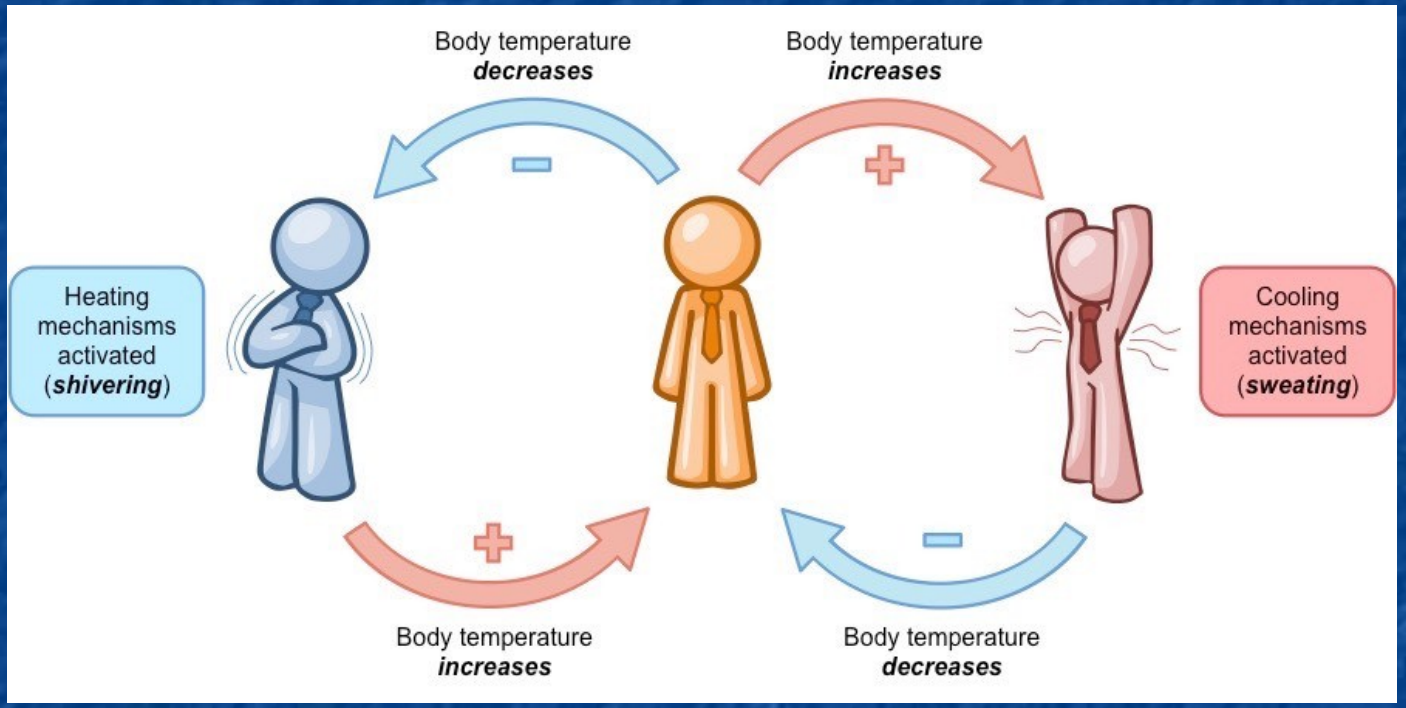
