

# NEURO-ENDOCRINE SYSTEM



**Course: Neuropsychology CC-6 (M.A PSYCHOLOGY SEM II); Unit I**

**By**

**Dr. Priyanka Kumari**

**Assistant Professor**

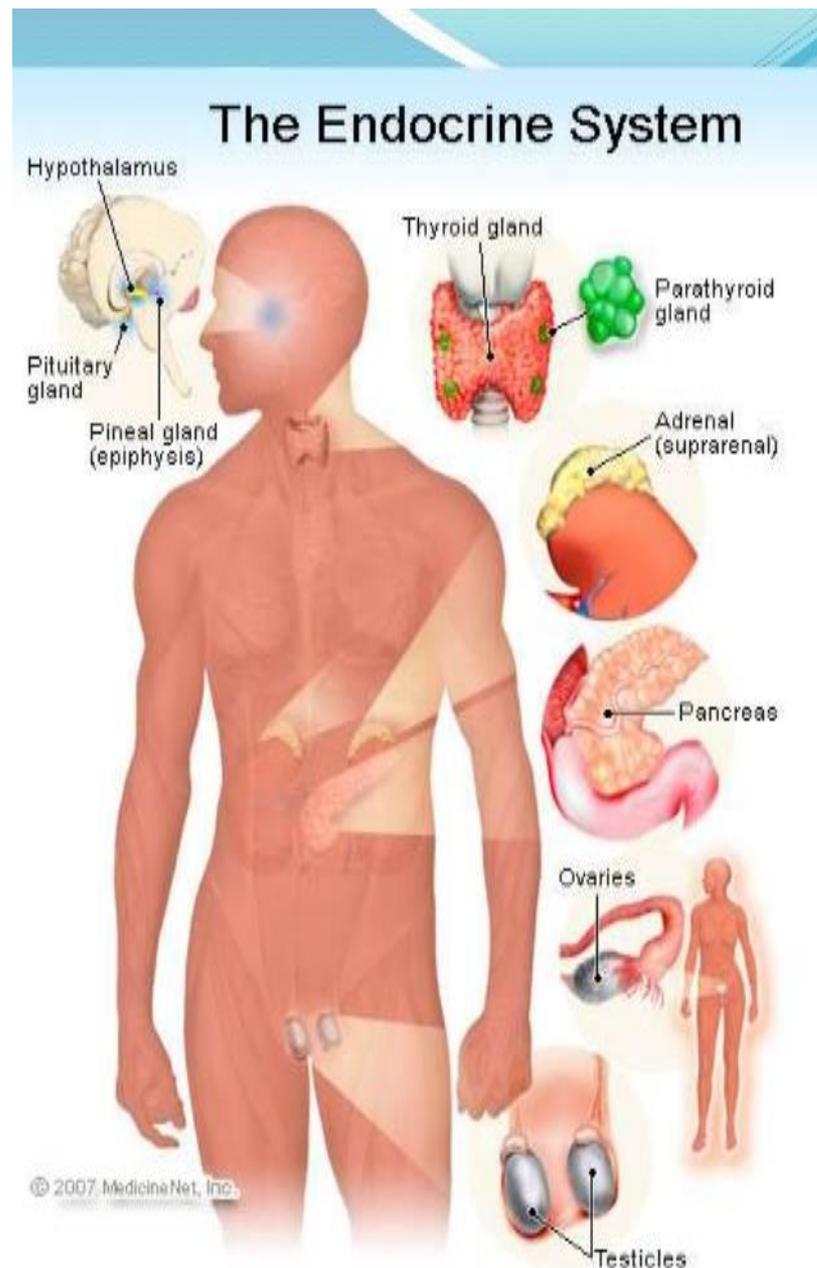
**Institute of Psychological Research and Service**

**Patna University**

**Contact No.7654991023; E-mail- Priyankakumari1483@yahoo.com**

## NEURO-ENDOCRINE SYSTEM

The endocrine system is a series of ductless glands located in various parts of the body. It manufactures and secretes a chemical substance known as hormones. These hormones are manufactured and released in one part of the body but have an effect on other parts of the body. Hormones are released directly into the blood stream without the help of ducts and it travels throughout the body system but each hormones perform its assigned job only when it connect with the body cells that have receptors for this particular hormones. That body part is called target organ. Some of the chemical substances that are neurotransmitter act as hormones as well.

