

ENDOCRINE SYSTEM;CC-3- Nutritional
Physiology-II
2ND-SEM

Hormones--

Hormones are **chemical messengers that are secreted directly into the blood**, which carries them to organs and tissues of the body to exert their functions. There are many types of hormones that act on different aspects of bodily functions and processes. Some of these include:

Development and growth

Chemical Structure of Hormones

1. Amines (amino acid derivatives)

Tyrosine derived: epinephrine, thyroid hormones

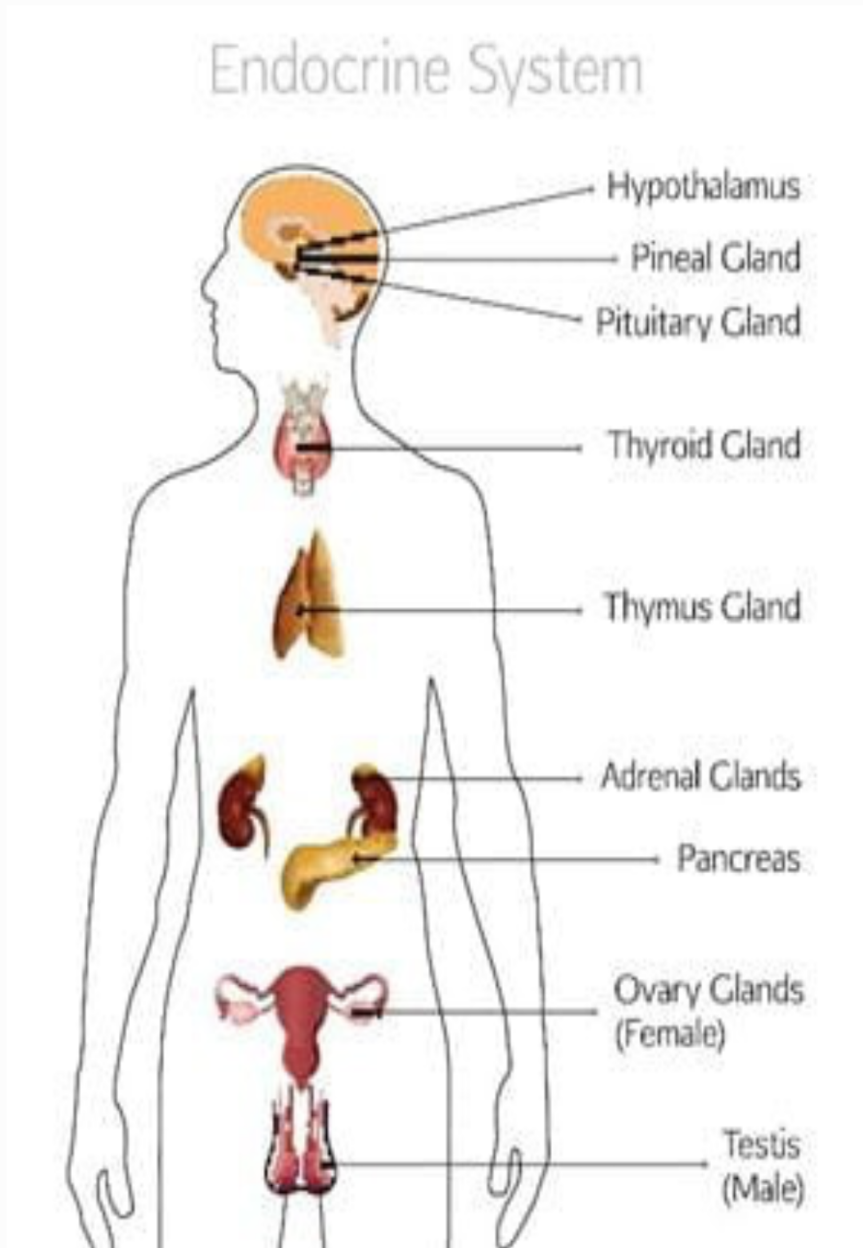
Tryptophan derived: melatonin

2. Polypeptides -Insulin, leptin, ADH

3. Glycoproteins -FSH, LH

4. Steroids (cholesterol derived)

Glucocorticoids, testosterone, vitamin D



What Is the Endocrine System?