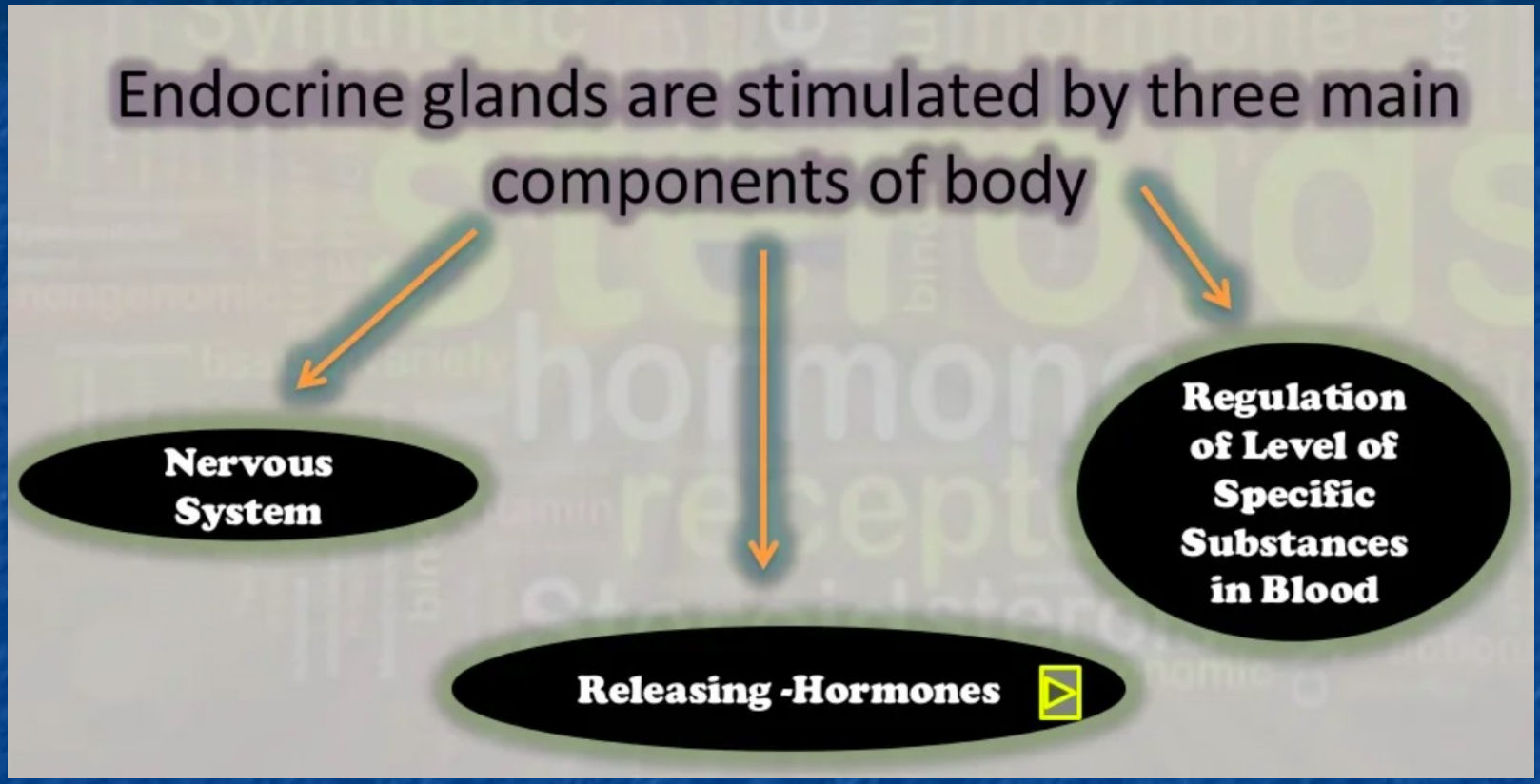
Regulation of Hormone Secretion