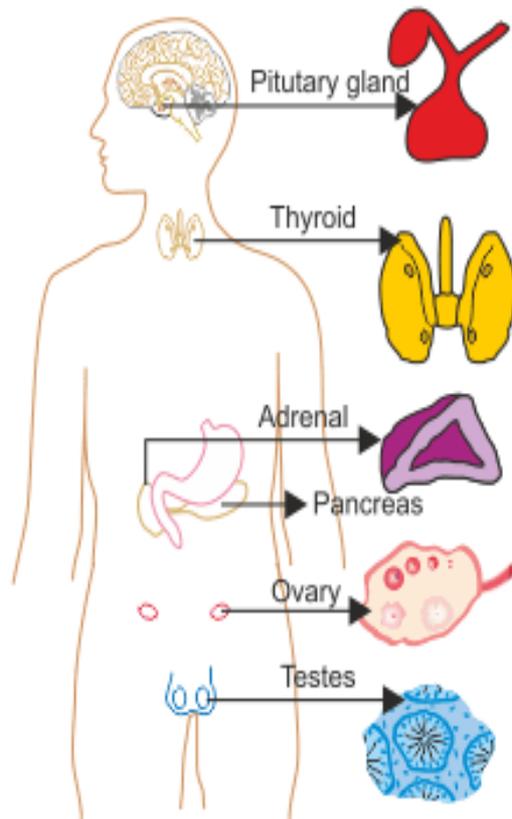


# The Endocrine System in Humans

Endocrine glands are ductless glands that **secrete hormones** (chemical messengers) which carry **messages to particular organ or tissue** through the blood stream.

These glands control **growth, development, metabolism and reproduction**.

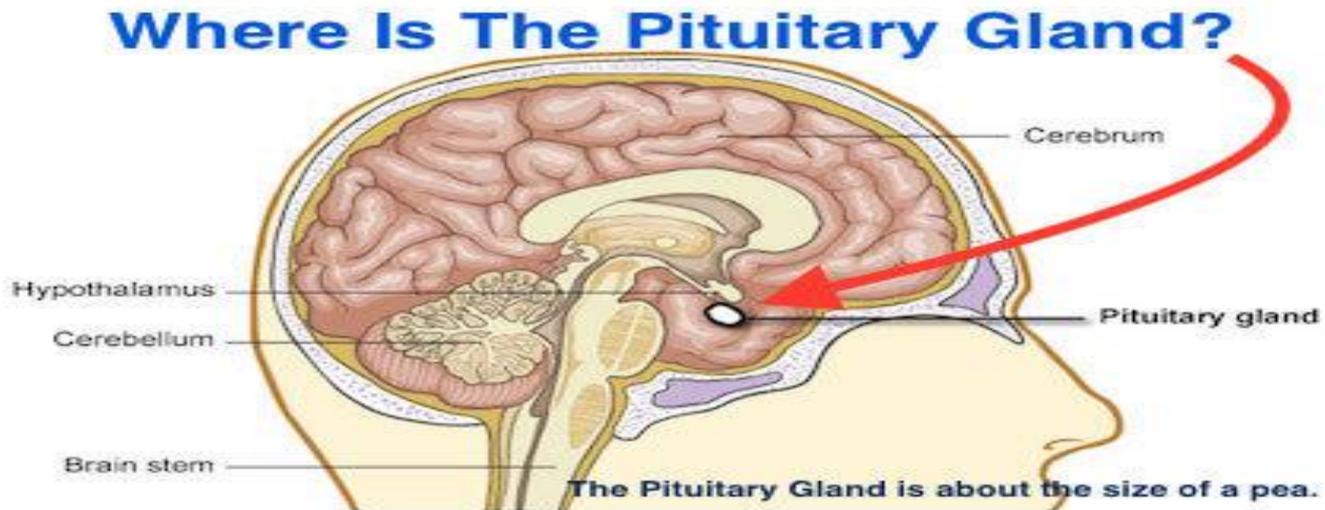
Endocrine glands secrete hormones in **response to external and internal stimuli**.



