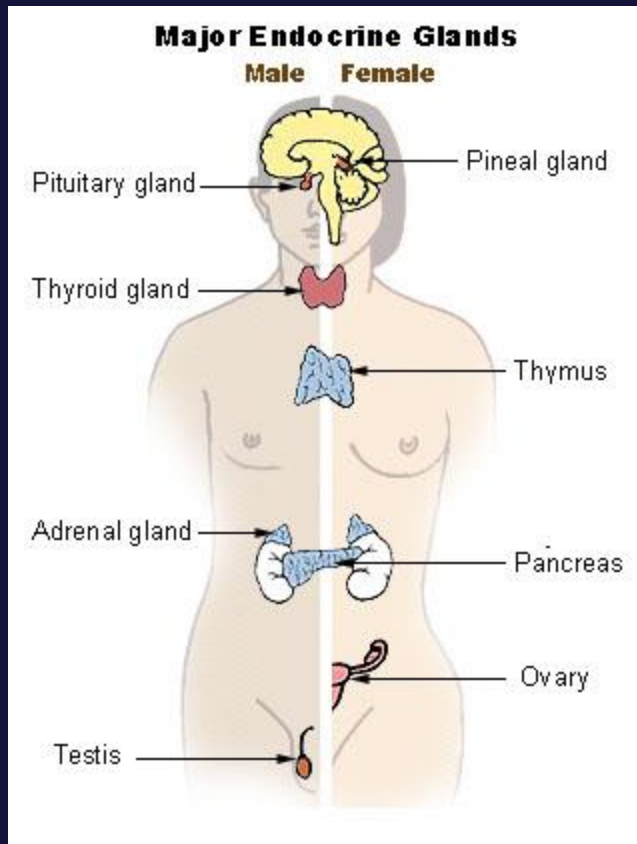




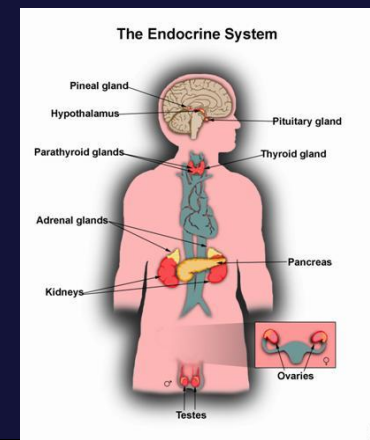
Endocrine System



اعداد
د. زينب علي

Endocrine System

- The **endocrine system** includes the endocrine glands and their hormones
- The function of the endocrine system is to secrete **hormones** into the bloodstream.
- **Hormone**: A Chemical messenger which targets a specific group of cells, in order to cause that group of cells do some activity or stop doing an activity.