Jaydev Mandal MSc, PhD
Assistant Professor
Department of Zoology
M. C. College, Barpeta

Introduction

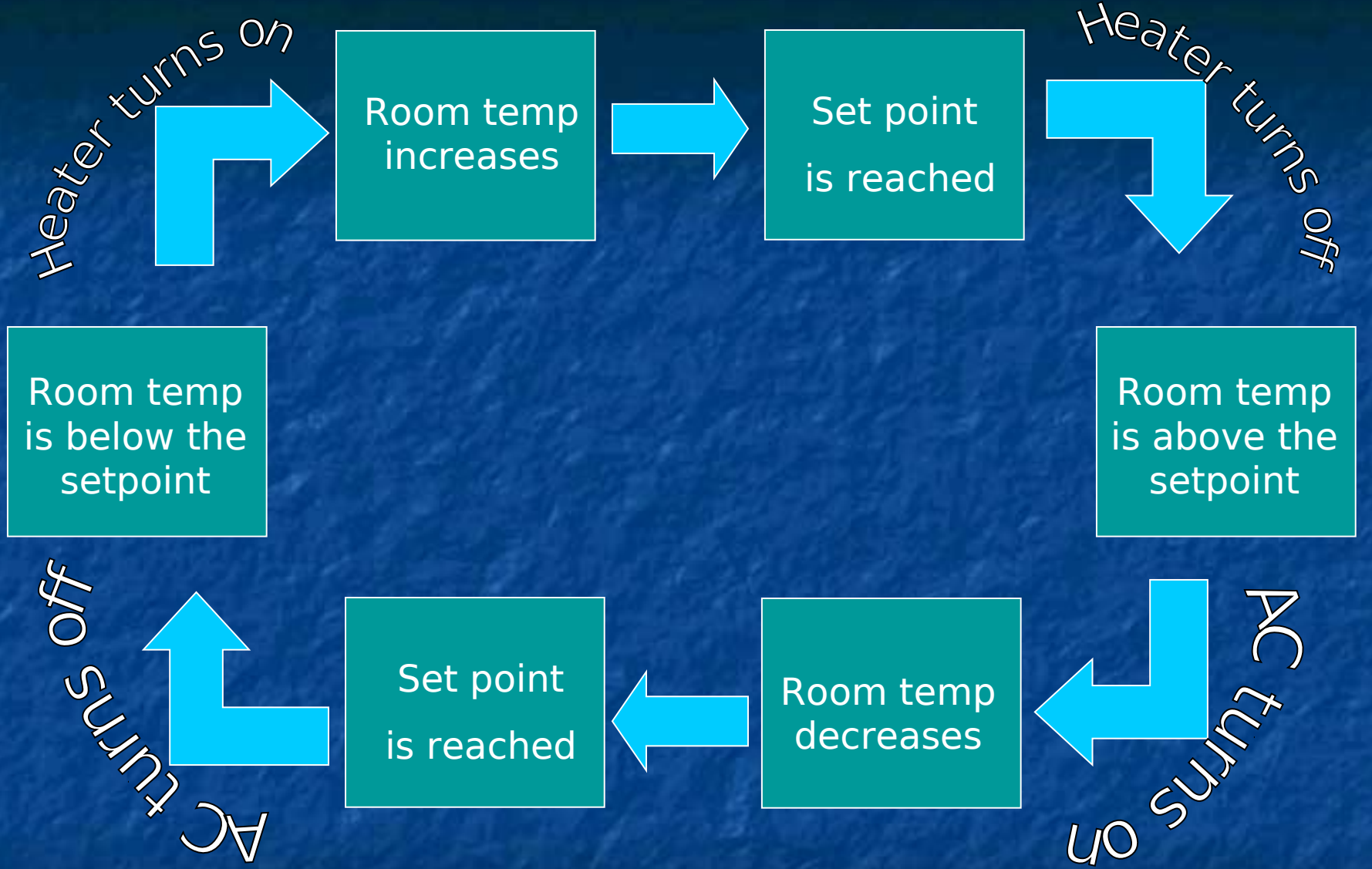


Feedback is the process in which part of the output of a system is returned to its input in order to regulate its further output.

Negative Feedback

- Negative feedback occurs when the output of a system acts to oppose changes to the input of the system.

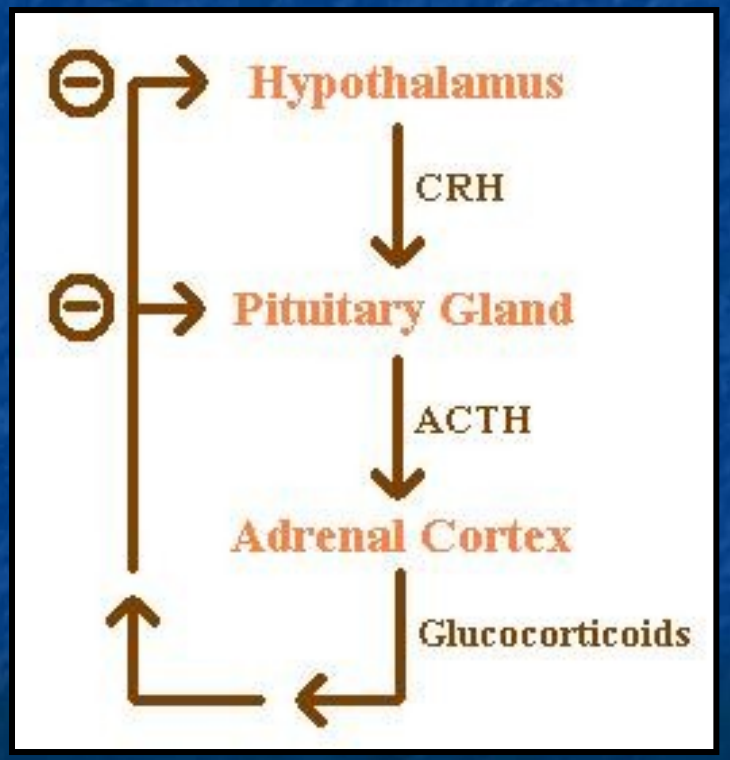
- A thermostat is an example of a negative feedback system.