Glands	Hormones	Functions
Pituitary	Growth hormone	<ul style="list-style-type: none"><li>Regulates growth</li><li>Controls the functioning of endocrine glands</li></ul>
Thyroid	Thyroxine	<ul style="list-style-type: none"><li>Controls the metabolism rate</li><li>It also brings about balanced growth</li></ul>
Parathyroid	Parathormone	<ul style="list-style-type: none"><li>Controls calcium balance of the body</li></ul>
Adrenal	Adrenaline	<ul style="list-style-type: none"><li>Prepares body for emergency</li></ul>
Pancreas	Insulin	<ul style="list-style-type: none"><li>Controls glucose level of the blood</li></ul>
Testes	Testosterone	<ul style="list-style-type: none"><li>Controls growth and development of male reproductive system</li></ul>
Ovaries	Oestrogen, progesterone	<ul style="list-style-type: none"><li>Controls growth and development of female reproductive system</li></ul>

# TYPES OF GLANDS AND ITS FUNCTIONS IN THE ENDOCRINE SYSTEM

**Pituitary Glands-** It is located just below the hypothalamus and is controlled by hypothalamus. **It is considered as a master gland. It is a master gland because it releases the hormone that activates the other glands in the endocrine system.** The pituitary also produces the hormone that is responsible for body growth. Too little secretion of the powerful substance will make a person dwarf and too much will produce the person giant.



# Functions Of Pituitary Gland

## o anterior lobe:

- o growth hormone (somatotropin)
- o prolactin - to stimulate milk production after giving birth
- o ACTH (adrenocorticotrophic hormone) - to stimulate the adrenal glands
- o TSH (thyroid-stimulating hormone) - to stimulate the thyroid gland
- o FSH (follicle-stimulating hormone) - to stimulate the ovaries and testes
- o LH (luteinizing hormone) - to stimulate the ovaries or testes

## o intermediate lobe:

- o melanocyte-stimulating hormone - to control skin pigmentation

## o posterior lobe:

- o ADH (antidiuretic hormone) - to increase absorption of water into the blood by the kidneys
- o oxytocin - to contract the uterus during childbirth and stimulate milk production

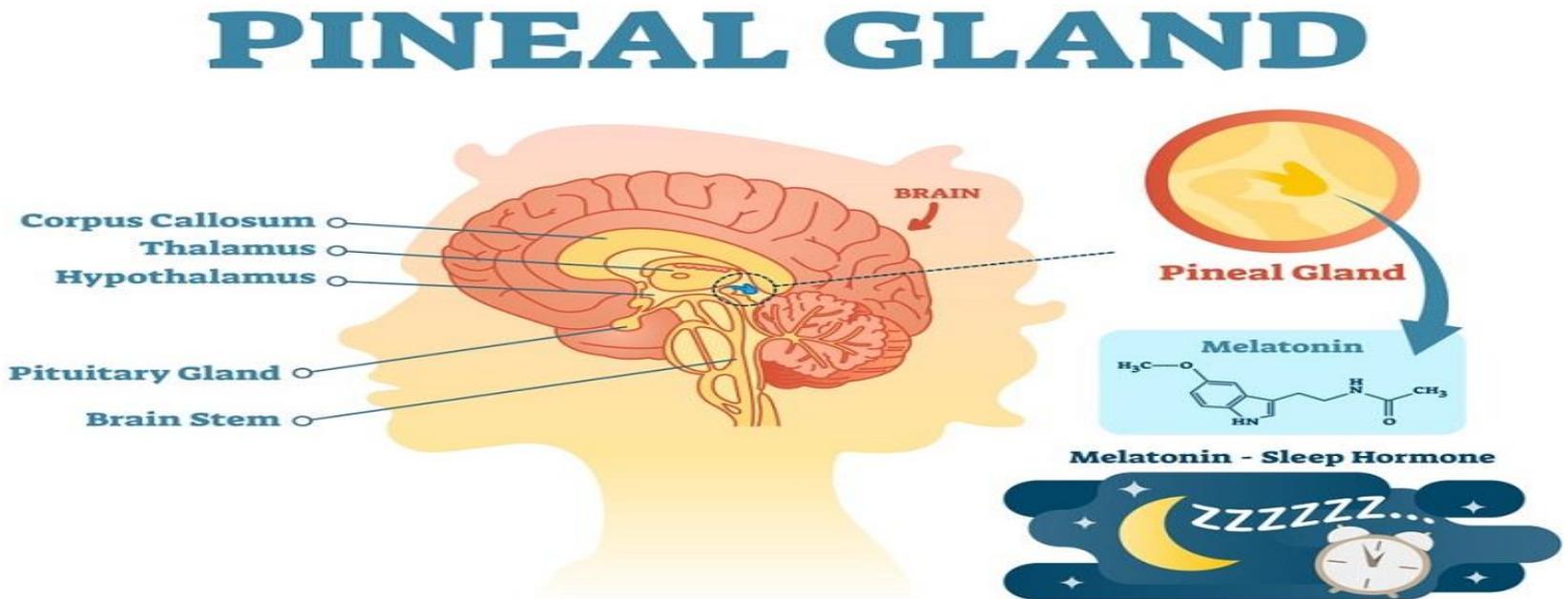
# The functions of the body that the pituitary gland manages include the following :

