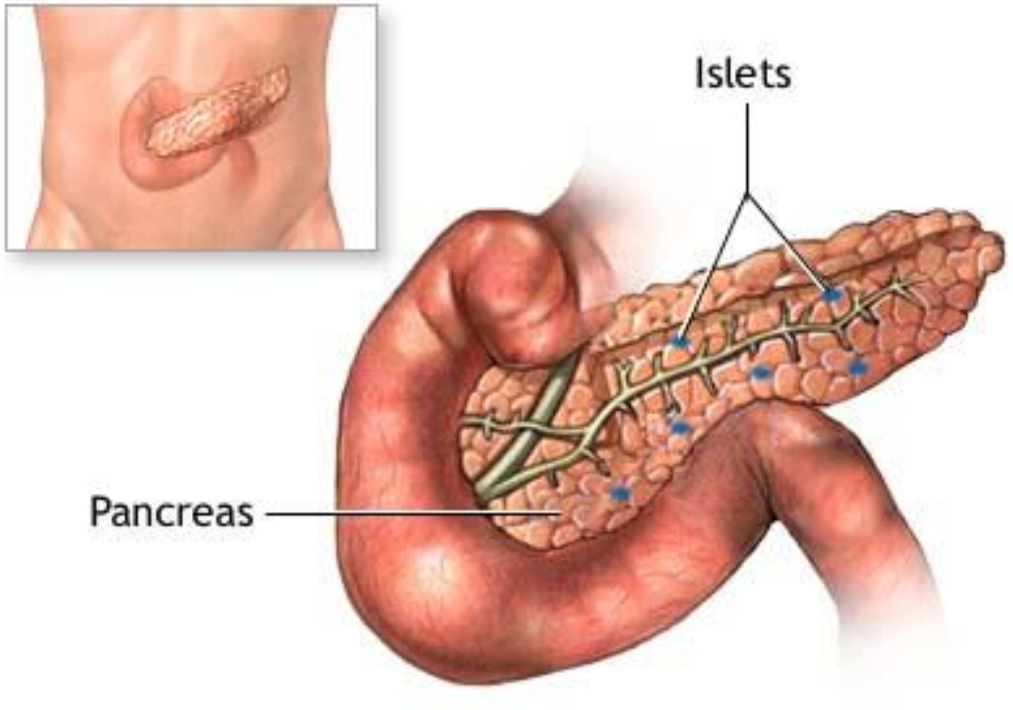
# 9.3 Hormonal Regulation of Stress Response and Blood Sugar

SBI4U

# Hormones of Pancreas

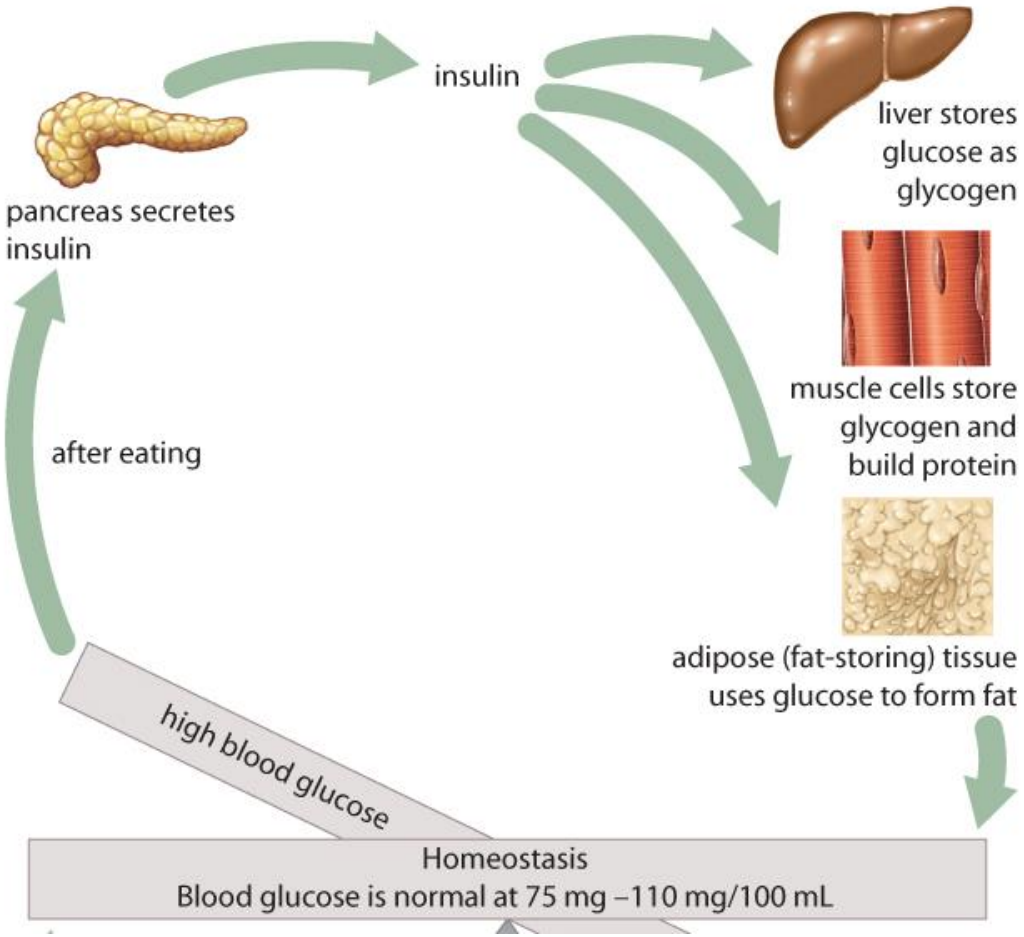
The pancreas is an organ that is involved in both digestion and maintaining sugar levels. It contains alpha and beta cells which produce and release the hormones, **insulin** and **glucagon**.