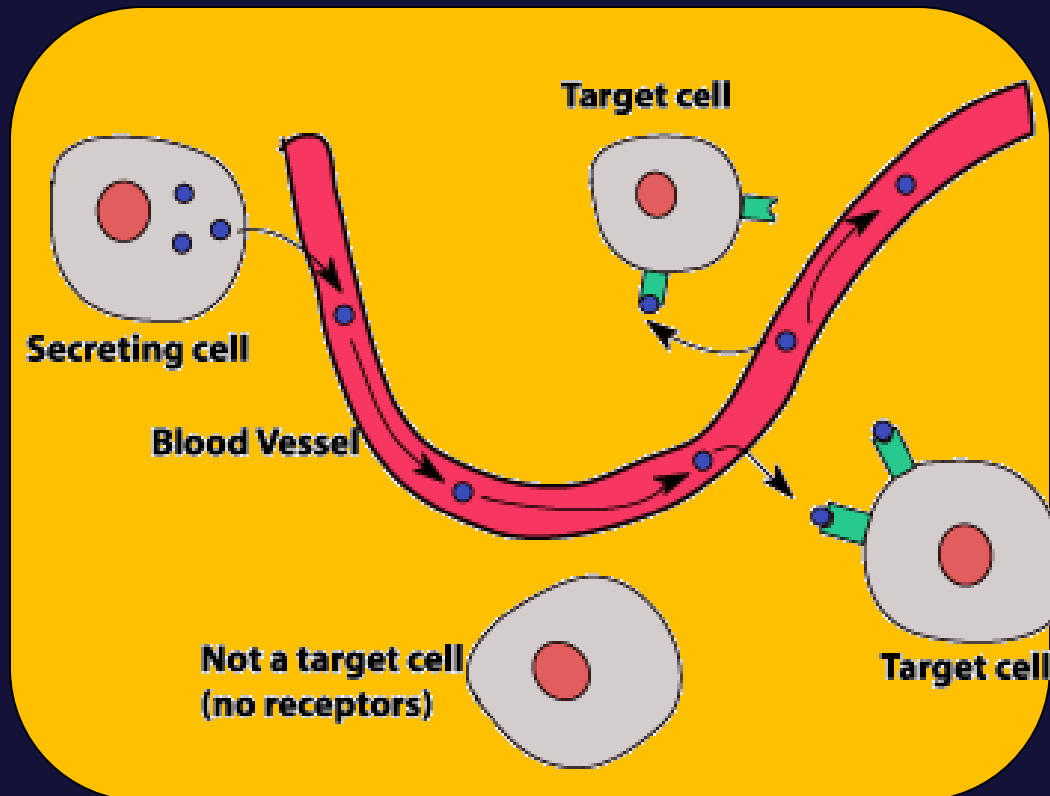


Endocrine System

- **Endocrine Glands** are called ductless glands
 - Release hormones directly into the bloodstream
 - Blood transports hormones throughout the body
 - Each hormone acts on only a certain kind of tissue called its **target tissue**

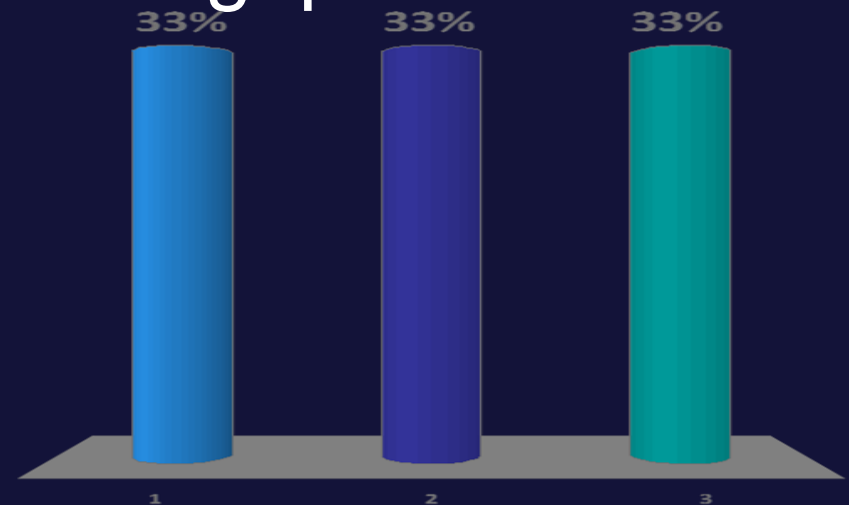
Endocrine System

- Each hormone acts on a certain kind of tissue called its **target tissue**



What are endocrine hormones?

- ★ 1. Chemical signals from one cell to remote target cells.
- 2. Chemicals for direct cell-to-cell communication.
- 3. Chemicals that cross a gap between to adjacent cells.



Messenger Molecules

- Cells must communicate with one another to coordinate cell processes within tissues and to maintain homeostasis.
- Cell-to-cell communication is carried out via messenger molecules.

Three types of chemical signals are used for cell-to-cell communication

Table 37-2 The Chemical Diversity of Vertebrate Hormones

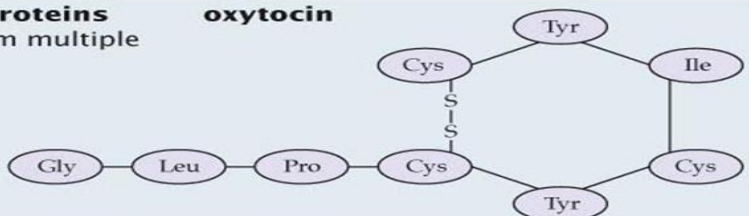
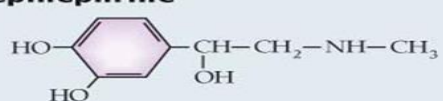
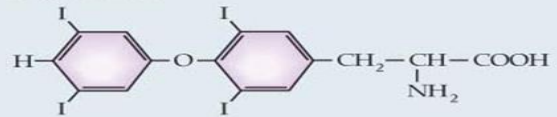


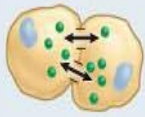
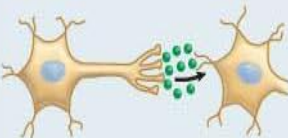
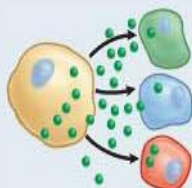
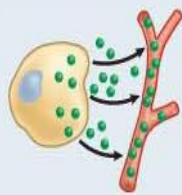
Chemical Type	Examples
Peptides and proteins (synthesized from multiple amino acids)	oxytocin 
Amino acid derivatives (synthesized from one or two amino acids)	norepinephrine 
	thyroxine 
Steroids (synthesized from cholesterol)	testosterone 
	estrogen 

