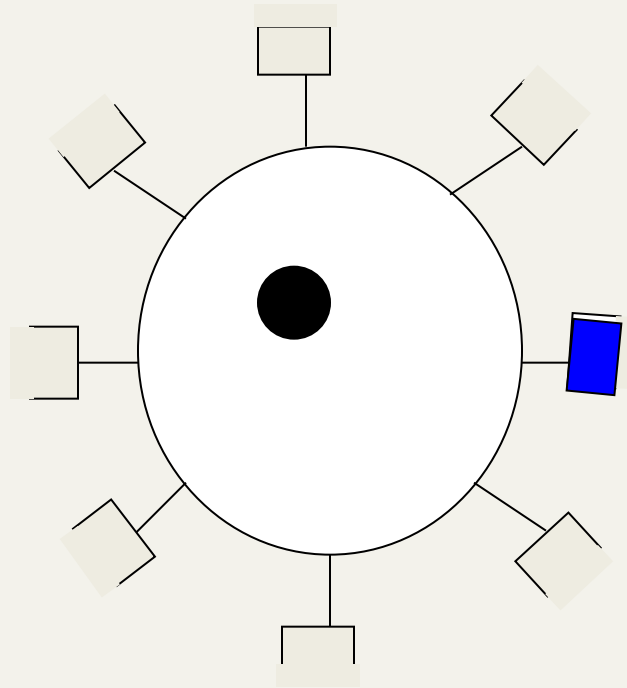
- The hormone will then trigger a **response** in the target tissue

Which hormones fit into the cell receptors?

The square
Why?? Because they are the same shape



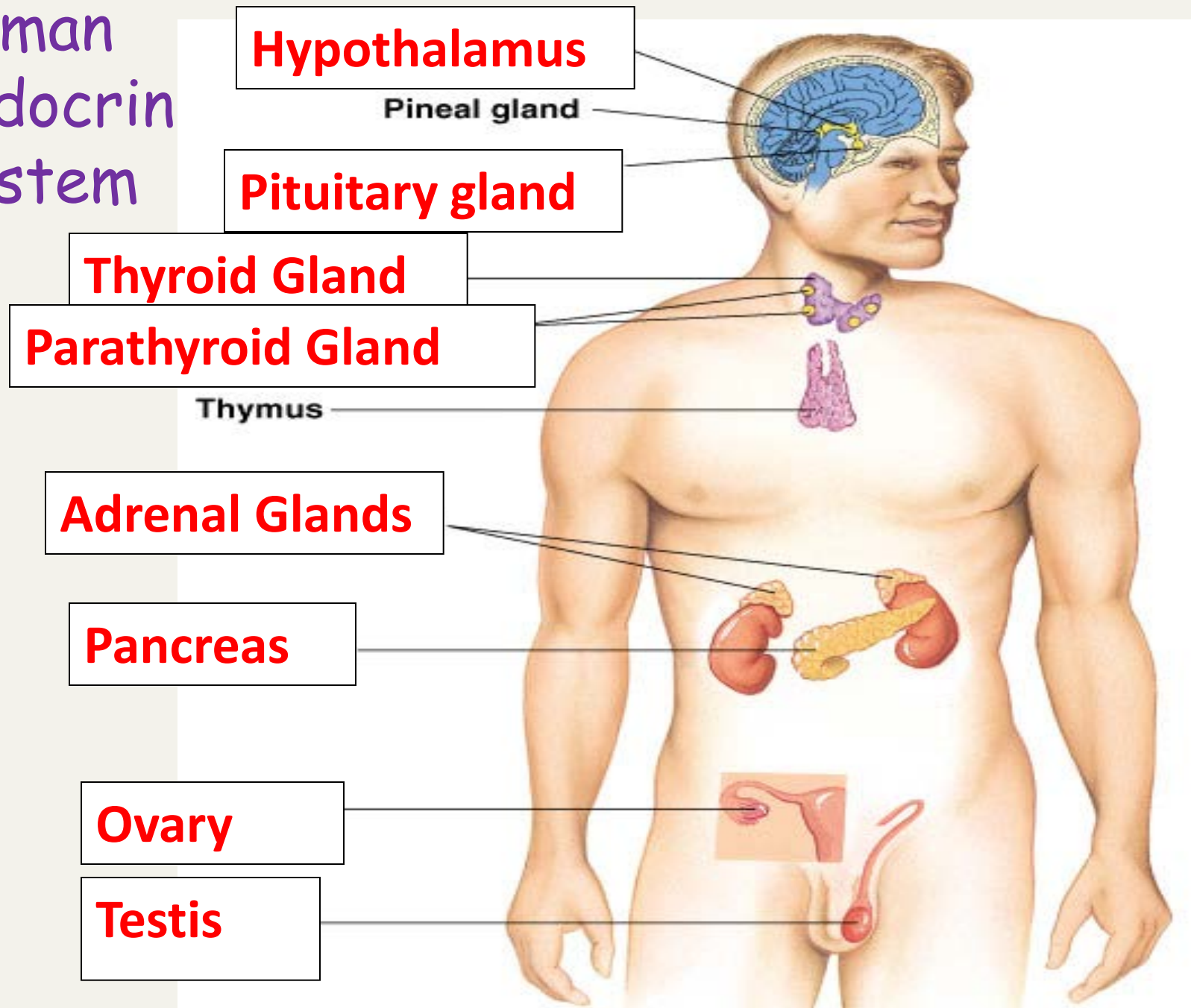
Once the hormone attached to the receptor of the target tissue, it will cause a change in the target tissue!



Movie!

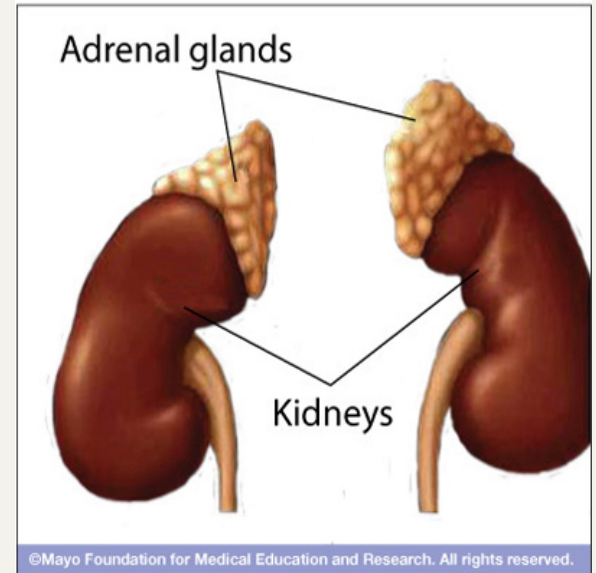
[How hormones work in the body](#)

