Frequently asked questions/FAQ

1. What are hormones and their importance in human health?

Ans: Hormones are defined as organic biologically active compounds of different chemical nature. Hormones are produced and secreted by endocrine glands into circulation. They have profound physiological and biochemical activities.

Hormones are the chemical messengers of body. Human body secretes and circulates around fifty different hormones. Most of these chemical substances are produced by endocrine cells, from the glands.

2. What are glands, how does endocrine and exocrine glands differs?

Ans: Exocrine glands secrete nonhormonal chemicals into ducts, which transport to a specific location inside and outside the body, for e.g sweat glands, mucous glands, salivery glands and few digestive glands.

ii) Endocrine glands; They are ductless glands located throughout the body. They secrets hormones into the bloodstream through the fluid surrounding the cells.

The hormones then enter the blood system to circulate throughout the body and activate target cells **.**Specific stimulus for hormones secretion are**:** nervous impulse and concentration of the certain compound in blood passing through the endocrine gland. The endocrine system works with nervous system.

4 How hormones are classified?

Ans : Hormones can be classified into three category based on their chemical nature

Amino Acid Derivatives: These hormones are derivatives of amino acid, tyrosine. They act as hormones e.g., thyroxine, adrenaline etc.

Polypeptides and Proteins: Many hormones are polypeptides or proteins by nature. These include insulin, glucagons, vasopressin, parathormone, hormones from anterior lobe of the pituitary body and hormones produced by the gastrointestinal tract.

Steroid Hormones: These contain steroid nucleus. The hormones of this category include male sex hormones (androgens), female sex hormones (estrogens and gestogens) and hormones of the adrenal cortex.

5.How does hormones functions in our body?

Ans: Hormones act on cell membranes in two different ways:

(a) They may alter the permeability of cell membrane

Hormones may alter the permeability or transport of monosaccharides, amino acids, cations and nucleotides across the cell membrane. Thus, growth hormone increases amino acid transport into muscle cells and insulin increases the active transport of glucose, amino acids, potassium ion, nucleosides and inorganic phosphate into muscle cells etc.

(b) They may activate some membrane bound enzyme system.

Few hormones activate membrane bound enzymes. The only enzyme found in cell membrane sensitive to hormones is adenyl cyclase which coverts ATP to cyclic AMP. Cyclic AMP activates glycogen phosphorylase and hydroxylation of corticosteroids and regulates glycogen synthetase activity. The level of cyclic AMP in cell membrane may be increased or decreased by hormonal action, depending on the hormone and the tissue involved. For example, glucagons may produce more cyclic AMP in the liver cell membrane as compared to that in muscle cell membrane while adrenaline produces more cyclic AMP in the muscle cell membrane than in liver cell membrane. Insulin decreases the formation of cyclic AMP in liver cell membrane.

6 Mention hormone receptors and how they act in human system?

Ans: 1. Intracellular Receptors:

•These are located inside target cells, in the cytoplasm or nucleus, and function as ligand-dependent transcription factors.

•The hormone-receptor complex binds to promoter regions of responsive genes and stimulates or sometimes inhibits transcription from those genes**.** example of insulin.

•Intracellular Receptors are composed of a single polypeptide chain that has three distinct domains: The amino-terminus, DNA binding domain, and the carboxy-terminus or ligand-binding domain.

•Steroid and thyroid hormones act on these receptors.

2. Cell surface receptors:

•These are located on the plasma membrane of target cells.

•Binding of hormone to receptor initiates a series of events which leads to generation of second messengers within the cell.

•The second messengers then trigger a series of molecular interactions that alter the physiologic state of the cell (signal transduction).

•Cell surface receptors are integral membrane proteins; they are composed of three parts: Extracellular domains, Transmembrane domains and Cytoplasmic or intracellular domains.

•Protein and peptide hormones and catecholamines act on these receptors.

3. Second Messenger Systems:

•Water soluble hormones act through binding to cell surface receptors and activation of one of the second messenger systems.

•Multiple hormones utilize the same second messenger system. Also, a single hormone can utilize more than one system.

•The small signal generated by hormone binding to its receptor is amplified within the cell into a cascade of actions that changes the cell's physiologic state.

•Examples are: Cyclic AMP, Protein kinase activity, Cyclic GMP, and Calcium and/or Phosphatidylinositide.

6. Write a brief note on transportation of hormones in the human body?

Ans: Hormones are secreted directly into the blood. Peptide and protein hormones are secreted by exocytosis. The hormones which are protein and peptide in nature are circulated in free State. Steroid hormones and hormones of thyroid gland are bound with alpha-globulins or albumins
Catecholamine can be found both in free state or bound with albumins, sulphates or glucuronic acid, which reach the target organs based on their specific receptors.

8.What are endocrine glands and what is their location?