- Production of growth hormones
- Regulation of the endocrine system
- Production of hormones that affect the function of the muscles and the kidneys
- Production of hormones that control other endocrine glands
- Storage of hormones that are produced by the hypothalamus

# Pineal Gland

The pineal gland is a small, pea-shaped gland in the brain. In lower animals it serves as a warning device and in case of human beings it regulates biological function like walking, sleeping, reproductive activities, the appearance of sex characteristics etc. **The pineal gland produces several hormones, the most important one is melatonin, which helps to regulate biological rhythms such as wake and sleep cycle. Melatonin secretion triggered by darkness and inhibited by light.**

The pineal gland was commonly dubbed the “third eye” for many reasons, including its location deep in the centre of the brain and its connection to light.



# Thyroid Gland

The thyroid gland is an endocrine gland in the front lower part in the neck just below the Voice box (Larynx).

It makes two hormones that are secreted into the blood:

1. Thyroxine (T4) and
2. Triiodothyronine (T3) and a [peptide hormone, calcitonin](#).

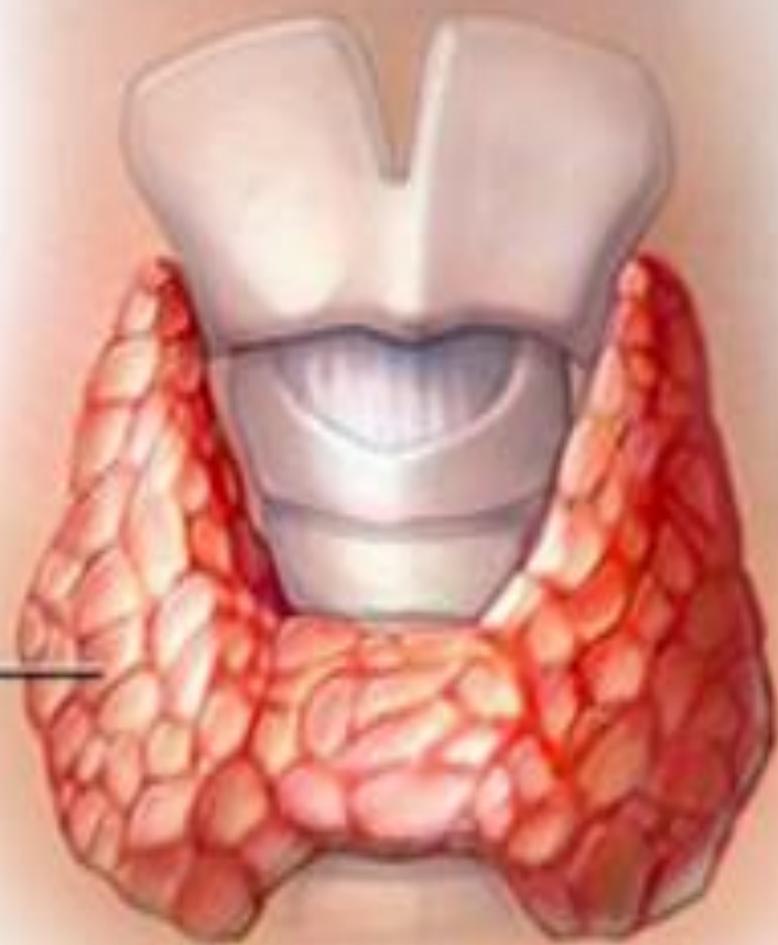
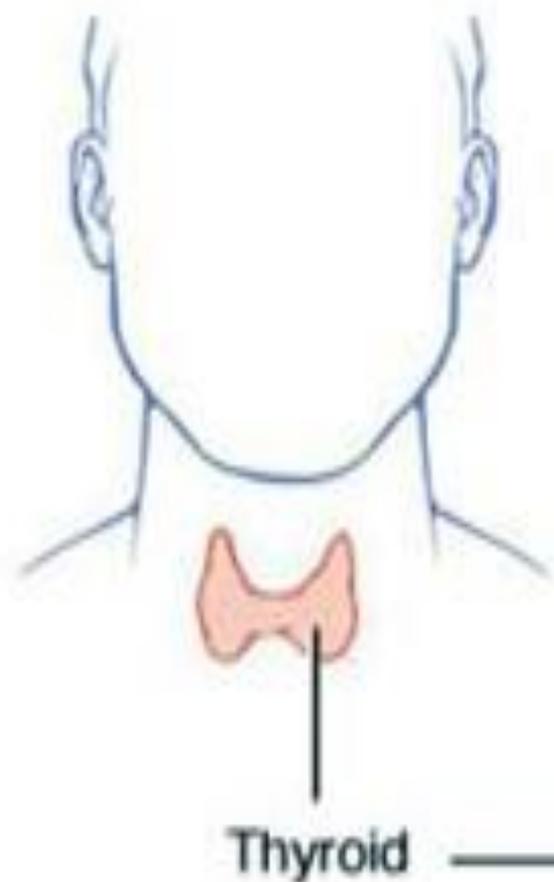
These hormones are necessary for all the cells in the body to work normally.

Thyroxine (T4) and triiodothyronine (T3) are important hormones produced by the thyroid gland that are essential for brain and physical development in infants and for metabolic activity in adults. Thyroid hormones help the brain, heart, liver, muscles, and other organs function properly.