Human Endocrine System



Adrenal Gland

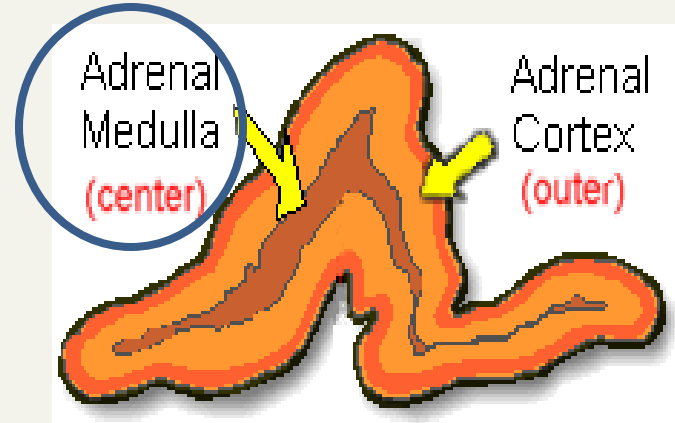
- The **adrenal glands** located on top of the kidneys.
- Each gland is actually **two glands** in one. Each gland produces different hormones.
- The **adrenal cortex** makes up the outer region of the adrenal gland
- The **adrenal medulla** makes up the inner region of the adrenal gland



Adrenal Gland (2)

1. Adrenal Medulla

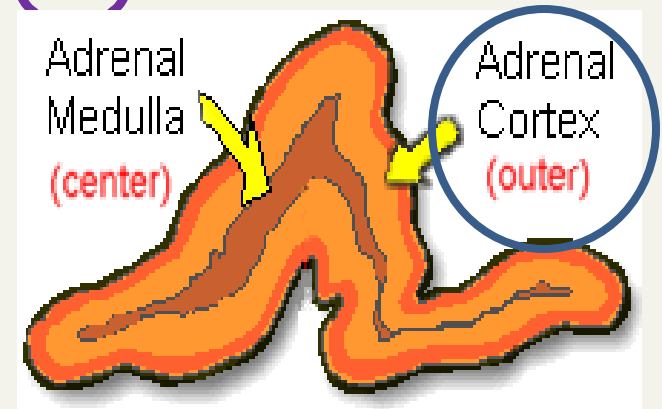
- ✓ Secretes **Adrenalin**
- ✓ Multiple target tissues
- ✓ Response of adrenaline is associated with the **“Fight or Flight Response”** : increases the blood sugar level and accelerates the **heart** and **breathing** rates.



Adrenal Gland (3)

2. Adrenal Cortex

- ✓ Secretes **Cortisone**
- ✓ Multiple target tissues
- ✓ Promotes the conversion of body **fat** and **proteins** into **sugars** .
- ✓ Secretes **other hormones** which promote the reabsorption of sodium and chloride ions by the kidney tubules onto the **blood stream** . This affects the **water** balance and helps maintain **blood pressure** .



Pancreas

The pancreas is a structure that contains both

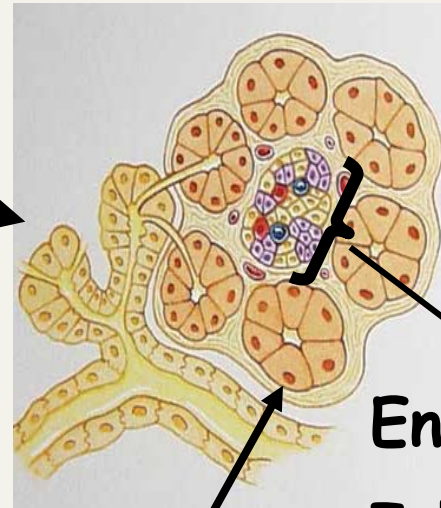
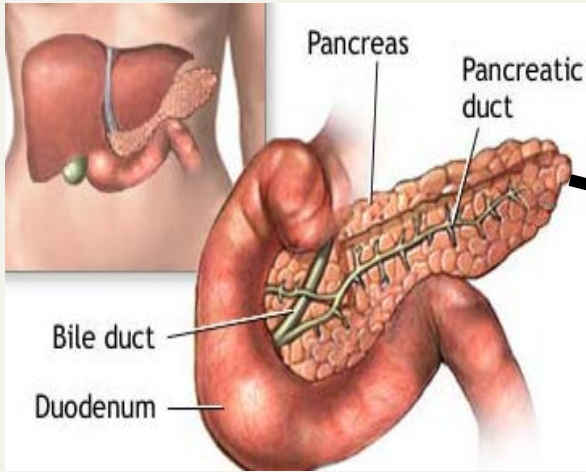
exocrine and endocrine glands . The

exocrine glands secrete **digestive enzymes** that travel through a duct to the small intestine.

The **endocrine glands** are found in the

Islets of Langerhans . These cells produce the hormones **insulin and glucagon** which are released into the circulatory system.

Pancreas (2)



Exocrine cells

Endocrine cells
Islets of Langerhans

Pancreas (3)

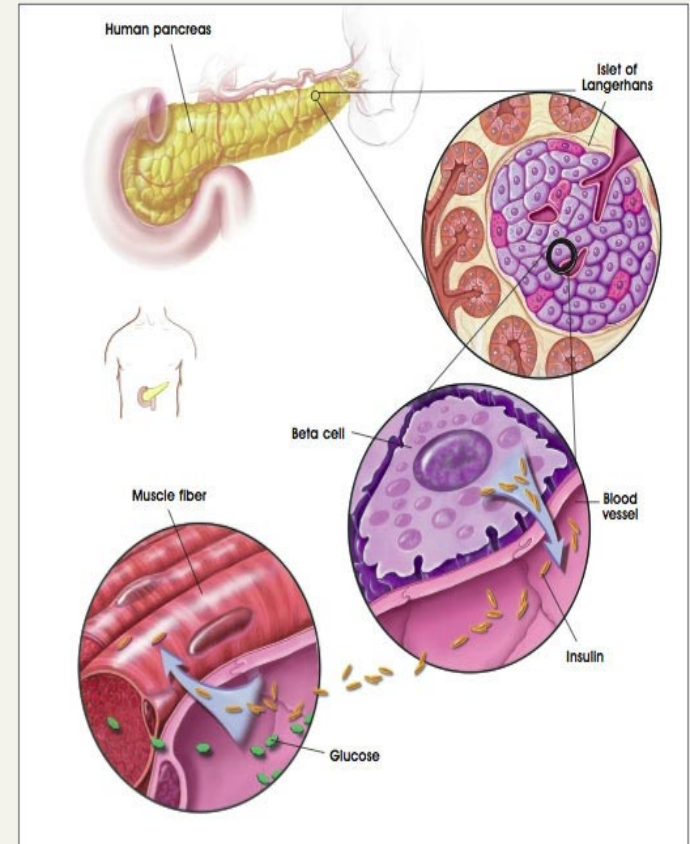
- **Insulin**

- ✓ Target Tissue is

- liver and muscle**

- ✓ Allows the liver and muscles to pick up **glucose** from the blood, which **lowers blood glucose** levels.