***Insulin*** *is produced in the beta cells. Released when sugar levels are high.*

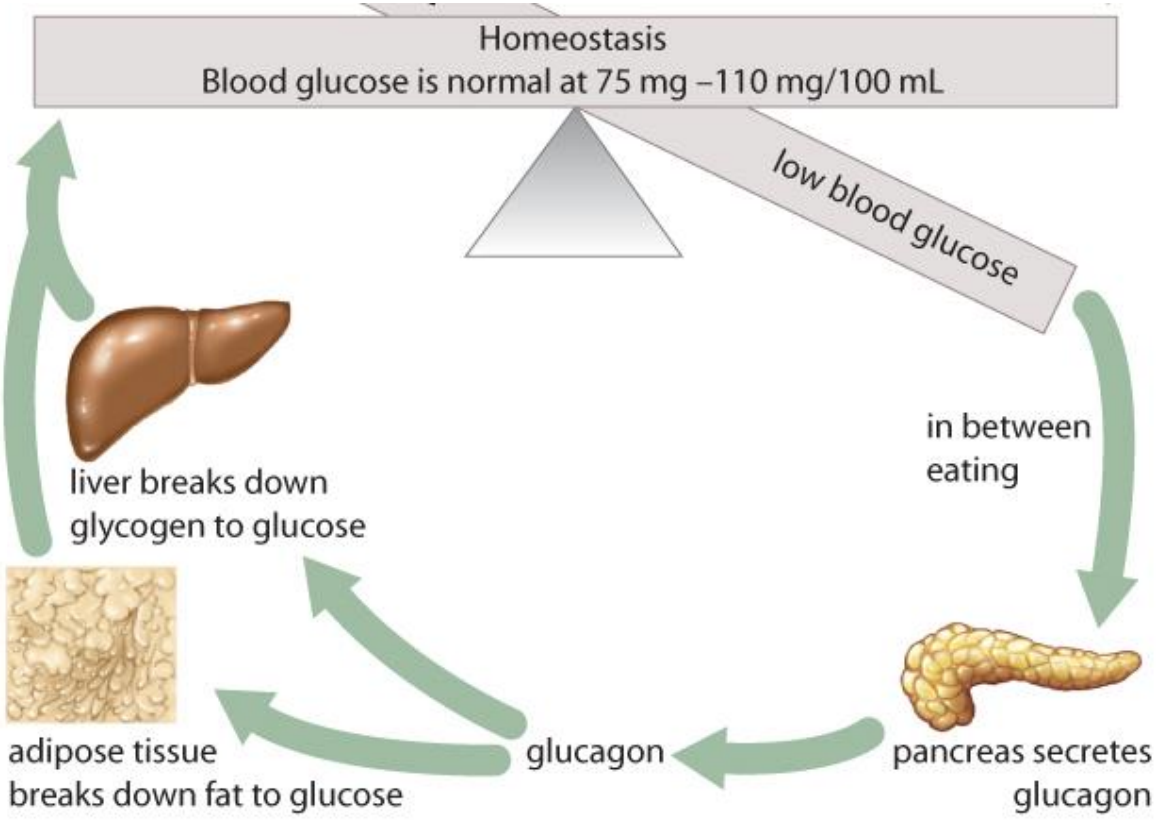
***Glucagon*** *is produced in the alpha cells. Released when sugar levels are low.*