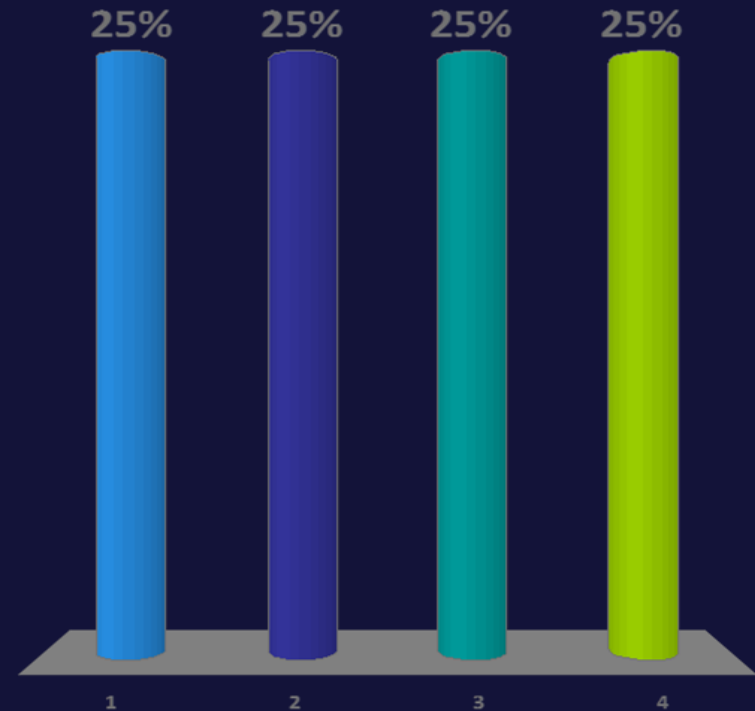
Table 37-1 How Cells Communicate

Communication	Chemical Messengers	Mechanism of Transmission	Examples
Direct 	Ions, small molecules	Direct movement through gap junctions linking the cytoplasm of adjacent cells	Ions flowing between cardiac muscle cells
Synaptic 	Neurotransmitters	Diffusion from a neuron across a narrow space (synaptic cleft) to a cell bearing the appropriate receptors	Acetylcholine
Paracrine 	Local hormones	Diffusion through extracellular fluid to nearby cells bearing the appropriate receptors	Prostaglandins
Endocrine 	Hormones	Carried in the bloodstream to near or distant cells bearing the appropriate receptors	Insulin

Four methods of cell-to-cell communication are found in the human body, ranging from direct to remote communication

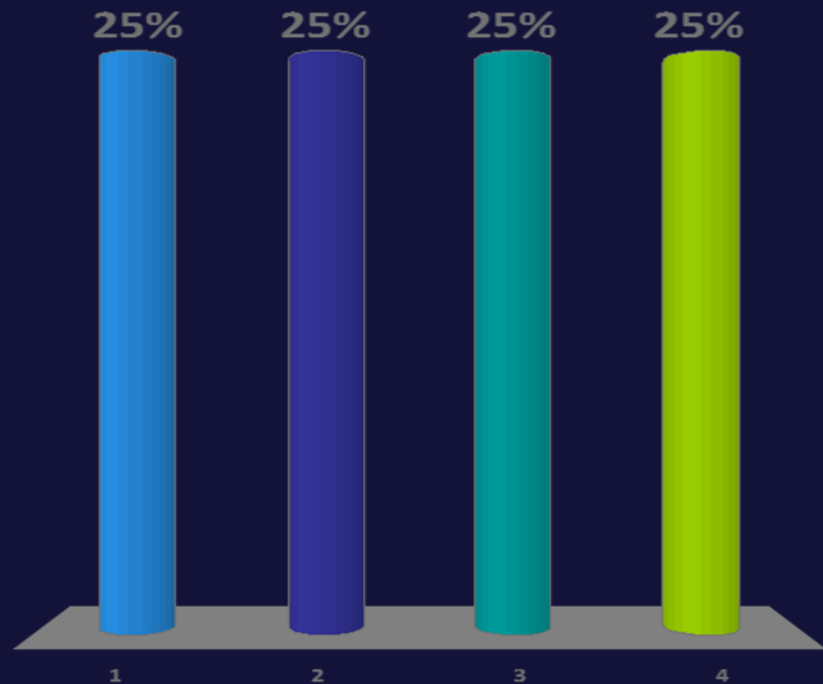
A muscle cell needs to tell a neighboring muscle cell to contract. This will be accomplished by ____ communication:

- ★ 1. Direct.
- 2. Synaptic.
- 3. Paracrine.
- 4. Endocrine.