- ✓ Allows the liver to change **glucose into glycogen** (for storage)



Pancreas (4)

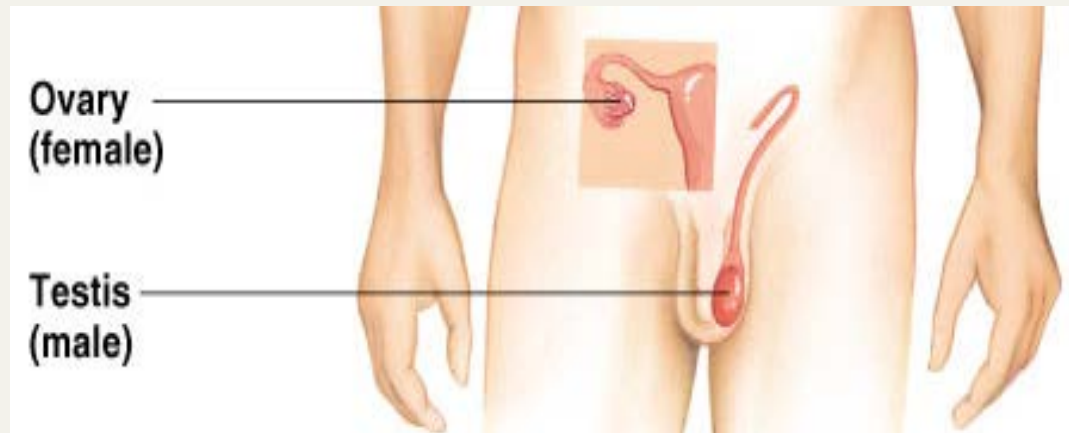
- Glucagon
 - ✓ Target Tissue is **liver and muscle**
 - ✓ Allows the liver to change **glycogen back to glucose**
 - ✓ **Increases glucose levels** in the blood

Pancreas Movie

- [Insulin and glucose](#)

Gonads

Gonads are sex glands of the human; **testis** in males and **ovaries** in females. Besides producing **gametes** (sperm and egg) the gonads produce **hormones** which influence **secondary sex characteristics**

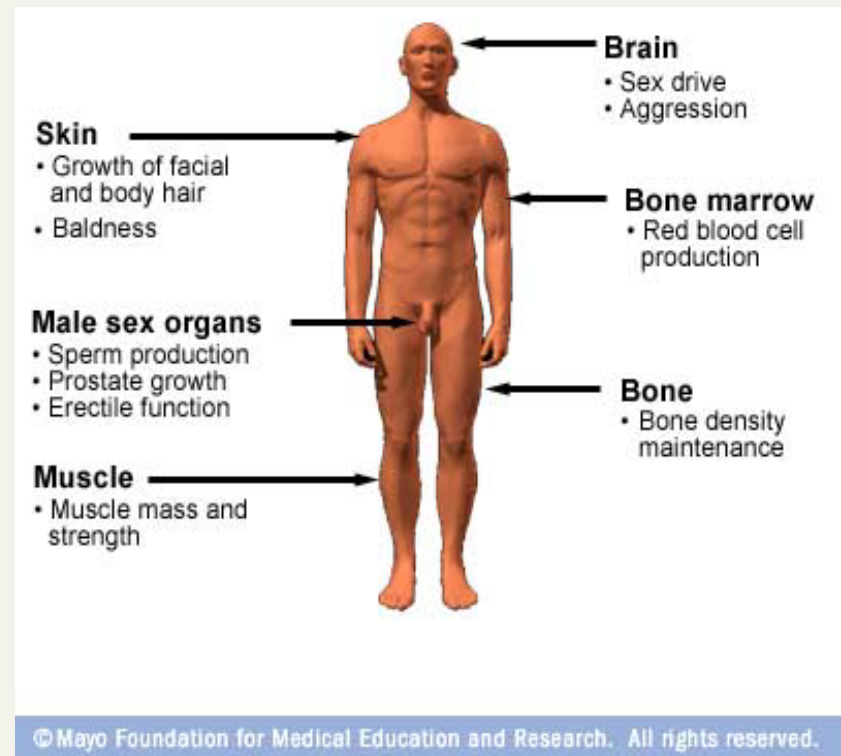
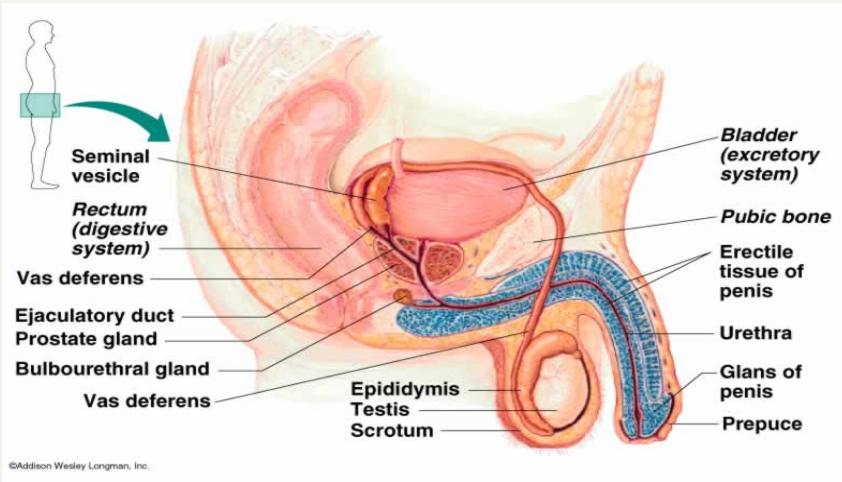


Gonads-Male

1. Testis

- ✓ Secrete **testosterone**
- ✓ Target Tissue-male
gonads, muscle, vocal cords, skin
etc.
- ✓ **Secondary sex characteristics** : the growth of facial hair, lowering the pitch of the voice, change in body form with an increase in muscle

Gonads-Male (2)