# Hormones of Pancreas




*Bloo sugar is controlled by a* ***negative feedback loop****. When sugar levels are high, the beta cells release insulin which targets the* ***liver****,* ***muscles*** *and* ***adipose tissue****.*

# Hormones of Pancreas




*When sugar levels are low, the alpha cells release glucagon which targets the **liver** and **adipose tissue** to break down fat or glycogen and increase blood sugar levels.*

# Diabetes

People who are affected by **diabetes** either do not produce enough insulin or their body does not respond to the hormone.

**Hyperglycemia** (high levels of blood sugar), causes the body to revert to fat and protein metabolism for energy. The glucose that cannot be absorbed is excreted from the kidneys as urine.

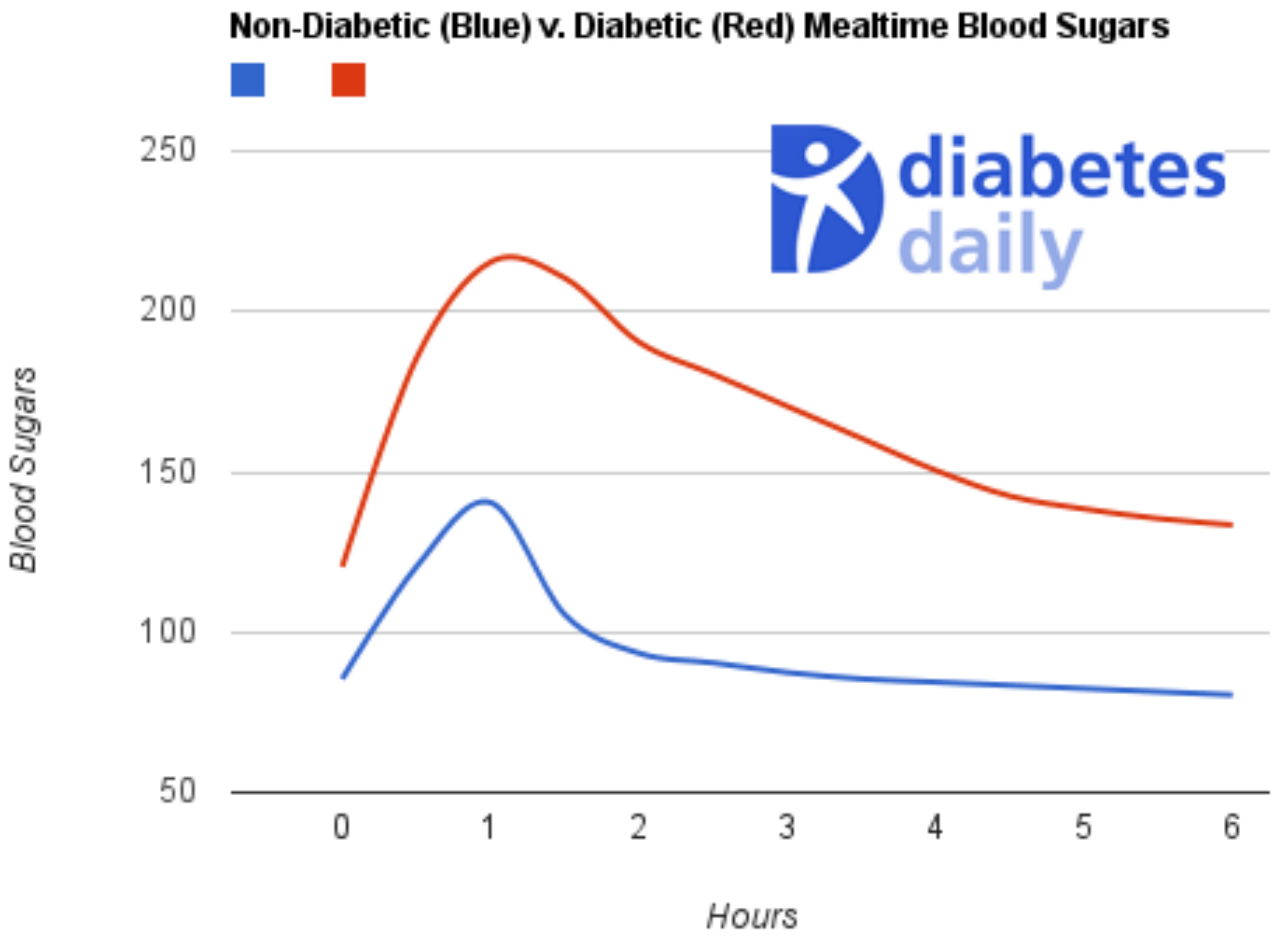
# Causes of Diabetes

There are two types of diabetes:

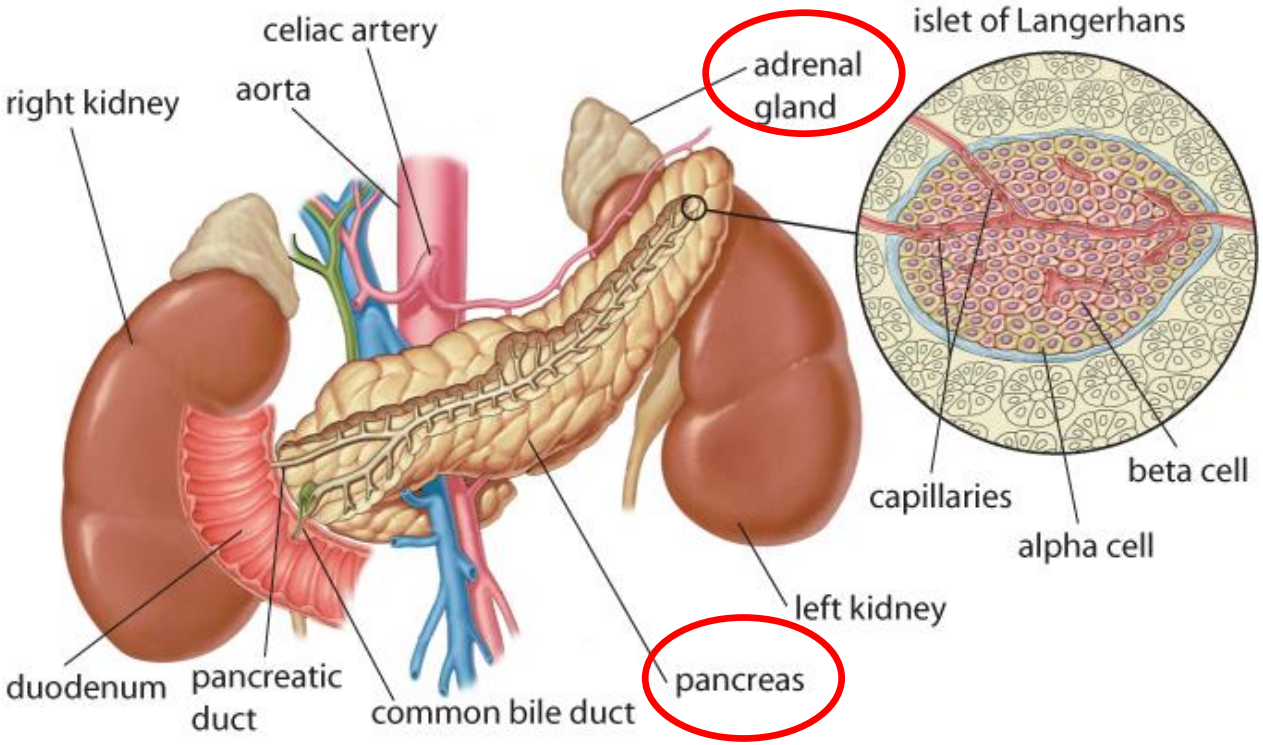
***Type 1 (Juvenile Diabetes):*** The immune system attacks the beta cells and thus are unable to produce insulin.