Ans: E**ndocrine glands** are highly specialized group of cells responsible for making hormones. These glands are located throughout entire body. Each gland plays a specific role in the production of a particular hormone or group of hormones. These hormones are required to carry out specific functions and to keep the body in homeostasis or continual balance. In order to perform with maximum level of efficiency, homeostasis is highly significant.

Apart from regulation of homeostesis, they react to specific stimuli, regulates the growth, development and reproduction. They also produce and store energy.

Endocrine glands and their related organs work like small factories. The specific endocrine gland receives message from the pituitary gland, which is also known as the master gland, stating how much hormone is needed and what is the site of action. The hormone then moves in the bloodstream till it reaches the targeted tissues or cells. These tissues and cells will have receptors which serve as binding sites for the attachment of the hormone. Once, the hormone gets attached to the binding sites, the hormone carries out its specific role.

Location of the Endocrine Glands and role of hypothalmus

The pituitary gland is found inside the skull, just above the nasal passages. It is considered the master gland as it ensures the timely production and delivery of every hormone in the body. Hypothalamus, plays an essential role in delivery of messages to and fro from respective endocrine glands throughout the body.

9.Function of hormones released by the anterior pituitary secretes?

Ans: . The pituitary gland: The pituitary gland consists of two parts – **(i)** the neurohypophysis or posterior lobe and **(ii)** the adenohypophysis or anterior lobe. The human pituitary weights about 0.5 g. in the adult, the adenohypophysis constituting 75 percent of the total weight. Functionally, both parts are controlled by hypothalamus.

i) The Anterior pituitary secretes:

•Luteinizing hormone (LH) and follicular stimulating hormone (FSH), which act on the gonads. In female, LH stimulates the menstruation cycle. In male, FSH stimulates testicular growth.

•Prolactin **(**PRL) stimulates the secretion of milk in the mammary gland, developed by the action of esterogen and progesterone.

•Adrenocortiotrpic hormone: ACTH stimulates the formation of cortical steroids from the cholesterol. Cortisol affects carbohydrate, protein and fat metabolism. It helps in coping with stress.

Decreased activity of ACTH causes Addison's disease which affects weight loss, low blood pressure, and general weakness and can lead to heart failure.

•Growth hormone (GH), Acts on bone, muscle and liver. The GH affects the metabolism of carbohydrates, fats and proteins.

•Thyroid stimulating hormone or thyrotropin (TSH) Stimulates the release of thyroxine (T4) and triiodothyronine (T3) from thyroid gland.

ii). The posterior pituitary secretes:

The hormones secreted by the neurohypophysis or posterior pituitary are:

b) Vasopressin b) Oxytocin and c) Coherin.

a) Vasopressin: Vasopressin is the antidiuretic hormone (ADH). Vasopressin exerts a marked effect on the kidney tubules accelerating the rate of water reabsorption from the distal tubules.

b) Oxytocin**:** Oxytocin is a hormone secreted by the neurohypophysis. Its secretion is controlled by hypothalamus. It acts on the smooth muscle of uterus and causes contraction of the muscle. It plays important role during childbirth.

c) Coherin: Coherin is a hormone secreted by the neurohypophysis. It induces prolonged rhythmic integrated contraction of the jejunum.

10.What is the relation between pituitary gland and thyroid stimulating hormones (TSH)?

Ans: Thyroid stimulating hormone or thyrotropin (TSH) stimulates the release of thyroxine (T4) and triiodothyronine (T3) from thyroid gland. In absence of pituitary gland thyroxine synthesis does not take place and condition is known as myxoedema.
The thyrotrophic hormone increases the rates of the following reactions**.**

(iii) Removal of inorganic iodide from blood by thyroid,

(iv) Incorporation of iodide in the thyroid hormone;

(iii) Release of thyroxine from the thyroid gland to circulation

11.What is the role of hormone vasopressin?

Ans: Vasopressin is the antidiuretic hormone (ADH). It is a polypeptide containing 9 amino acid residues**.**Vasopressin exerts a marked effect on the kidney tubules accelerating the rate of water reabsorption from the distal tubules. The half life of the hormone is approximately one minute, due to rapid inactivation in blood and excretion by the kidney. The regulation of absorption rate of water per minute is due to the ADH

12.What are the parathyroid glands?

Ans: Parathyroid hormone **(**PTH) regulates calcium homeostasis.
The parathyroid hormone (PTH) is involved in regulation of the calcium levels in the blood are produced by parathyroid hormones. The PTH increases the reabsorption of calcium in the kidneys and uptake of calcium from the digestive system.

13. Write a note on hormone secreted by pancreas?

Ans: Insulin and Glucagon; both control glucose level in the blood. Hormones insulin and glucagon regulates the metabolism of blood glucose (sugar) each with an opposite effect. Insulin stimulates its target