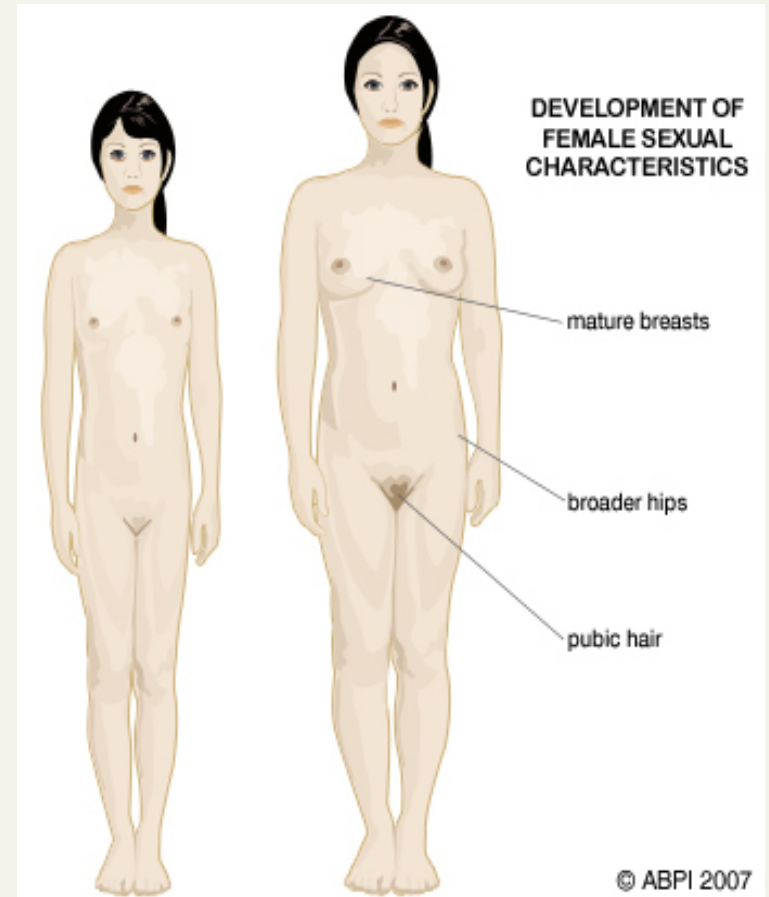
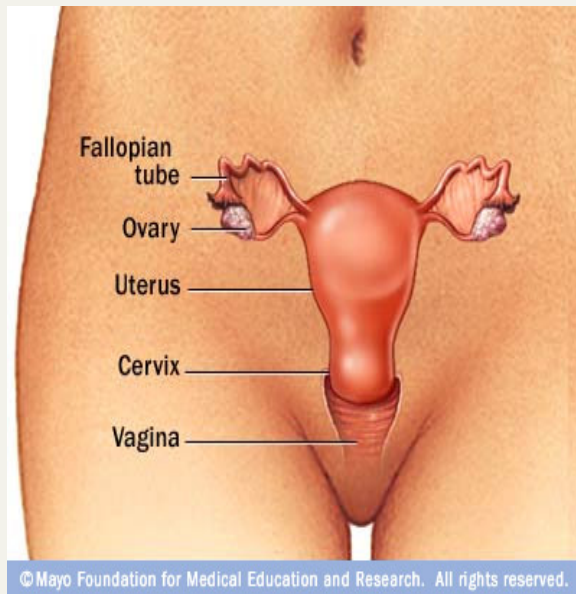


Gonads-Female

2. Ovaries

- ✓ Secrete **Estrogen and progesterone**
- ✓ Target Tissue-uterus, mammary glands
- ✓ **Secondary sex characteristics** : regulation of the menstrual cycle, breast development, change in body form with an increase in fat deposition

Gonads-Female (2)

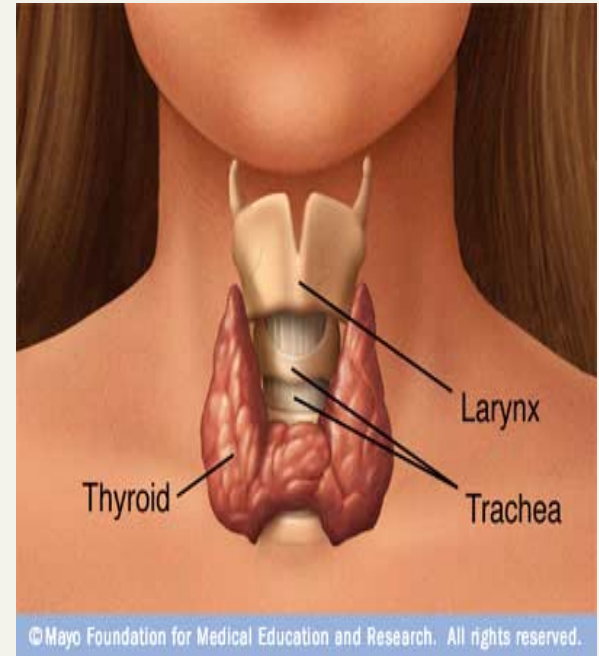


Gonad Movie

- [Ovary & Testes](#)

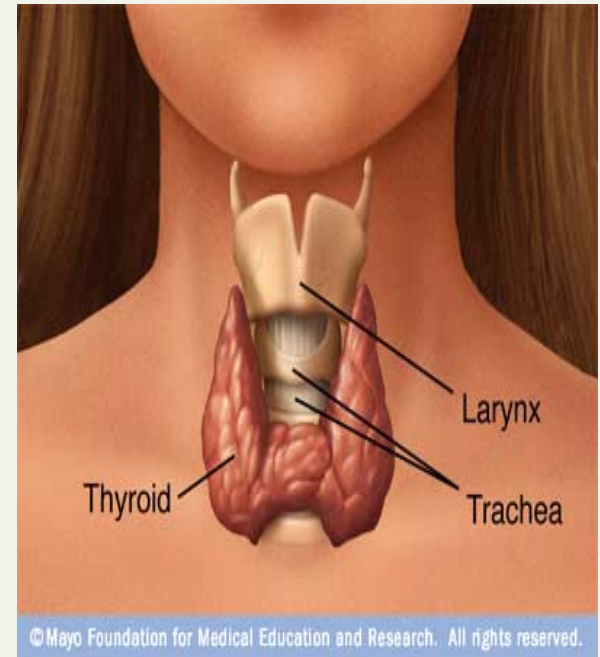
Thyroid Gland

The **thyroid** gland is located in the neck, produces hormones which regulate the rate of your metabolism (**Metabolic rate**)