Calcitonin is a hormone that is produced in humans by the Para follicular cells (commonly known as C-cells) of the thyroid gland. **Calcitonin is involved in helping to regulate levels of calcium and phosphate in the blood, opposing the action of parathyroid hormone.**

The thyroid gland produces hormones that regulate the body's metabolic rate as well as heart and digestive function, muscle control, brain development, mood and bone maintenance. Its correct functioning depends on having a good supply of iodine from the diet.

# Thyroid Gland



# The parathyroid glands

The parathyroid glands are four tiny glands, located in the neck, that control the body's calcium levels. Each gland is about the size of a grain of rice (weighs approximately 30 milligrams and is 3-4 millimetres in diameter). The parathyroid produce a hormone called parathyroid hormone (PTH).

The major function of the parathyroid glands is to maintain the body's calcium and phosphate levels within a very narrow range, so that the nervous and muscular systems can function properly. The parathyroid glands do this by secreting parathyroid hormone (PTH).

**Calcium.** PTH increases blood calcium levels by directly stimulating osteoblasts and thereby indirectly stimulating osteoclasts to break down bone and release calcium. PTH increases gastrointestinal calcium absorption by activating vitamin D, and promotes calcium conservation (reabsorption) by the kidneys.

**Phosphate.** PTH is the major regulator of serum phosphate concentrations via actions on the kidney. It is an inhibitor of proximal tubular reabsorption of phosphorus. Through activation of vitamin D the absorption (intestinal) of Phosphate is increased.