***Type 2 (Adult-Onset Diabetes):*** body cells no longer respond to the insulin and as a result the beta cells produce less of the hormone over time. This can be controlled by diet and exercise, however they may become dependent on insulin injection.

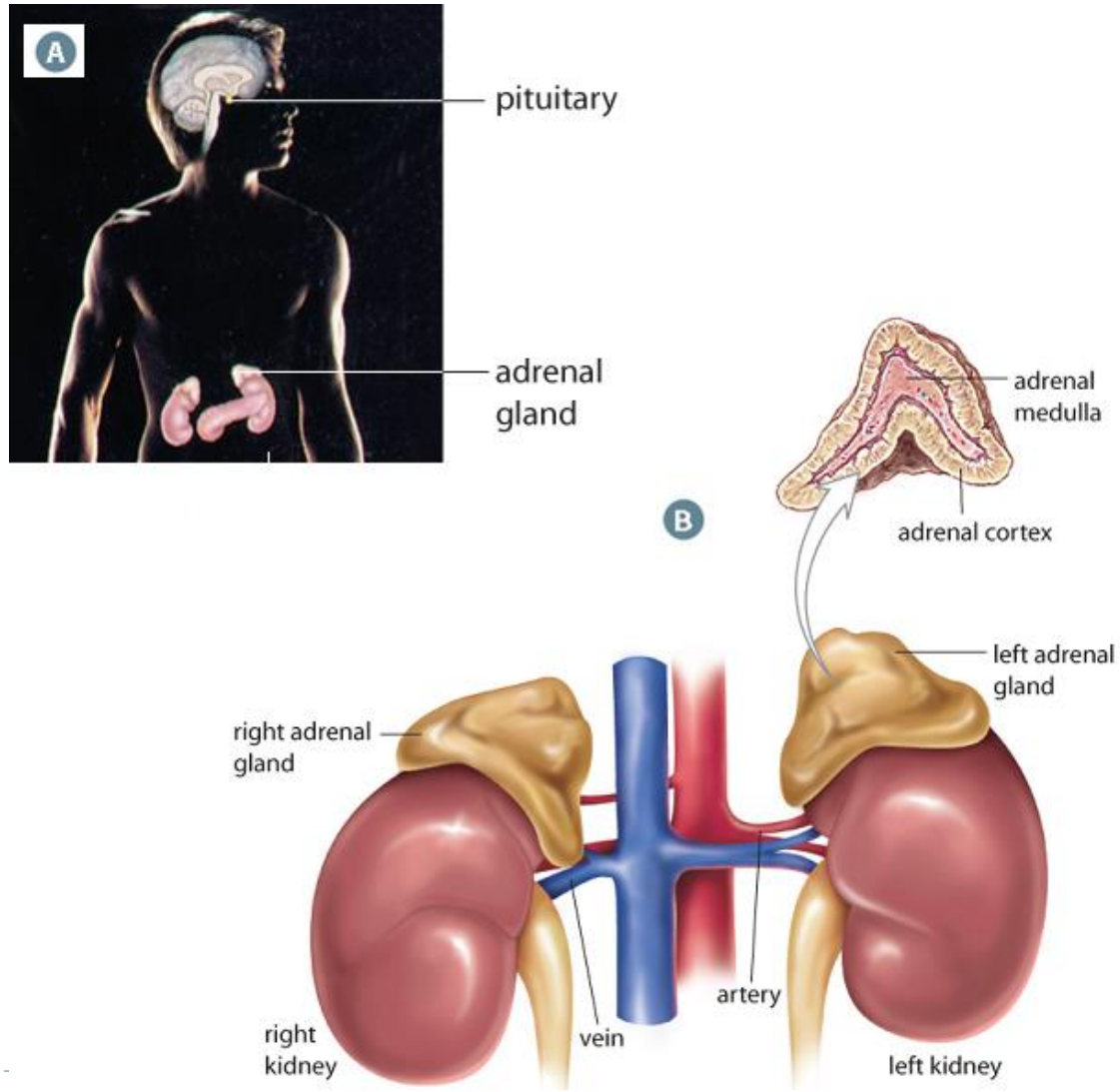
# Interpreting Blood Sugar Levels



# Location of Pancreas and Adrenal Glands



# Adrenal Glands




*The adrenal gland is composed of two main glands:*

1) ***Adrenal Medulla:*** *regulated by nervous system*

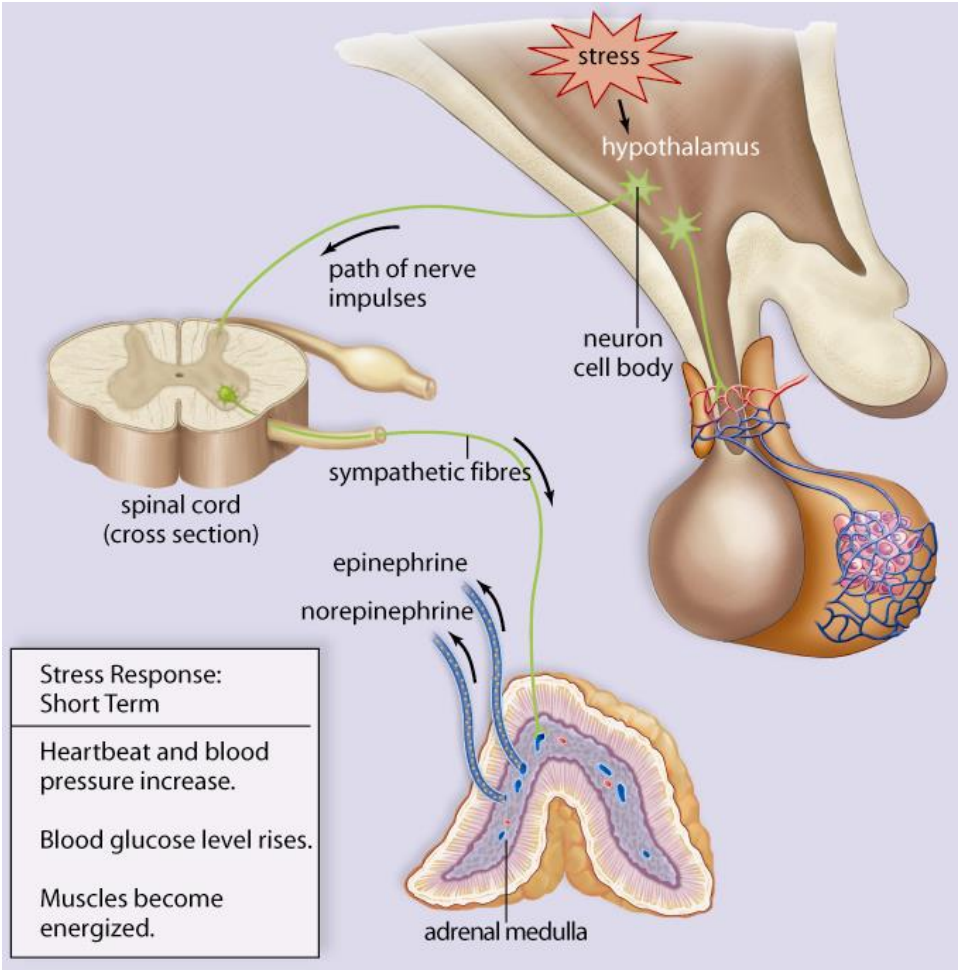
2) ***Adrenal Cortex:*** *regulated by hormones*

# Adrenal Medulla

*The* **sympathetic nervous system** *carries a message from the hypothalamus to the adrenal glands during times of stress by releasing epinephrine. (Fight- or- Flight Response)*

*The adrenal medulla also produces* ***epinephrine*** *and* ***norepinephrine*** *in the form of a hormone. The release of the hormones are stimulated by the sympathetic nervous system, causing them to travel in the bloodstream to their target organs.*

# Adrenal Medulla & Hypothalamus




*Epinephrine works quickly and can be used in anaphylactic emergencies to open up air passages and restore breathing.*

# Adrenal Cortex

The Adrenal Cortex produces three types of hormones: **glucocorticoids**, **mineralcorticoids** and small amounts of sex hormones.