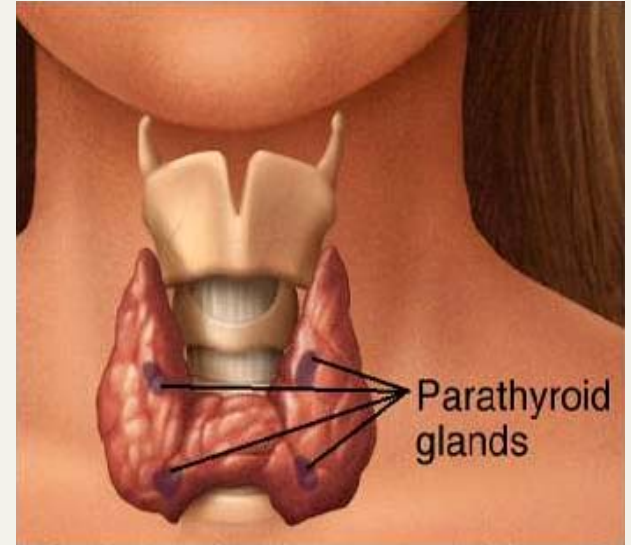
Thyroid Gland (2)

- Thyroxin.
 - ✓ Thyroxin needs iodine in order to function properly
 - ✓ Multiple target tissues
 - ✓ regulates the rate of **metabolism**
 - ✓ in the body and is essential for **normal physical and mental development**



Parathyroid Gland

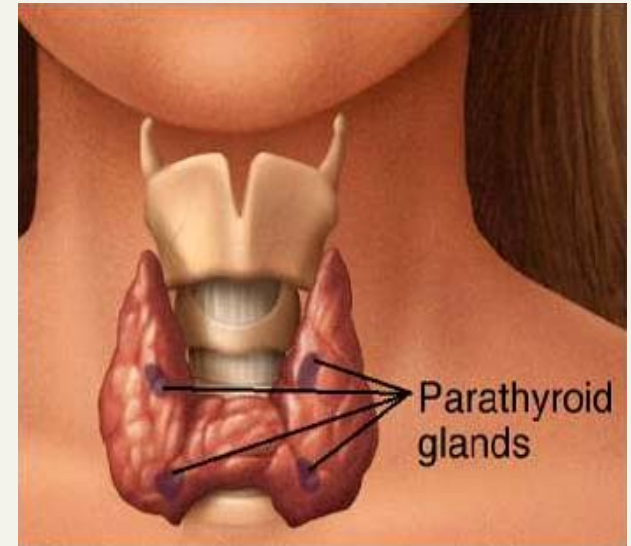
The **parathyroid** gland, are four patches of tissue **embedded in** the thyroid gland. Parathyroid gland secretes **Parathyroid hormone**



Parathyroid Gland (2)

- **Parathyroid Hormone**

- ✓ Target tissues-mainly bones, teeth,
- ✓ Regulates **calcium** levels in the blood which is necessary for nerve function, blood clotting and proper growth of **teeth** and **bone** .

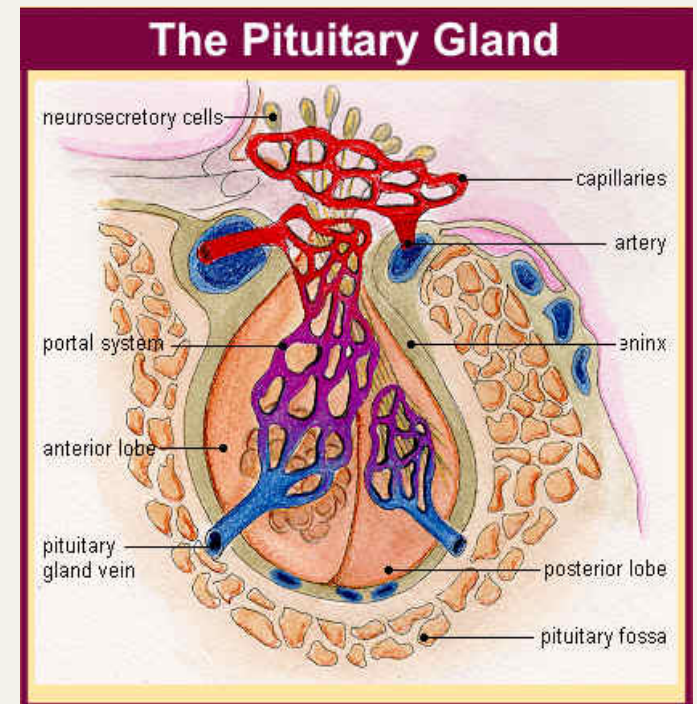
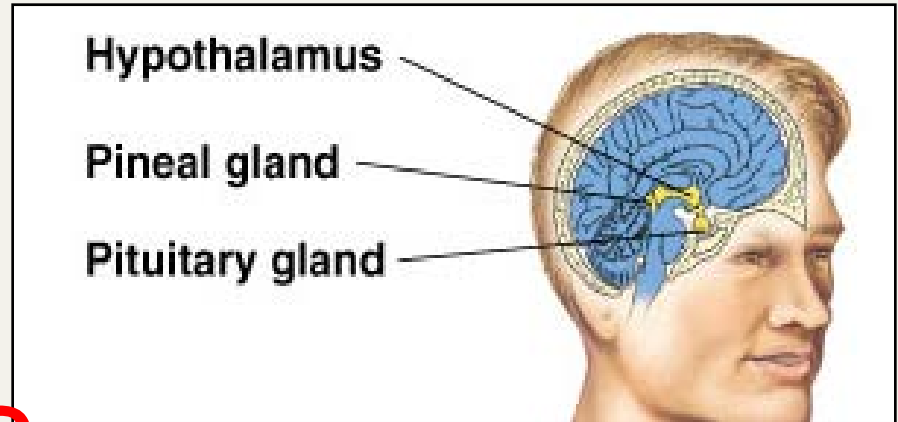


Pituitary Gland

Pituitary (anterior)-

THE MASTER GLAND

The **pituitary** gland is the “master gland” of the body. It is located at the base of the brain and secretes numerous hormones some of which will, **control other endocrine glands**