The endocrine system is a network of glands in your body that make the hormones that help cells talk to each other. They're responsible for almost every cell, organ, and function in your body

Endocrine System Functions

Our endocrine system:

- Makes hormones that control your moods, growth and development, metabolism, organs, and reproduction
- Controls how your hormones are

released

- Sends those hormones into your bloodstream so they can travel to other body parts

Parts of the Endocrine System

Many glands make up the endocrine system. The hypothalamus, pituitary gland, and pineal gland are in your brain. The thyroid and parathyroid glands are in your neck. The thymus is between your lungs, the adrenals are on top of your kidneys, and the pancreas is behind your stomach. Ovaries or testes are in your pelvic region.

- **Hypothalamus.** This organ connects your endocrine system with your nervous system. Its main job is to tell your pituitary gland to start or stop

making hormones.

- **Pituitary gland.** This is your endocrine system's master gland. It uses information it gets from your brain to tell other glands in your body what to do. It makes many important hormones, including growth hormone; prolactin, which helps breastfeeding moms make milk; antidiuretic hormone (ADH) (vasopressin), which controls blood pressure and helps control body water balance through its effect on the kidney, corticotropin /ACTH: Adrenocorticotrophic hormone. which stimulates the adrenal gland to make certain hormones, thyroid-stimulating hormone (TSH), which stimulates the production and secretion of thyroid hormones, oxytocin which helps in milk

ejection during breast feeding; and luteinizing hormone, which manages estrogen in women and testosterone in men.

- **Pineal gland.** It makes a chemical called melatonin that helps your body get ready to go to sleep.
- **Thyroid gland.** This gland makes thyroid hormone, which controls your growth and metabolism. If this gland doesn't make enough (a condition called hypothyroidism), everything happens more slowly. Your heart rate might slow down. You could get constipated. And you might gain weight. If it makes too much (hyperthyroidism), everything speeds up. Your heart might race. You could have diarrhea. And you might lose

weight without trying. The thyroid gland also produces the hormone calcitonin, which may contribute to bone strength by helping calcium to be incorporated into bone.

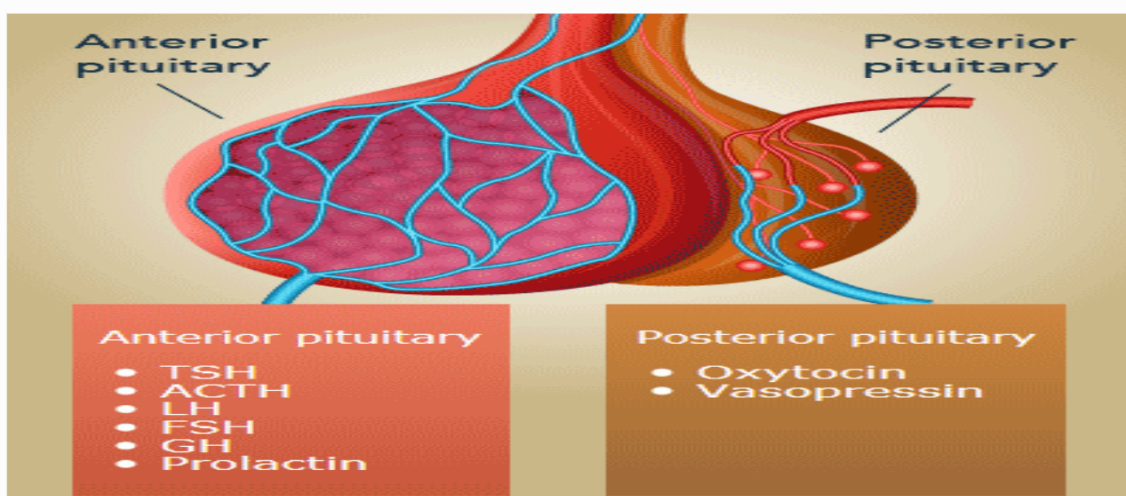
- **Parathyroid.** This is a set of four small glands behind your thyroid. They play a role in bone health. The glands control your levels of calcium and phosphorus.
- **Thymus.** This gland makes white blood cells called T-lymphocytes that fight infection and are crucial as a child's immune system develops. The thymus starts to shrink after puberty.
- **Adrenals.** Best known for making the "fight or flight" hormone adrenaline (also called epinephrine), these two glands also make hormones called