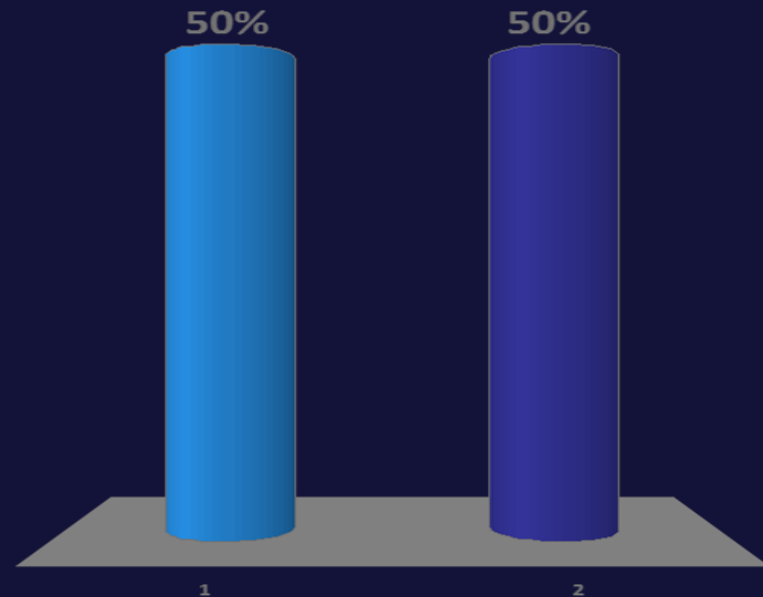
When blood sugar is high, body cells must be stimulated to take up sugar. This is accomplished by ____ communication

1. Direct.
2. Synaptic.
3. Paracrine.
- ★ 4. Endocrine.



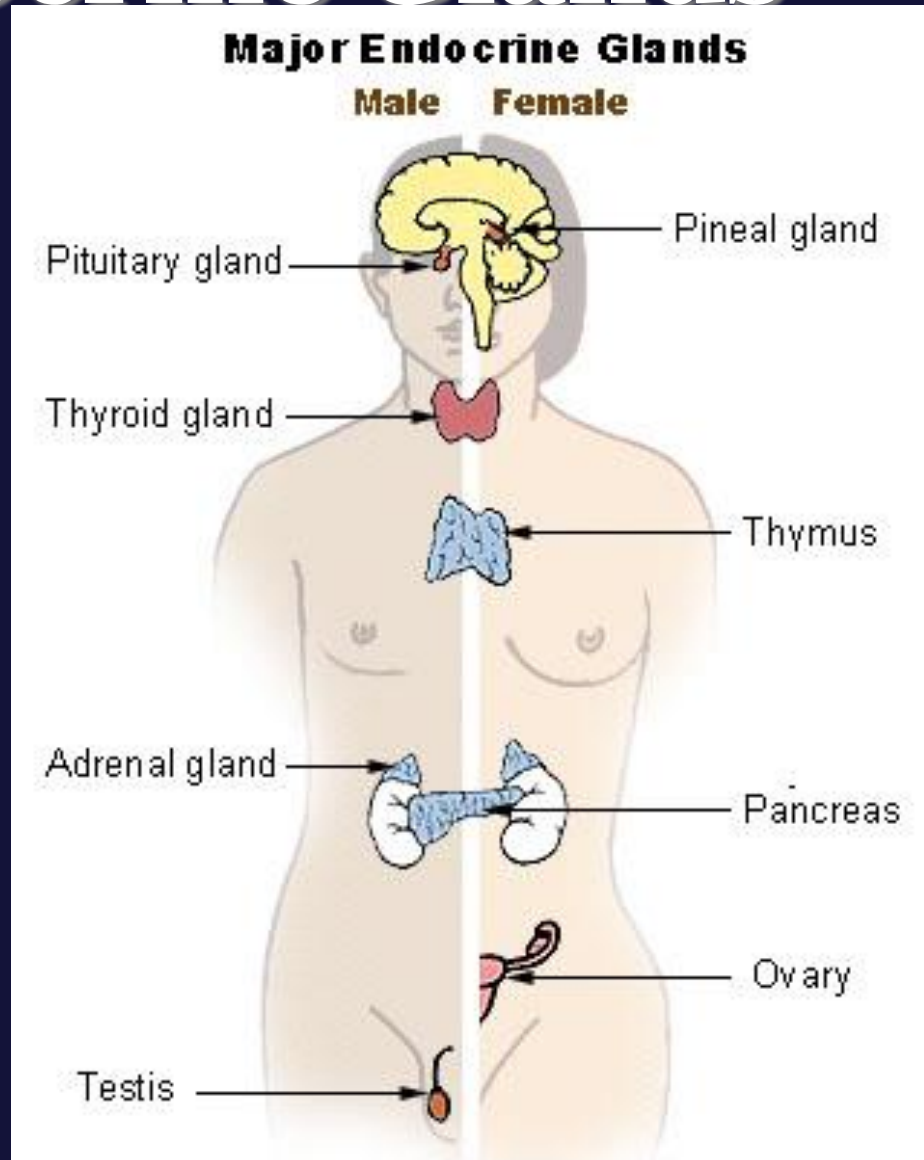
Aspirin helps relieve headaches because it:

- ★ 1. Inhibits prostaglandin synthesis.
- 2. Stimulates prostaglandin synthesis.