A thermostat is a device for regulating the temperature of a system so that the system's temperature is maintained near a desired *setpoint* temperature.

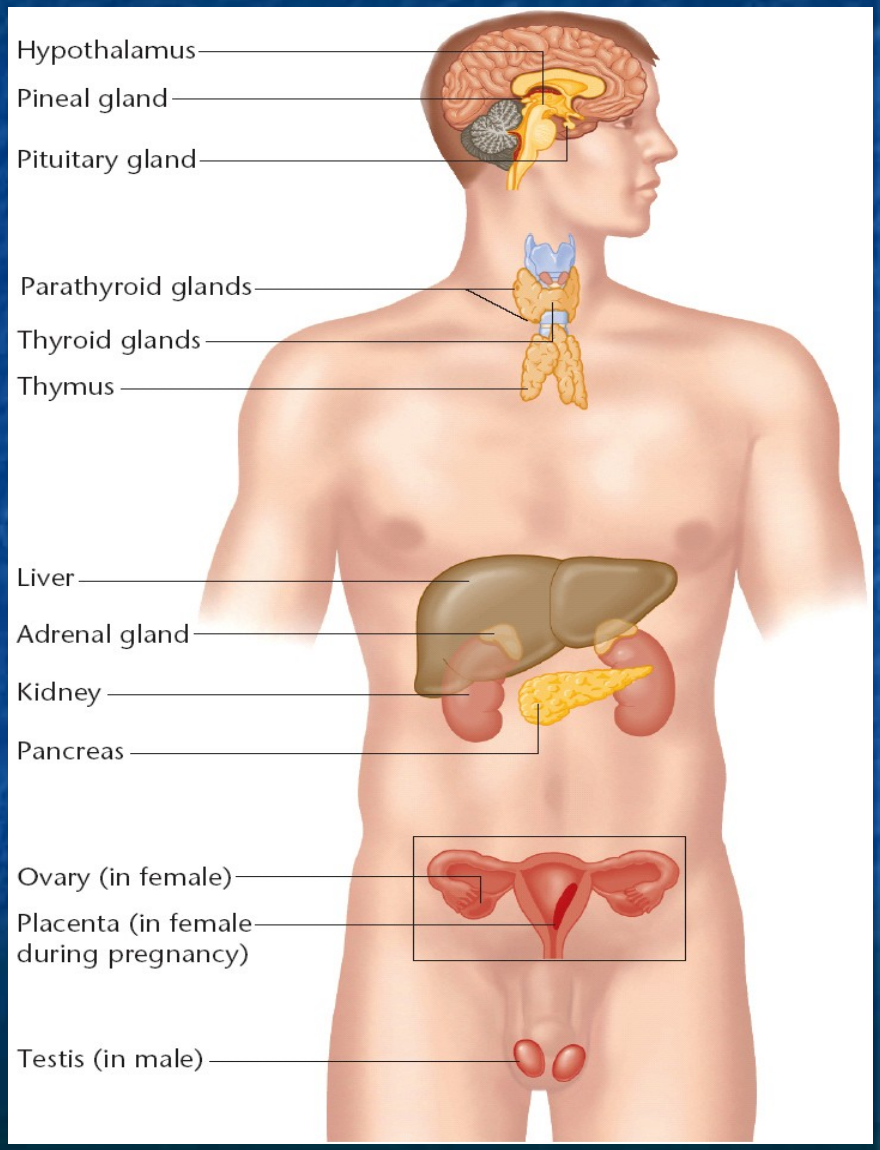
Negative Feedback in Biology

- Negative feedback also regulates many systems in organisms.
- The endocrine system is one example.
- This diagram shows a negative feedback loop for stress hormones.
- Areas of negative feedback are indicated with a minus sign, (-).