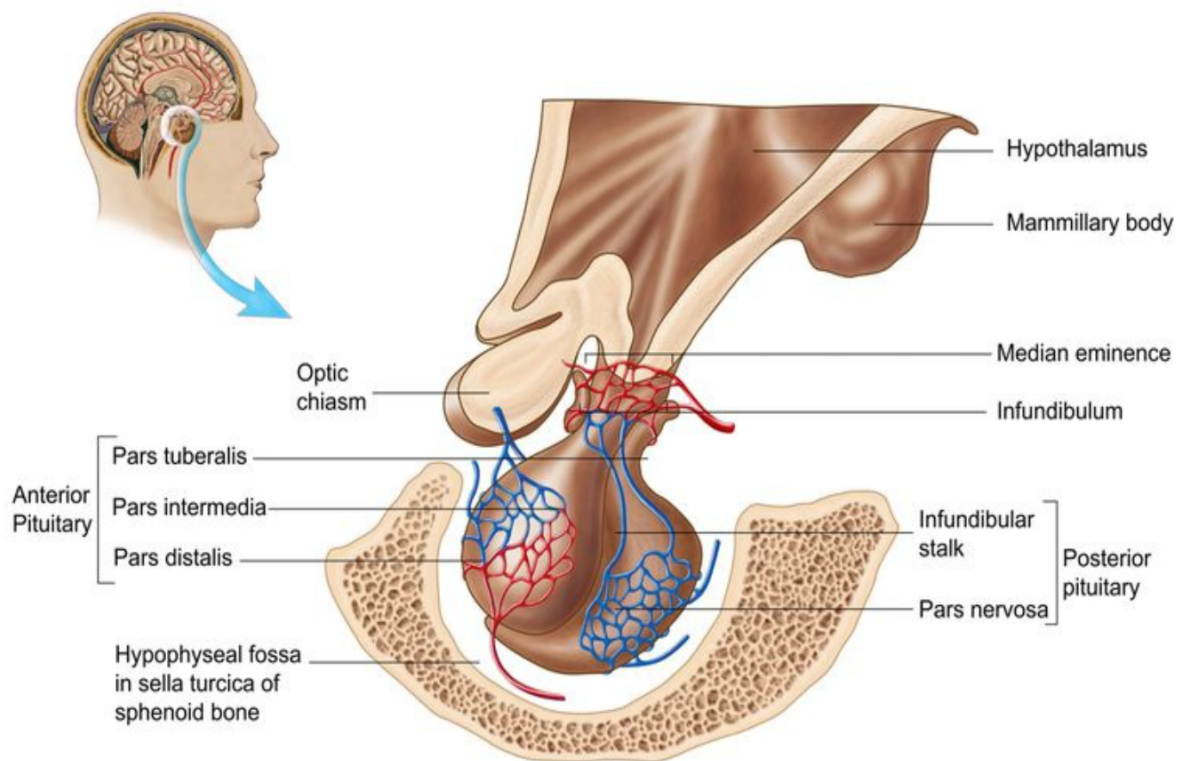
corticosteroids. They affect your metabolism heart rate, oxygen intake, blood flow, and sexual function, among other things.

- **Pancreas.** This organ is part of both your digestive and endocrine systems. It makes digestive enzymes that break down food. It also makes the hormones insulin and glucagon. These ensure you have the right amount of sugar in your bloodstream and your cells.
- If you don't make insulin, which is the case for people with type 1 diabetes, your blood sugar levels can get dangerously high. In type 2 diabetes, the pancreas usually makes some insulin but not enough.

- **Ovaries.** In women, these organs make estrogen and progesterone. These hormones help develop breasts at puberty, regulate the menstrual cycle, and support a pregnancy.
- **Testes.** In men, the testes make testosterone. It helps them grow facial and body hair at puberty. It also tells the penis to grow larger and plays a role in making sperm

❑ MASTER GLAND





The pituitary is the most influential gland in the endocrine system. It is actually two distinct glands in one.

- Its front, or anterior lobe manufactures 6 major hormones and releases them into the bloodstream.
- Behind it is the posterior (back) lobe which receives its two main hormones from the hypothalamus, which lies

above it and then it releases 2 hormones.

□ THYROID GLAND

The thyroid gland sits in the throat region, just below the larynx, served by large arteries with many branches and a dense network of capillaries.

The hormones it secretes, travel in the bloodstream throughout the body to:

- ⊠ Increase metabolism
- ⊠ Regulate glucose use
- ⊠ Protein synthesis
- ⊠ Nervous system development.
- ⊠ It also releases Calcitonin, which helps maintain blood calcium homeostasis by causing calcium to be removed from the blood and deposited into bones when blood (calcium) levels are too high.

Iodine is an element that's required for the thyroid gland to produce thyroid hormones. Since the body does not produce iodine on its own, it needs to come from dietary sources—and striking the right balance is key.