Human Endocrine Glands

- **Pituitary**
- **Thyroid**
- **Parathyroid**
- **Adrenal**
- **Pancreas (Islets of Langerhans)**
- **Testes and Ovaries**

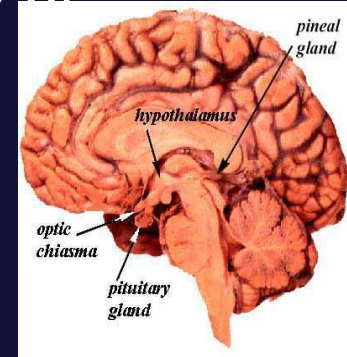


Pituitary

- Pituitary gland is a round organ about the size of a pea (~1 cm in diameter), located behind the bridge of the nose at the base of the brain

- Role of the Pituitary

- The pituitary is the “master gland” that signals other glands to produce their hormones when needed.
- The anterior lobe of the pituitary receives signals from the hypothalamus, and responds by sending out the appropriate hormone to other endocrine glands.
- The posterior pituitary receives oxytocin or antidiuretic hormone (ADH) from the hypothalamus, relays them to the body as necessary



Role of the Hypothalamus

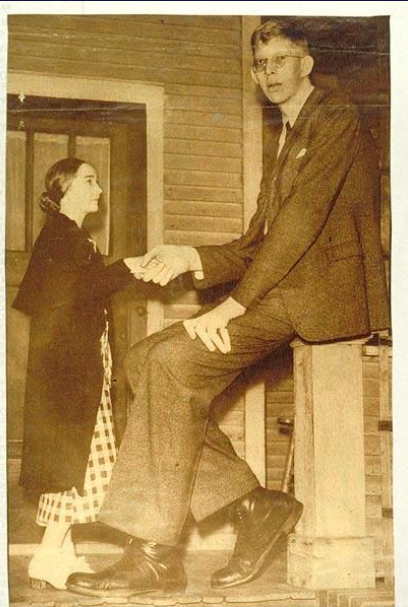
- The thalamus receives sensory information, relays some to the hypothalamus.
- Hypothalamus monitors the body for temperature, pH, other conditions.
- Hypothalamus signals pituitary gland if conditions need to be corrected.

A Few Pituitary Hormones

Hormone	Function
Growth Hormone (GH)	To increase body size during childhood and adolescence; to maintain body size during adulthood
Thyroid Stimulating Hormone (TSH)	To stimulate the thyroid to produce thyroxin
Follicle Stimulating Hormone (FSH)	Regulate puberty, development, and reproductive processes
Luteinizing Hormone (LH)	Stimulates the production of estrogen and testosterone

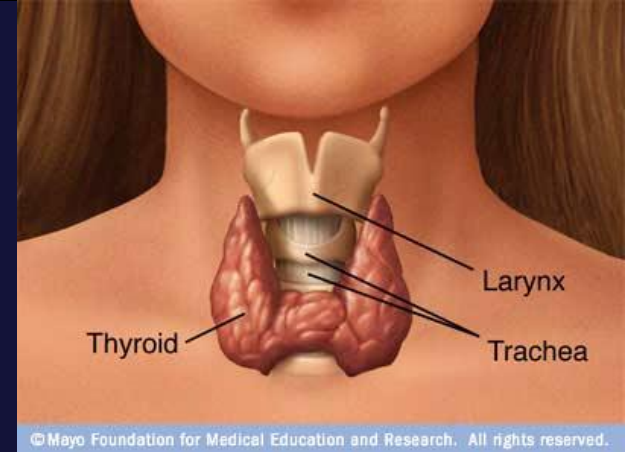
Growth Hormone

- Oversecretion of growth hormone:
 - **Gigantism** in childhood and acromegaly in adults (bones of face, hands and feet enlarge)
- Undersecretion of growth hormone:
 - **Dwarfism** in childhood