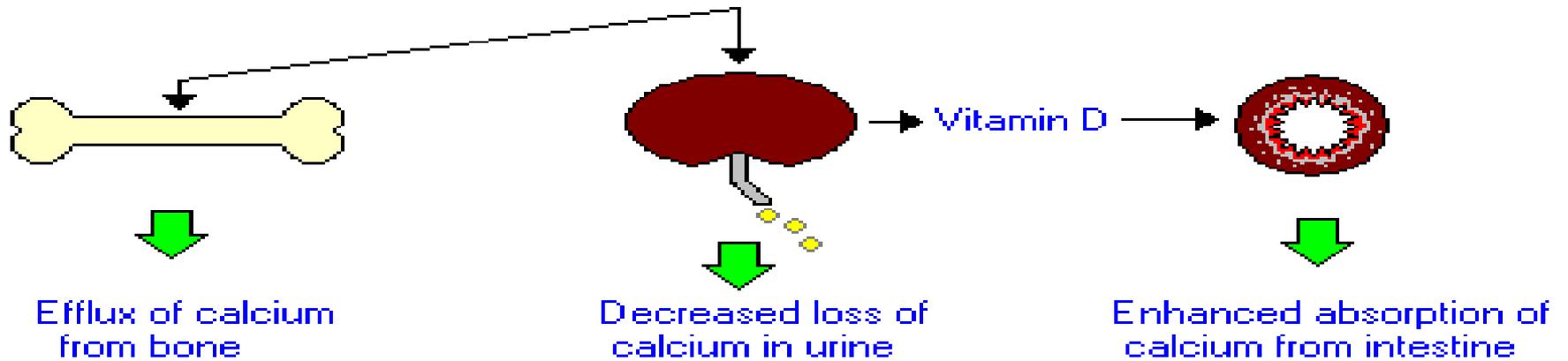
Parathyroid gland removes the toxic products from the body. Parathyroid hormone (also known as parathormone) is a small protein that takes part in the control of calcium and phosphate homeostasis, as well as bone physiology. **Parathyroid hormone has effects antagonistic to those of calcitonin.**