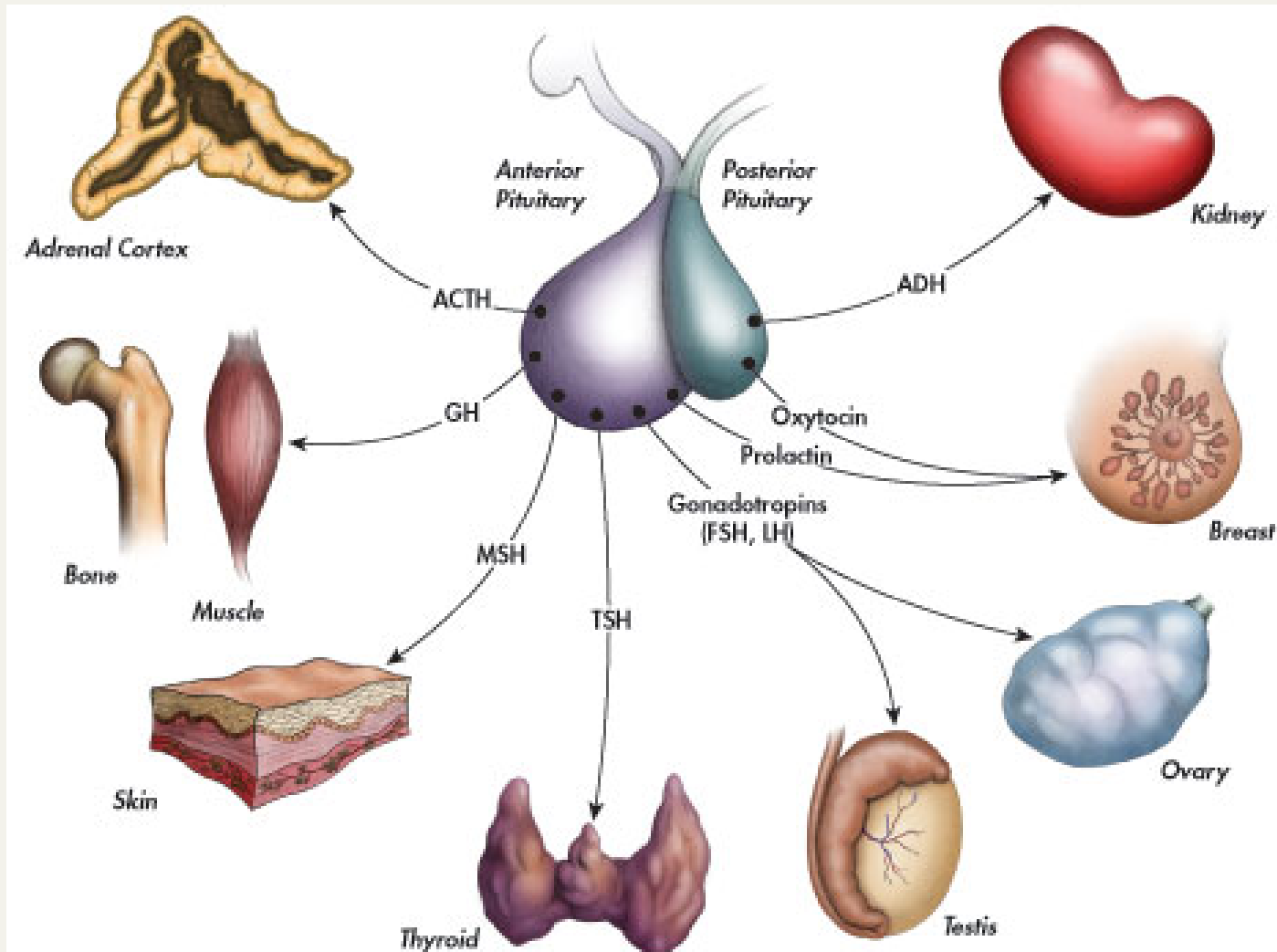
Pituitary Gland (2)

- Growth Hormone
 - ✓ Multiple target tissues including bone, muscle
 - ✓ Stimulates growth by increasing the length of bones (arm, leg etc)
- Stimulating Hormones
 - ✓ Group of hormones that affect other **endocrine** glands
 - ✓ Some key stimulating hormones:

Pituitary Gland (3)

Pituitary Hormone	Target Tissue & effect
Thyroid Stimulating Hormone (TSH)	Tells the THYROID GLAND to secrete the hormone THYROXIN
Follicle Stimulating Hormone (FSH)	Tells the ovaries to mature an egg in the follicle and the testes to create sperm cells
Adrenocorticotrophic Hormone (ACTH)	Tells the Adrenal Cortex to secrete cortisone

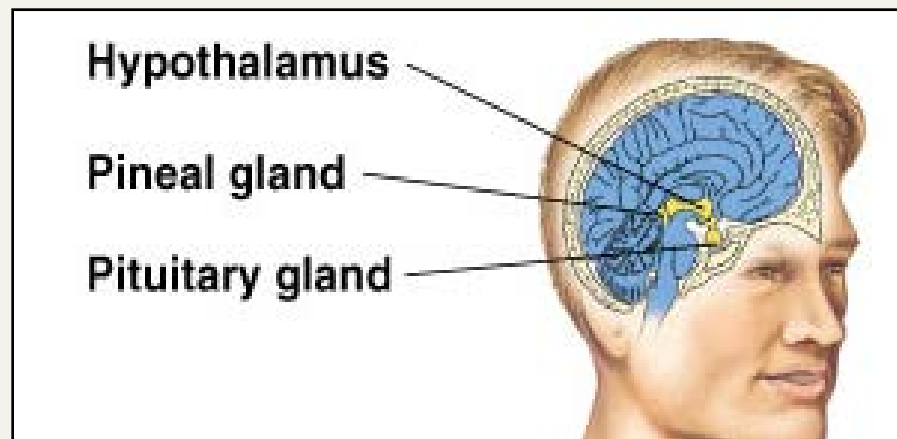
Pituitary Gland (4)



Hypothalamus

How do the nervous system and the endocrine system communicate?

The **hypothalamus** is a small region of the brain. It is part of the **nervous** system, and also plays a role in **endocrine** function. It produces releasing hormones which influence the **pituitary** gland.



Hypothalamus

Neurosecretory cells produce releasing and release inhibiting hormones.

These hormones are secreted into a portal system.

