

Classification of Hormone

Hormone: Starling and Bayliss have defined hormones as the chemical agent which is released from one group of cells and travel via the blood stream to affect one or more different groups of cells. But Huxley (1935) has defined hormones as the information transferring molecules, the essential function of which is to transfer information from one set of cells to another for the good of the cell population as a whole.

Note:- The organ influenced by a particular hormone is called a target organ. When the target organ is an endocrine organ itself, the hormone is named as trophic (trophe= to nourish) hormone. All trophic hormones are secreted by the anterior pituitary.

Classification of hormones:

On the basis of the chemical composition, there are following groups of hormones.

Steroid hormones: Steroid hormones are mesodermal in origin. These are produced by steroidogenic tissue of adrenal or gonadal origin. Steroids are a class of lipids derived from cholesterol. The pathway of steroid biosynthesis is complex & is synthesized within the elements of smooth endoplasmic reticulum found in the steroid secreting cells. A complex multiple enzyme system is required for the synthesis of steroids. These enzymes are present within the mitochondria as well as the cytoplasm. Steroids play important roles in carbohydrate metabolism & electrolyte balance. Steroid hormone receptors are present inside the cell (target cell).

Hormone	Origin	Function
Glucocorticoids:		Carbohydrate metabolism & electrolyte balance
Cortisol	Adrenal	-do-
Corticosterone	-do-	-do-
Cortisone	-do-	-do-
Mineralocorticoids:		
Aldosterone	-do-	-do-
Gonadal steroids:		
Androgen	Testis	Masculinizing

Testosterone	-do-	Development and maintenance of secondary sexual characters
Estrogen	Ovary	Femnizing
Progesterone	-do-	Related to pregnancy & gestation
Estradiol	-do-	Development and maintenance of female secondary sexual characters

Glycoprotein Hormone: Three hormones of the anterior pituitary are glycoprotein's, they are Thyrotropin (TSH), follicle stimulating hormone (FSH), luteinizing hormone (LH) contain covalently bonded carbohydrate moieties at one or more positions within their structures.

Each of these pituitary glycoprotein's is composed of two chains, α & β chains. The α subunit of the three pituitary glycoprotein's within a species are identical to each other, whereas the β subunit of each hormone is structurally different. The α subunit consists of a polypeptide of 92 amino acid residues in human & 96 in other mammals. The α subunit exhibit identical amino acid sequence in a given species, their N-linked oligosaccharide chains are generally different.

The β subunit exhibits different amino acid sequences within & between a given species. The β subunits are composed of 112 residues (TSH), 115 residues (LH), 118 residues (FSH) & 145 residues in HCG.

Note: HCG is found 10 days after ovulation, a glycoprotein molecule that's unique to pregnancy is present in the blood (only if the ovum's fertilized). This protein molecule is secreted by the syncytiotrophoblast & in human is referred to as Human Chorionic Gonadotropin or HCG. Detection of HCG in the urine provides the basis for the most common test for pregnancy.

Hormone	Origin	Function
TSH (Thyroid stimulating hormone or Thyrotropin)	Basophilic Thyrotrophs (δ) cells of pars distalis.	i)Control of thyroid gland function ii)Induces metamorphosis iii)Thermo genesis in mammals. iv)Fatty acid release from fat cells
LH (Lutotropin)	Basophilic gonadotrophs (γ) LH secreting cells	i)Corpora lutea formation ii)Ovulation in female iii)Stimulates testosterone synthesis in interstitial leydig cells
FSH (Follitropin)	Basophilic gonadotrophs (γ) FSH secreting cells	i)Early development of ovarian follicle in female ii)Initial steps of spermatid maturation in males iii)Stimulates the synthesis of testicular ABP iv)Increase the LH receptors in testicular leydig cells

Mono Amino Acid Derivative Hormone: These hormones are composed of any single amino acid.

Hormone	Origin	Amino Acid	Function
T3/T4	Thyroid	Tyrosine	Growth, differentiation, increase in metabolic activity
Epinephrine	Adrenal medulla (Chromaffin cells) & post ganglionic neurons	-do-	i)Increased O ₂ consumption ii)Accelerates hepatic glycogenolysis iii)Increases cardiac output & vasodilatations
Norepinephrine	-do-	-do-	i)Peripheral vasoconstriction ii)Excitatory and inhibitory transmitter in CNS
Melatonin	Pineal Gland	Tryptophan	i)Anti-reproductive hormone ii)Associates with photo sexual activity

Peptide Hormone & Protein Hormone: These hormones consist of 3-10 amino acids (may be referred as peptide or polypeptide depending on their specific chain length). Peptide hormones may be composed of a linear chain as in α -MSH or angiotensin-II, or many contain a ring structure due to bridge formation disulfide bond, as in oxytocin & vasopressin. Some of the larger protein hormones are composed of 2 chains as in insulin.

Synthesis: They are synthesized on ribosomes where their specific amino acid sequence is determined by a specific amino acid sequence (codon). The nascent proteins are then released & transported into the cisternae of the RER and then to Golgi elements where they may be altered.

Hormone	Origin	Function
TRH (3aa)	Hypothalamus	TSH secretion
GnRH (10aa)	-do-	FSH and LH secretion
Oxytocin (9aa)	Pituitary post lobe	Milk secretion Uterine contraction
Vasopressin (9aa)	-do-	Renal water absorption Elevation of blood pressure by Vasoconstriction
Angiotensin-II (9aa)	Plasma angiotensinogen	Thirst, aldosterone secretion
Proteinaceous Hormone	Origin	Function
Insulin	Pancreatic islets	Inhibits blood glucose Stimulates protein, glycogen & fat synthesis
Glucagon	-do-	Stimulate blood glucose, glycogenolysis, gluconeogenesis
Prolactin	Pars distalis	Milk synthesis
ACTH	Anterior pituitary	Carbohydrate metabolism, sympathetic function

Prostaglandin: Doesn't have any discrete endocrine organ but it is a universal hormone. Prostaglandins are called Eicosanoids. Eicosanoids are member of the class of lipid. All Eicosanoids are synthesized from arachidonic acids which are formed from phospholipids.

Function: i) Uterine muscle contraction

ii) Associated with estrogen. Inflammation & smooth muscle contraction.