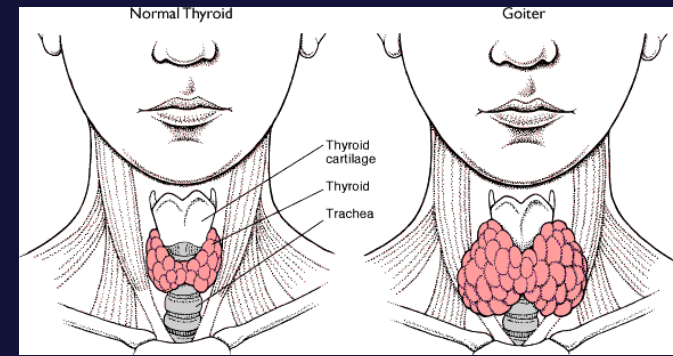


Thyroid

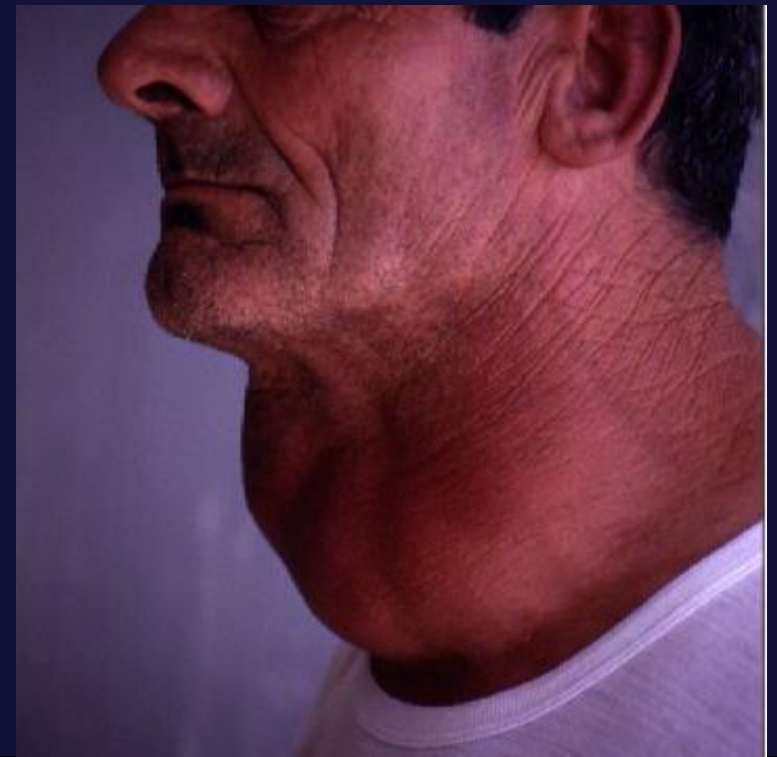
- Located in the **neck**
- Releases hormone **thyroxin**
- Function is to regulate rates of **metabolism** in the body
 - Essential for normal physical and mental development
- **Oversecretion of thyroxin:**
 - Results in nervousness and weight loss
- **Undersecretion of thyroxin:**
 - Results in cretinism (mental retardation, small size) in children



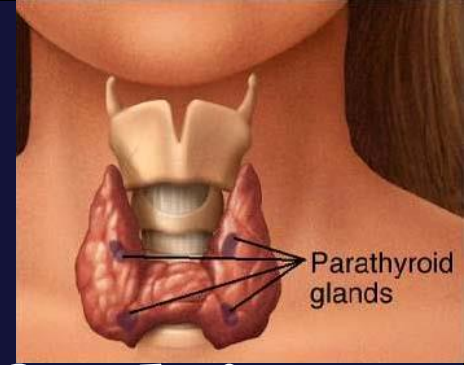
Thyroid



- **Iodine** deficiency in your diet results in **goiter** (enlargement of thyroid gland)



Parathyroid



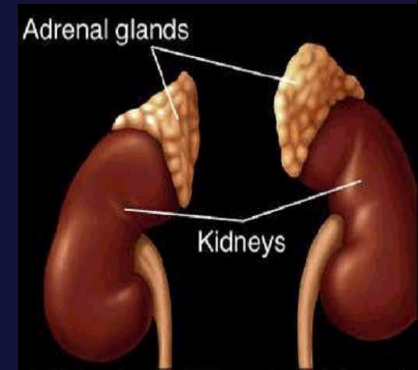
Function is to control **metabolism of calcium**

– Necessary for normal nerve and muscle function, blood clotting, healthy bones and teeth

- Located in back of thyroid gland (in neck)
- Hormone released is **parathormone**
- Undersecretion of parathormone results in nerve disorders, brittle bones and clotting problems

Adrenal Glands (Kidney Hats)

- Located at the top of each **kidney**
- Hormones released are **cortisone** and **adrenaline**
- Function of cortisone is to regulate carbohydrate, protein and fat metabolism
 - promotes conversion of fats and proteins to glucose
- Function of adrenaline is to raise blood sugar levels and increases heartbeat and breathing rates