- **The Importance of Iodine** When you consume iodine, it is quickly absorbed and entered into your bloodstream. Your thyroid, which has tiny cells that capture the circulating iodine, takes in and oxidizes it so it can begin to be used to create T3 and T4—thyroid hormones that make their way throughout the body to regulate metabolism and ensure healthy functioning of the heart, brain, and other organs

☐ Parathyroid Glands

On the posterior (back) surface of the thyroid sit much smaller, separate glands: the parathyroids. Typically there are four parathyroid glands, a superior and inferior pair on the left and right sides of the thyroid. They secrete parathyroid hormone (PTH), which stimulates bones to release calcium into the blood when blood (calcium) levels are low.

PTH also causes the kidneys to reduce calcium secretion into urine to further elevate calcium levels in the blood.

Together, calcitonin and PTH act in complementary ways to maintain blood calcium homeostasis, which is one of the most tightly controlled physiological parameters in the body.

☐ GUT HORMONES

The gut hormones work in association with the gut's extensive nervous system (enteric nervous system) and play a coordinating role in:

- ☒ The control of appetite
 - ☒ The digestion of food
 - ☒ The regulation of energy balance
 - ☒ The maintenance of blood glucose levels.
- The gut continuously sends information to the brain regarding the quality and quantity of the food that is consumed .

THE ROLE THAT SOME OF THESE HORMONES PLAY IS OUTLINED BELOW:

- Ghrelin is produced in the stomach, and its function is to tell the brain that the body has to be fed. It increases appetite.

- Gastrin is produced in the stomach when it is stretched. It stimulates the release of gastric juice rich in pepsin and hydrochloric acid.
- Secretin is produced in the duodenum and has the effect of stimulating the pancreas to produce alkaline secretions as well as slowing the emptying of the stomach.
- Cholecystokinin (CCK) is produced in the duodenum. It reduces appetite, slows down the emptying of the stomach and stimulates the release of bile from the gall bladder.
- Peptide YY (PYY) is produced in the last part of the small intestine known as the ileum as well as parts of the large intestine. It plays a role in slowing down the passage of food along the gut, which increases the efficiency of digestion and nutrient absorption after

meal.

- Glucagon-like peptide 1 (GLP-1) is produced in the small intestine and colon and has multiple actions including inhibition of gastric emptying and appetite as well as the stimulation of insulin release.

☐ **PANCREAS – A DUAL-PURPOSE GLAND**

The Pancreas Regulates Blood Sugar
Surrounded by enzyme-producing acini cells, the tiny pancreatic islets contain three types of cells: alpha, beta, and delta. The secretions of the latter help regulate insulin and glucagon production. It is also a part of the digestive system. It excretes pancreatic juice into the small intestine via the pancreatic duct.

Scattered within the pancreas there are also tiny cell clusters called pancreatic islets (or islets of Langerhans) that release hormones into the bloodstream. These islets make up less than 2% of pancreatic tissue, but their specialized cells regulate blood glucose levels (or blood sugar). When blood sugar is low, alpha cells in the islets release glucagon. Glucagon spurs the liver to break down glycogen and release more glucose into the blood. When blood sugar is high, beta cells in the islets release insulin, which increases glucose reuptake.

What causes endocrine disorders?

Endocrine disorders arise because of problems with the glands of the endocrine system. Of the many potential endocrine

disorders, some of the most common relate to problems with the pancreas or with the pituitary, thyroid, or adrenal glands.

Causes of endocrine disorders

A number of factors are believed to cause endocrine disorders. Types and causes of endocrine disorders include:

- Acromegaly, an overproduction of growth hormone, and prolactinoma, an overproduction of prolactin hormone, resulting from damage to the pituitary gland
- Addison's disease and Cushing's syndrome, disorders relating to changes in levels of hormones produced by the adrenal glands

- Diabetes mellitus, which arises when the pancreas does not produce sufficient insulin or when the body cannot respond to the insulin that is present
- Environmental or nutritional factors, such as a lack of iodine in hypothyroidism, which can affect hormone production
- Genetic factors, which may play a role in endocrine disorders, especially with diabetes and other disorders, such as autoimmune thyroiditis, or Hashimoto's thyroiditis
- Hyperthyroidism (overactive thyroid), hypothyroidism (underactive thyroid), Graves' disease (a type of hyperthyroidism resulting in excessive

thyroid hormone production), and Hashimoto's thyroiditis (autoimmune disease resulting in hypothyroidism), all resulting from problems with the thyroid gland

- Tumors, since the underlying cause of the endocrine disorder can be linked to a growth or tumor of the gland

What are the symptoms of endocrine disorders?