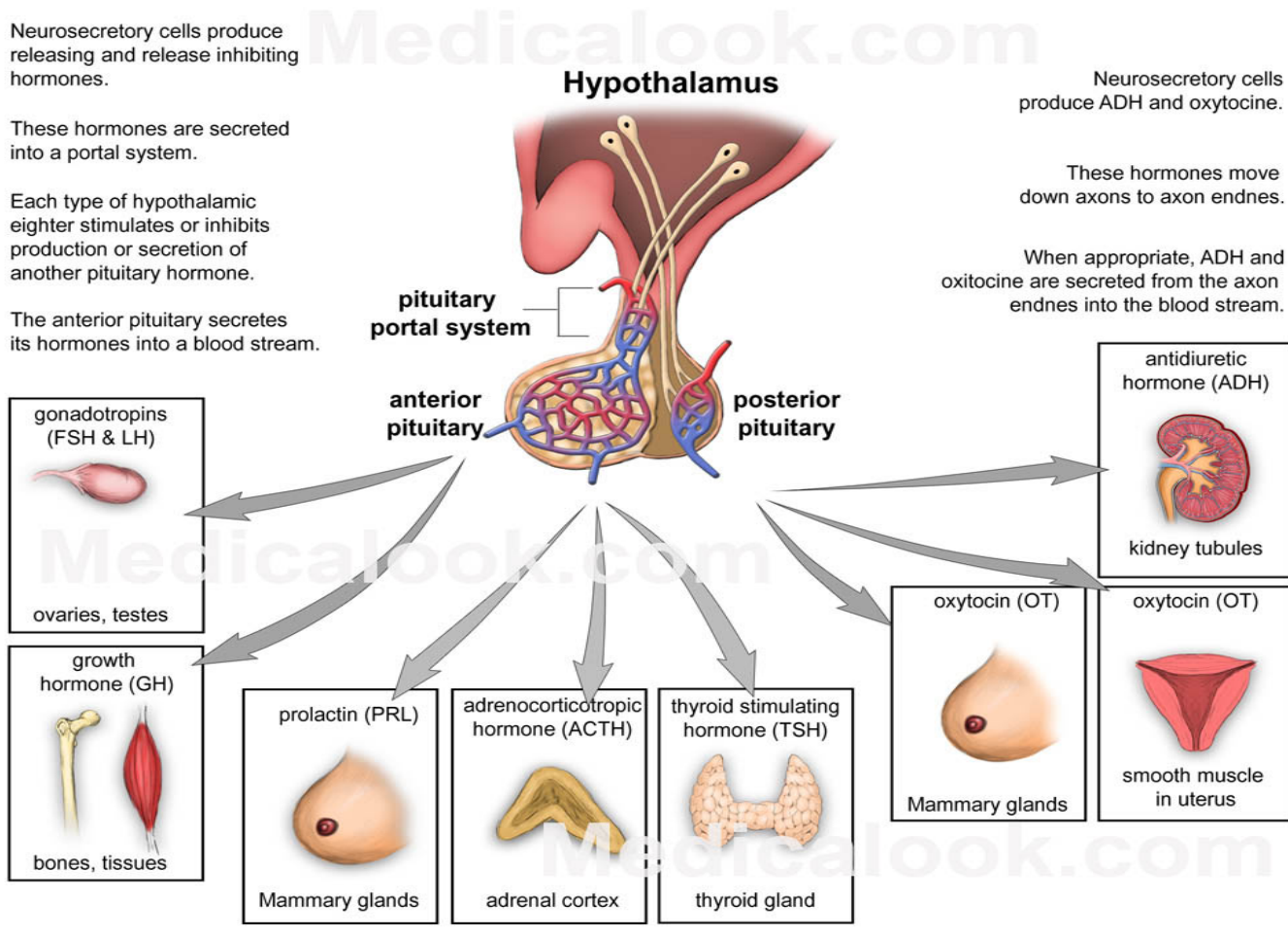
Each type of hypothalamic hormone stimulates or inhibits production or secretion of another pituitary hormone.

The anterior pituitary secretes its hormones into a blood stream.

Neurosecretory cells produce ADH and oxytocine.

These hormones move down axons to axon ends.

When appropriate, ADH and oxytocine are secreted from the axon ends into the blood stream.

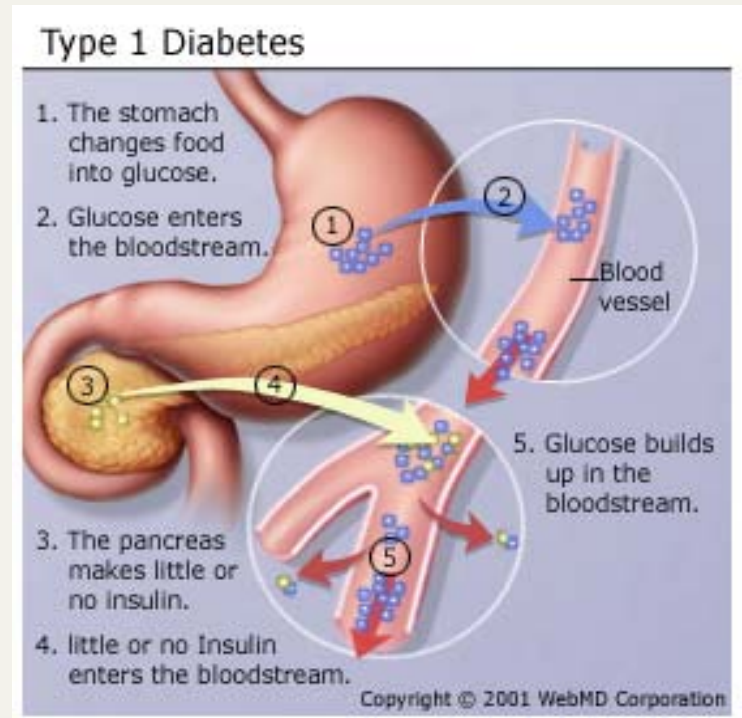


Hypothalamus Movie

- [Hypothalamus & Pituitary](#)
- [Endocrine Summary](#)
- [Endocrine and mood](#)

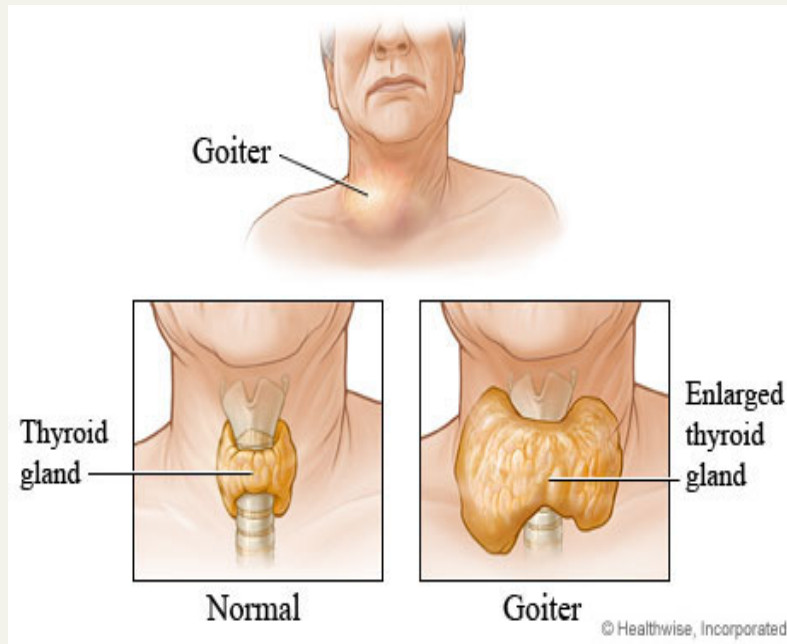
Diseases/Malfunctions

- **Diabetes:** Not enough **insulin** produced by the pancreas. Without insulin the body cells and liver cannot absorb glucose from the blood . High levels of blood sugar can be detected in a urine test.