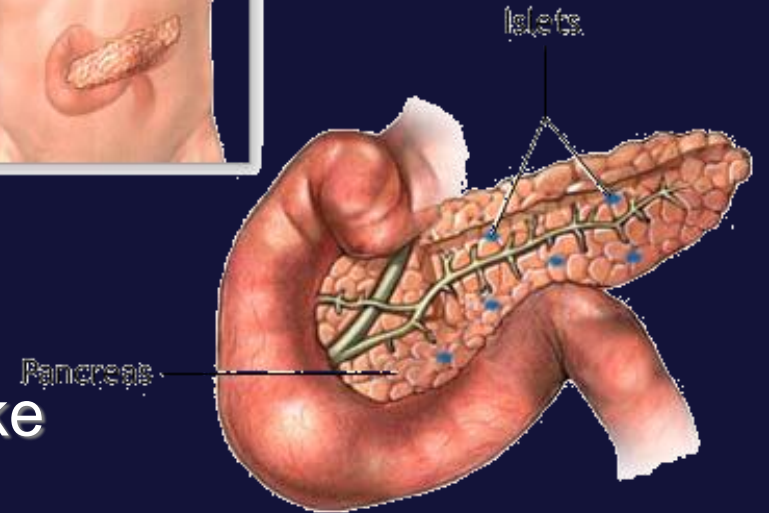
Adrenal

- Undersecretion of adrenaline results in the **inability** to deal with stress



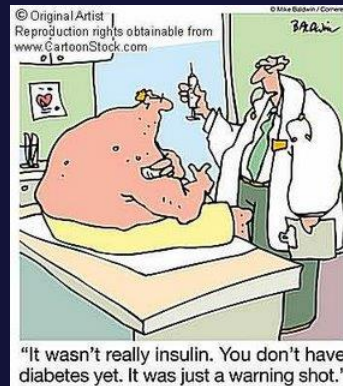
Islet of Langerhans

- Located on the pancreas
- Hormones secreted are insulin and glucagon
- **Insulin** stimulates glucose uptake by cells
- **Glucagon** promotes conversion of glycogen (animal-based carbohydrate) to glucose

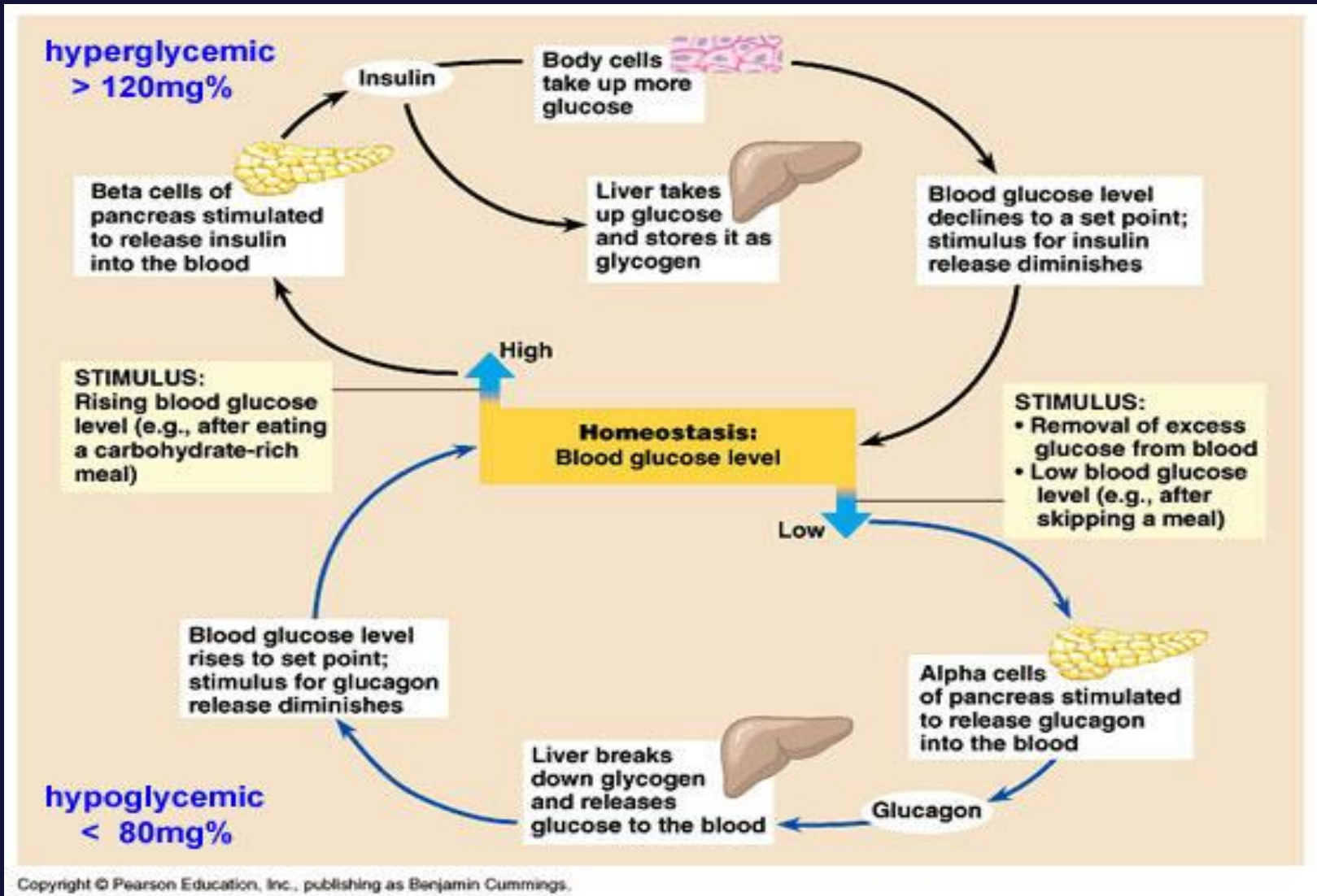


Blood Sugar Regulation

- Oversecretion of insulin results in **low** blood sugar
- Undersecretion of insulin results in **high** blood sugar
 - This can lead to a condition known as **diabetes**