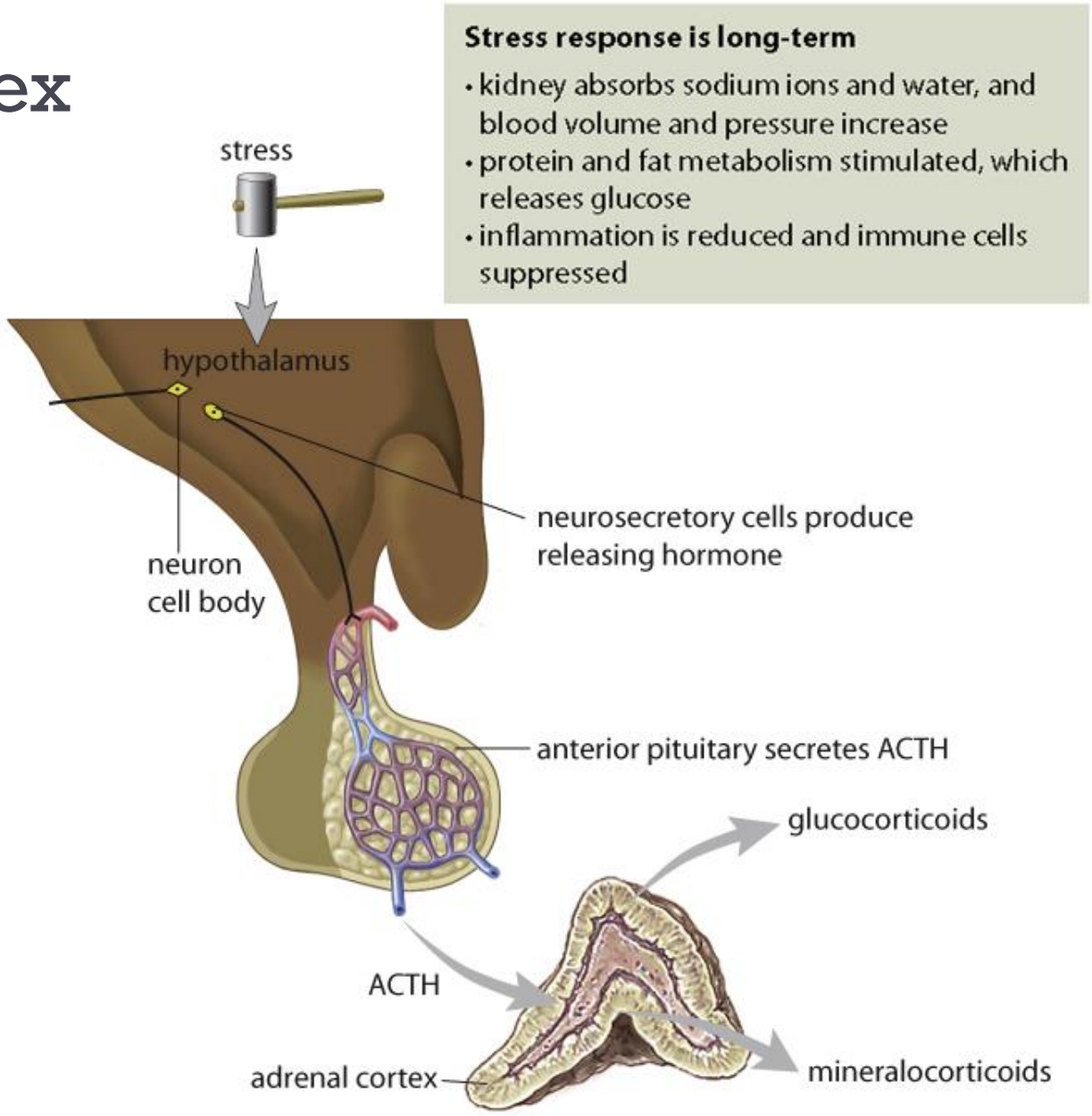
A) **Glucocorticoid:** Cortisol is a type of glucocorticoid that helps increase the levels of amino acids in blood to recover from stress. The liver converts the amino acids into glucose, Which can be used to produce energy during times of stress.

B) **Mineralocorticoid:** Aldesterone helps to increase sodium retention in the blood and water reabsorption by the kidneys.

# Adrenal Cortex

*The hypothalamus sends a tropic hormone to the pituitary gland, which in turn send its own tropic hormone (**ACTH**) to the adrenal cortex.*

*If there is too much cortisol in the blood, it can inhibit the the release of tropic hormones form the hypothalamus or pituitary.*



# Homework

Textbook: p. 413 # 1, 2, 3, 6, 8 & 9