Diseases/Malfunctions (2)

- **Goiter:** Swelling of the thyroid gland many times due to insufficient iodine in the blood.



Diseases/Malfunctions (3)

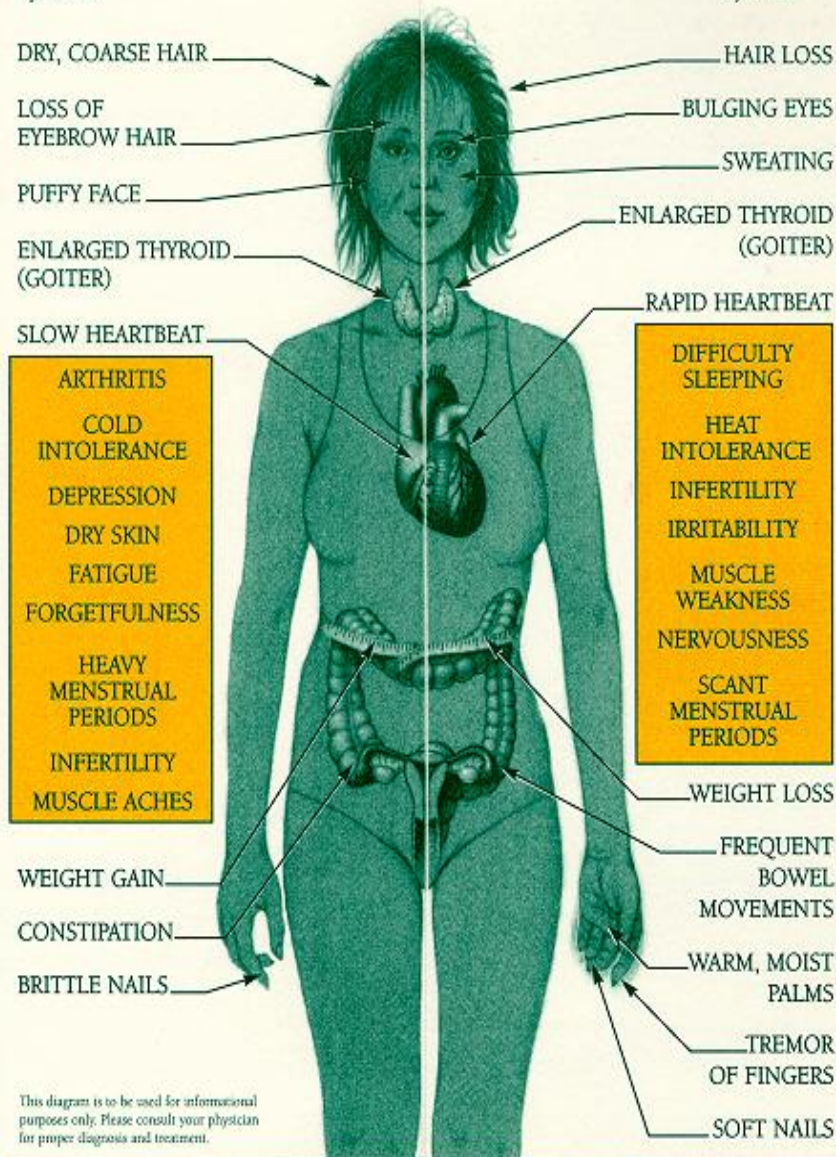
- **Hypothyroidism**-not enough thyroid hormone which lowers a person's metabolic rate
- **Hyperthyroidism**-over secretion of thyroid hormone which increases a person's metabolic rate

HYPO

thyroidism

HYPER

thyroidism



This diagram is to be used for informational purposes only. Please consult your physician for proper diagnosis and treatment.

Diseases/Malfunctions (4)

- **Cretinism:** “underactivity of the thyroid gland at birth resulting in growth retardation, developmental delay and other abnormal features. It can also be due to deficiency of iodine in the mother's diet during pregnancy.



Diseases/Malfunctions (5)

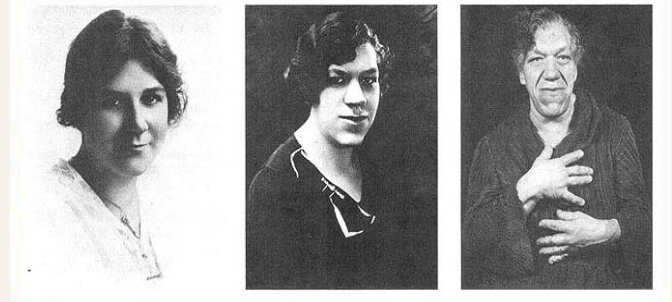
- **Pituitary Dwarf**-not enough growth hormone



- **Pituitary Giant**-too much growth hormone



- **Acromegaly**-over-secretion of growth hormone in adults



SUMMARY

Gland	Location	Hormone(s) Secreted	Disease/ Malfunction
Hypothalamus	Brain	Connects nervous system and endocrine system	
Anterior Pituitary	Base of Brain	Growth Hormone- increases growth	Dwarfism Gigantism
		Stimulating Hormones- control other endocrine glands	

SUMMARY

Gland	Location	Hormone(s) Secreted	Disease/ Malfunction
Thyroid Gland	Neck	Thyroxin-controls metabolic rate	Goiter Hypothyroid hyperthyroid
Parathyroid Gland	In thyroid gland	Parathyroid Hormone- regulates calcium levels	
Adrenal Gland (Cortex)	On top of kidney	Cortisone- changes fats and protein to glucose	

SUMMARY

Gland	Location	Hormone(s) Secreted	Disease/ Malfunction
Adrenal Gland (medulla)	On top of kidney	Adrenalin-“fight & flight Response”	
Islets of Langerhans	Pancreas	Insulin- Lowers blood glucose levels	diabetes
		Glucagon- elevates blood glucose levels	