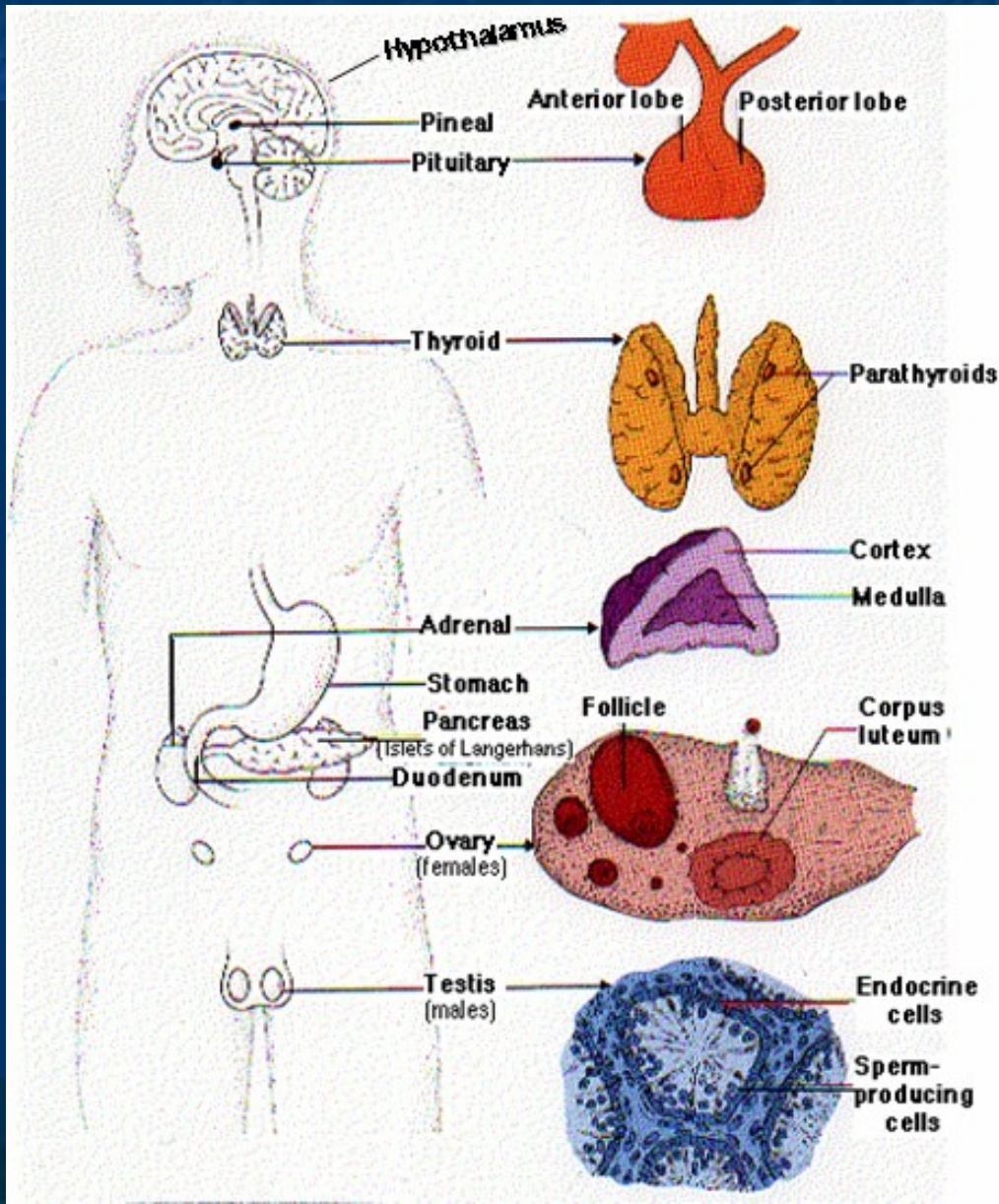
Endocrine System

- The endocrine system is composed of glands that produces chemical messengers called hormones.
- Hormones are produced in one part of the body and travel to target organs through the bloodstream.