**Low concentration of calcium in blood**



**Release of parathyroid hormone**



**Increased concentration of calcium in blood**

# Adrenal Glands

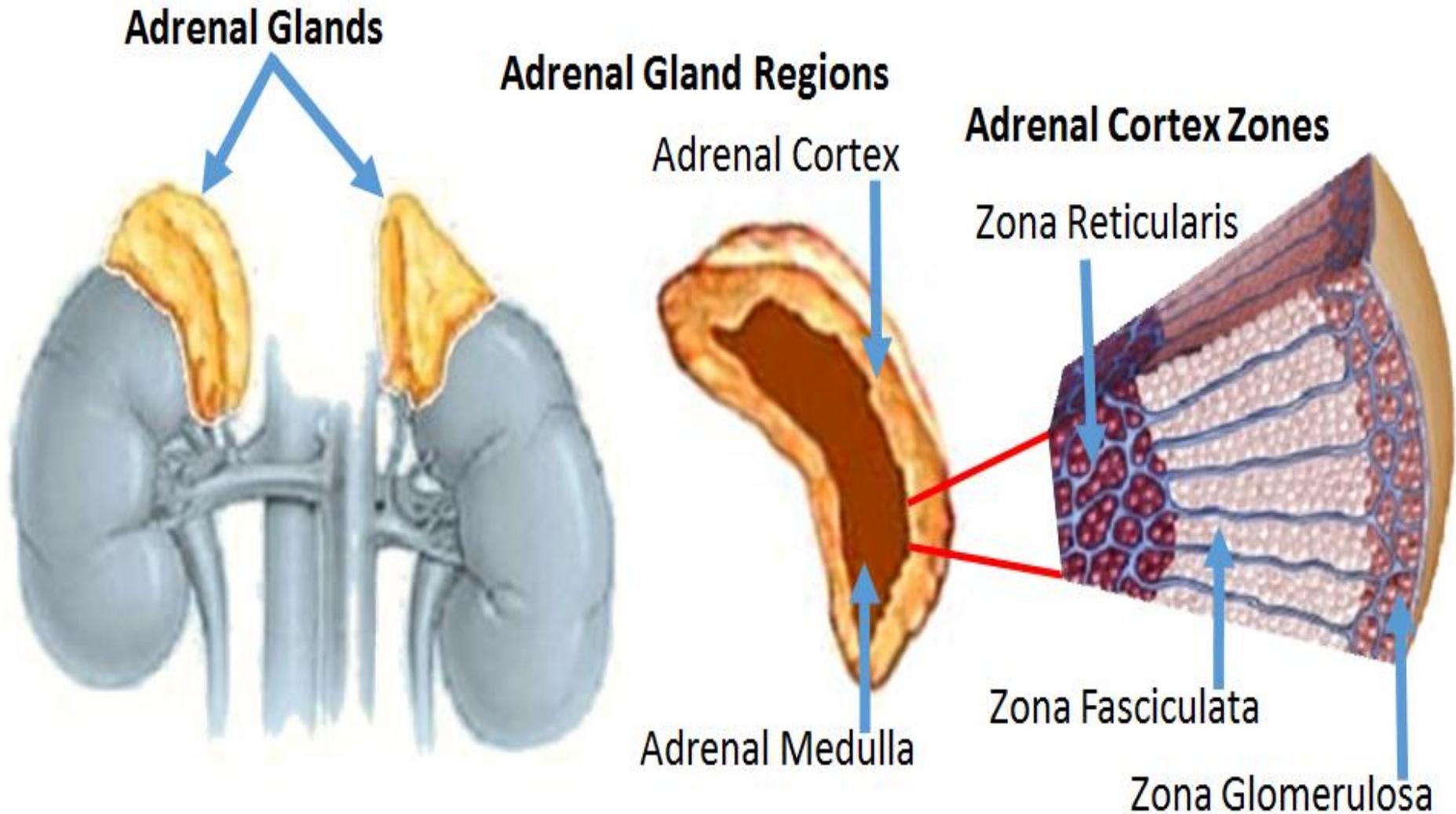
The Adrenal glands are a paired gland located just above each kidney, influence our emotional state, level of energy and ability to cope with stress. They consist of two parts:

1. The inner layer called Adrenal medulla and
2. Outer layer called Adrenal Cortex.

Adrenal medulla produces epinephrine and norepinephrine. Both prepare the body to respond to emergencies by making the heartbeat faster, diverting blood from the stomach to intestine to voluntary muscles and enhances energy resources by increasing blood sugar level. The Adrenal medulla is able to act quickly in threatening situation because it is stimulated directly by neural impulses.

Adrenal cortex secretes at least 20 hormones helps the pituitary gland to control metabolism. Adrenal cortex along with sex glands produces Androgen (a male hormone). The over secretion of Androgen may result in masculine characteristics in the case of women.

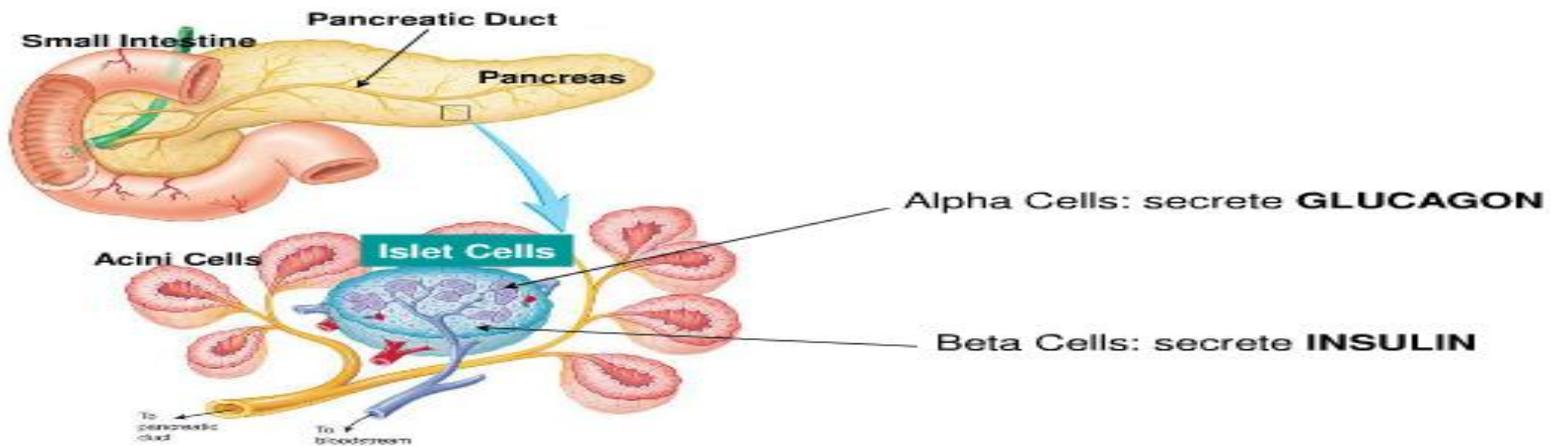
# Adrenal Glands



# Pancreas

It is situated between the stomach and small intestine. It secretes two hormones insulin and glucagon which work against each other to maintain a balance level of sugar in our blood. The over secretion or under secretion of these two hormones leads to excess or deficiency of sugar in blood. Excess of sugar causes diabetes and deficiency of sugar results in hypoglycaemia.

**Insulin & Glucagon are synthesized in pancreatic islet cells**



# Gonads or the sex glands

The gonads are additional types of endocrine glands. They are the sex organs and include the male testes and female ovaries. Their main role is the production of steroid hormones. The testes produce androgens, which allow for the development of secondary sex characteristics and the production of sperm cells. Ovaries produce 2 types of hormones.

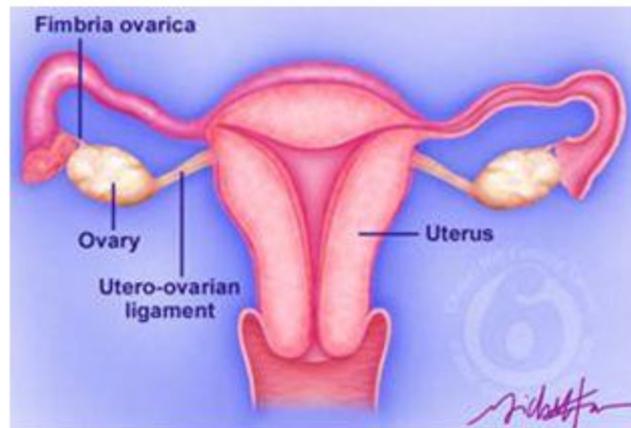
1. Estrogen- which influences development of female physical sex characteristics.
2. Progestational Compounds- It helps to regulate the menstrual cycle and prepare the uterus for pregnancy. The main sex gland testes produces androgen. It influences the development of main physical sex characteristics and sexual motivation.

Males have testicles, or testes, as their gonads, and females have ovaries as their gonads. Even though the gonads don't look the same in males and females, they actually serve identical functions. The function of the gonads is to produce gametes for reproduction and secrete sex hormones

# GONADS – sex glands

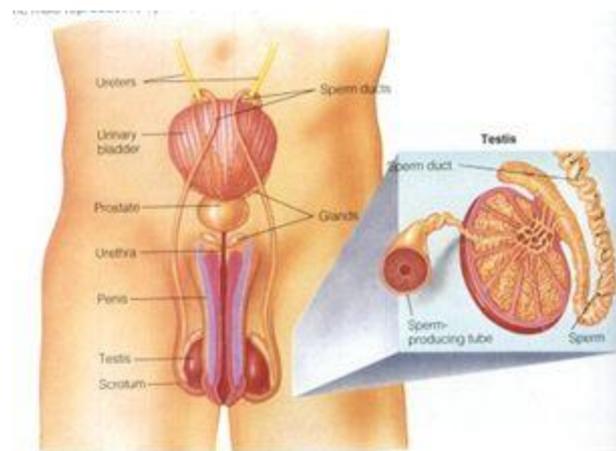
## Ovaries

- Releases **Estrogen** – 2<sup>nd</sup> degree sex characteristics/ cycle
- Releases **Progesterone** – cycle and maintain pregnancy



## Testes

- Releases **Testosterone** – 2<sup>nd</sup> degree male characteristics and production of sperm



***Thank you***