Blood Sugar Control



Diabetes-Type 1

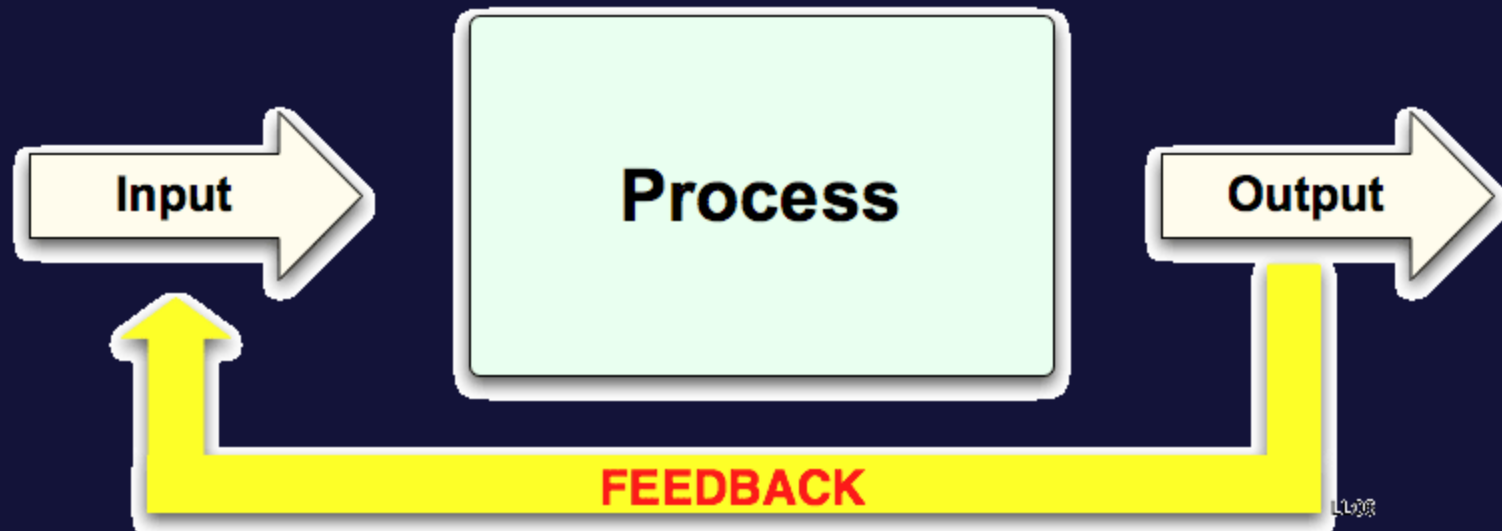
- **Type 1**- Usually found in children and young adults; the body doesn't make enough insulin

Diabetes- Type 2

- **Type 2**- Either the body doesn't produce enough insulin, or the cells ignore it.
 - If you consume too much sugar over a long period of time, your body has to release large amounts of insulin. This can result in your cells building up a tolerance for insulin, which means they won't be affected by it.

Endocrine System Control

- Regulated by feedback mechanisms
 - 2 types of feedback mechanisms
 1. **positive** feedback
 2. **negative** feedback



Feedback Mechanisms

- Negative Feedback mechanisms:
 - Act like a thermostat in a home
 - As the temperature cools, the thermostat detects the change and triggers the furnace to turn on and warm the house
 - Once the temperature reaches its thermostat setting, the furnace turns off
 - Example: Body sugar increases after a meal, so the pancreas secretes **insulin**, which tells the body's cells to take in **glucose**. Once blood sugar levels reach normal, the pancreas stops making insulin.
 - Often used to maintain **homeostasis**

Negative Feedback

- **Homeostasis** is often maintained by two hormones who have antagonistic effects
 - Each hormone does the **opposite** of the other.
 - For example, if the blood pressure drops too low, the pituitary releases ADH, which causes the kidneys to reabsorb more water. If the blood pressure increases too much, then the heart will release ANH, which will cause the kidneys to reabsorb less water.

Positive Feedback Mechanisms

- Positive Feedback mechanisms control events that can be out of control and do not require continuous adjustment
- Rarely used to maintain homeostasis
- Example of positive feedback found in childbirth
 - Oxytocin stimulates and enhances labor contractions
 - As labor continues, more oxytocin is produced
 - Intensifies contractions until the baby is outside birth canal
 - Oxytocin production stops and labor contractions stop

Finally...

- **Summarize the roles of the pituitary and other endocrine glands in maintaining homeostasis in the human body.**



Thank You!