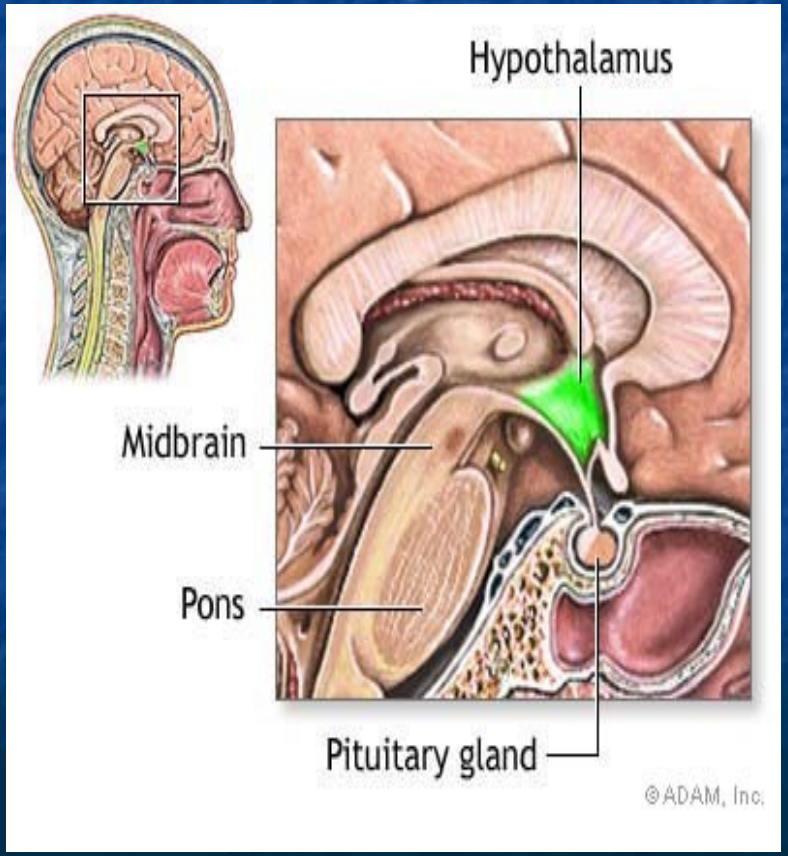
Endocrine system

- Glands of the endocrine system include:
- Pituitary gland
- Thyroid Gland
- Parathyroid glands
- Thymus
- Adrenal glands
- Pancreas
- Ovary and Testis



Endocrine System

- The brain continuously sends signals to the endocrine glands to secrete and release hormones and the glands, in turn, send feedback to the nervous system.
- The hypothalamus in the brain is the master switch that sends signals to the pituitary gland which can release up to eight hormones into the bloodstream.
- The hormone travels to its target organ and usually results in the release of another hormone into the bloodstream.



Endocrine System

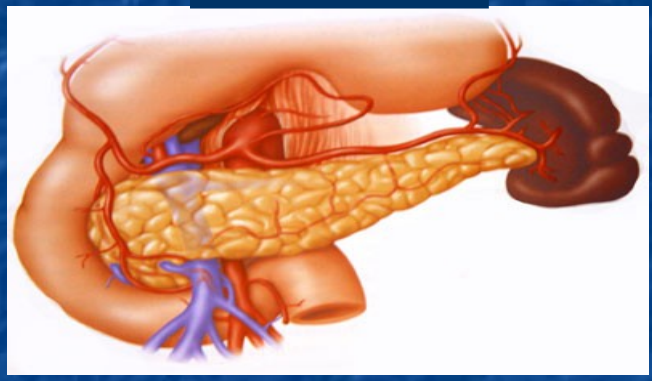
- The hypothalamus then detects the rising hormone levels from the target organ and decreases the release of hormones from the pituitary which results in a decrease in hormone release from the target organ.

- The process of maintaining normal body function through negative feedback mechanisms is called homeostasis.