The symptoms of endocrine disorders can range from mild or even nonexistent to

serious and affecting your entire body and overall feeling of well-being. Specific symptoms depend on the specific part of the endocrine system affected

Common symptoms of diabetes

Diabetes mellitus is the most common endocrine disorder and occurs when the pancreas either does not produce sufficient insulin or the body cannot use the available insulin. Symptoms of both type 1 and type 2 diabetes include:

- Excessive thirst or hunger
- Fatigue
- Frequent urination
- Nausea and vomiting

- Unexplained weight loss or gain
- Vision changes

Common symptoms of acromegaly

Acromegaly is a disorder in which the pituitary gland overproduces growth hormone. This leads to symptoms of overgrowth, especially of the hands and feet. Symptoms of acromegaly include:

- Abnormally large lips, nose or tongue
- Abnormally large or swollen hands or feet
- Altered facial bone structure

- Body and joint aches
- Deep voice
- Fatigue and weakness
- Headaches
- Overgrowth of bone and cartilage and thickening of the skin
- Sexual dysfunction, including decreased libido
- Sleep apnea
- Vision impairment

Common symptoms of

Addison's disease

Addison's disease is characterized by decreased production of cortisol and aldosterone due to adrenal gland damage. Common symptoms of Addison's disease include:

- Depression
- Diarrhea
- Fatigue
- Headache
- Hyperpigmentation of the skin (bronze appearance)
- Hypoglycemia (low blood glucose)

- Loss of appetite
- Low blood pressure (hypotension)
- Missed menstrual periods
- Nausea, with or without vomiting
- Salt cravings
- Unexplained weight loss
- Weakness (loss of strength)

Common symptoms of Cushing's syndrome

Cushing's syndrome arises from excess cortisol, produced by the adrenal glands.

Symptoms of Cushing's syndrome include:

- Buffalo hump (fat between the shoulder blades)
- Skin discoloration such as bruising
- Fatigue
- Feeling very thirsty
- Thinning and weakening of the bones (osteoporosis)
- Frequent urination
- High blood sugar (hyperglycemia)
- High blood pressure (hypertension)
- Irritability and mood changes

- Obesity of the upper body
- Rounded “moon” face
- Weakness (loss of strength)

Common symptoms of Graves’ disease

Graves’ disease is a type of hyperthyroidism resulting in excessive thyroid hormone production. Common symptoms of Graves’ disease include:

- Bulging eyes (Graves’ ophthalmopathy)
- Diarrhea
- Difficulty sleeping

- Fatigue and weakness
- Goiter (enlargement of the thyroid gland)
- Heat intolerance
- Irregular heart rate
- Irritability and mood changes
- Rapid heart rate (tachycardia)
- Thick or red skin on the shins
- Tremors
- Unexplained weight loss

Common symptoms of

Hashimoto's thyroiditis

Hashimoto's thyroiditis, or autoimmune thyroiditis, is a condition in which the thyroid is targeted by the immune system, leading to hypothyroidism and low production of thyroid hormone. Often, Hashimoto's thyroiditis is symptomless, but symptoms can include:

- Cold intolerance
- Constipation
- Dry hair and loss of hair
- Fatigue
- Goiter (enlargement of the thyroid gland)

- Joint and muscle pain
- Missed menstrual periods
- Slowed heart rate
- Weight gain

Common symptoms of hyperthyroidism

Hyperthyroidism is a condition characterized by an overactive thyroid gland. Common symptoms of hyperthyroidism include:

- Diarrhea
- Difficulty sleeping

- Fatigue
- Goiter (enlargement of the thyroid gland)
- Heat intolerance
- Irritability and mood changes
- Rapid heart rate (tachycardia)
- Tremors
- Unexplained weight loss
- Weakness (loss of strength)

Common symptoms of hypothyroidism

Hypothyroidism is a condition in which the thyroid is underactive and produces too little thyroid hormone. Often, hypothyroidism can be symptomless or very mild. Common symptoms of hypothyroidism include:

- Cold intolerance
- Constipation
- Decreased sweat production
- Dry hair
- Fatigue
- Goiter (enlargement of the thyroid gland)
- Joint and muscle pain

- Missed menstrual periods
- Slowed heart rate
- Swollen face
- Unexplained weight gain

Common symptoms of prolactinoma

Prolactinoma arises when a dysfunctional pituitary gland makes excess prolactin hormone, which functions in the production of breast milk. Excess prolactin can lead to symptoms such as:

- Erectile dysfunction

- Infertility
- Loss of libido
- Missed menstrual periods
- Unexplained milk production

THANK YOU