Glucose and Insulin

- Glucose intake occurs during digestion of food that is needed for energy expenditure to perform routine physical activities.
- The pancreas is the key organ that regulates the glucose levels in body by secreting two hormones, insulin and glucagon.
- The liver also helps to store the excess glucose in form of glycogen to be utilized

Pancreas



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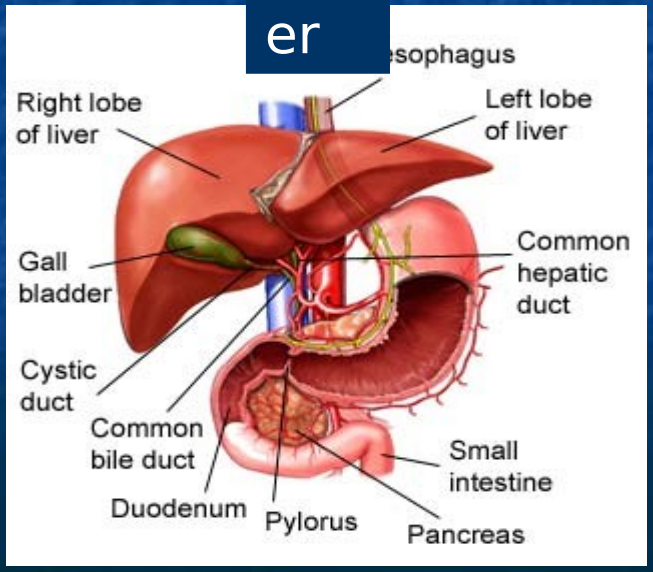
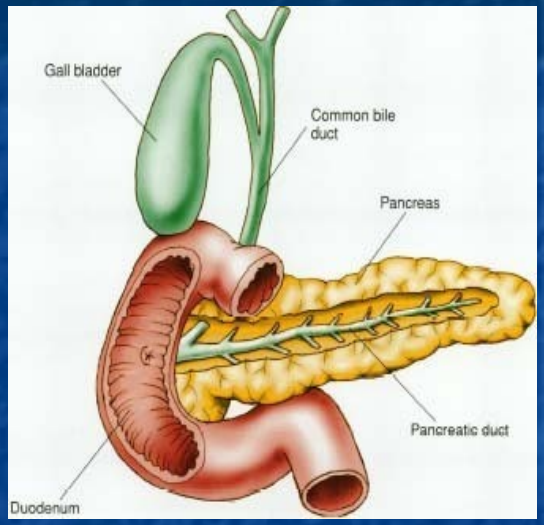


Glucose and Insulin Negative Feedback Loop

Boy eating cake

Increases Glucose Levels



Stimulates β cells of pancreas to secrete insulin

Insulin stimulates the cells to take up glucose from the blood.

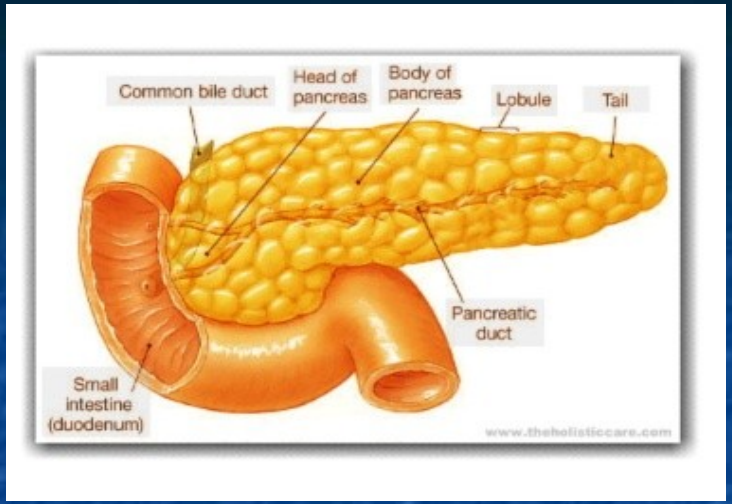
Lowers Blood Glucose levels

(-)

CYCLE 1

CYCLE 2

Low Blood Glucose Levels



Stimulated Alpha Cells in Pancreas

Glucagon is released

Glucagon stimulates liver cells to release glucose into the blood

High blood glucose levels and Cycle 1 continues

(-)

Glucose and Insulin Negative Feedback Loop

- Two primary Hormones

Insulin

↓

Lowers Blood Glucose Levels

Glucagon

↓

Raises Blood Glucose Levels

The opposite actions of these two hormones, insulin and glucagon, helps to maintain normal blood sugar levels in the body hence maintain homeostasis of the body.