Date
Page No.

CHEMICAL COORDINATION AND INTEGRATION

Endocrine glands : Lack duct and are Called ductless gland.

→ Secreation are Called Hormone.

Hormones : Hormones are non-nutrient Chemicals which act as intercellular messenger and are produce in trace amount.

* HUMAN ENDOCRINE SYSTEM

⊙ Endocrine glands located in different parts of body Constitute Endocrine System.

⊙ Pituitary, Pineal, thyroid, adrenal, Pancreas, Parathyroid, thymus and gonads are Organised Endocrine bodies.

⊙ Some Other Organ eg: Liver, Kidney and Heart also produce Hormone.

* HYPOTHALAMUS

→ Basal part of diencephalon, forebrain.
→ Regulate body function.
→ Contain Neurosecretory Cells Called nuclei which produce Hormone.

↓

Regulate the synthesis and secreation of pituitary hormone.

⊙ Hormone produce by Hypothalamus are of two types.

1. Releasing hormone: Stimulate secretion of pituitary hormone
eg: Gonadotropin releasing hormone [GnRH] stimulate pituitary to synthesize and secretion of gonadotropin.

2. ~~Somatostatin~~: Inhibiting Hormone: Inhibit secretion of pituitary hormone.

eg: Somatostatin from Hypothalamus inhibit release of growth hormone.

* PITUITARY GLAND

→ Located in bony Cavity Called Sella turcica attached to hypothalamus by a stalk.

→ Divide anatomically into Adenohypophysis and Neurohypophysis.

→ Adenohypophysis Consist of two portion
(i) Pars Distalis: Commonly Called anterior pituitary

→ Produce Growth Hormone [GH], Prolactin [PRL] Thyroid Stimulating hormone [TSH], Luteinizing hormone [LH], Adrenocorticotrophic hormone [ACTH] and FSH

(ii) Pars intermedia secretes only one hormone called Melanocyte stimulating hormone [MSH].

⊙ Neurohypophysis also known as posterior pituitary.

→ Store and release two hormone Oxytocin and Vasopressin.

Synthesised by Hypothalamus.

⊙ Over-secretion of GH stimulate abnormal growth of body leading gigantism.

→ Low secretion of GH result in stunted growth result in dwarfism

* Function OF Hormone

[i] Prolactin: regulate growth of mammary gland and formation of milk in them.

[ii] T.S.H: stimulate Synthesis and secretion of thyroid hormones.

[iii] ACTH: stimulates secretion and synthesis of steroid hormone Glucocorticoids from adrenal Cortex.

[iv] LH: In male stimulates Synthesis and Secreation of hormone called Androgen.
→ In females induce Ovulation.

[v] FSH: FSH and androgen regulate Spermatogenesis in male.
→ In female stimulates growth and development of Ovarian follicle.

[vi] MSH: Act on Melanocytes [melanin Containing Cells] and regulate pigmentation of skin.

[vii] Oxytocin: Act on smooth muscles and stimulate their Contraction.

[viii] Vasopressin: act at kidney and stimulates resorption of water and electrolyte by distal tube.

It is also called anti-diuretic hormone [ADH].

* PINEAL GLAND

→ Located at dorsal side of forebrain
→ Secreate Melatonin.

- Important for regulation of 24 hour rhythm
- Help in maintaing body temperature, also influence metabolism and pigmentation.

Date
Page No.

Thyroid Gland

→ Composed of two lobes located on either side of trachea.
→ interconnected with a Connective tissue Called isthmus.
→ Composed of follicles and stromal tissue.

⊙ Follicular Cells Synthesise two hormones tetraidothyronine or thyroxine [T_4] and Triiodothyronine [T_3].

⊙ Iodine essential for normal rate of hormone Synthesise.

→ Deficiency of iodine in out diet result in Hypothroidism and elargement of thyroid gland Commonly Called goitre.

→ Hypothroidism during pregnancy Cause defective development and maturation of growing baby lead to Stunted growth mental retardation, Low intelligence, abnormal skin etc.

→ Women, Hypothyroidism Cause menstrual cycle irregular.

⊙ Hyperthyroidism : Rate of Synthesis and Secretion of thyroid hormone increased to high.

* Function Of Thyroid Hormones

(i) Regulation of Metabolic rate.
(ii) Support the process of RBCs formation.
(iii) Control metabolism of Carbohydrates, protein and fats.
(iv) Secretes protein hormone Called Thyrocalcitonin [TCT] which regulate blood Calcium level.

* PARATYROID GLAND

→ four parathyroid gland are present on back side of thyroid gland, one pair each in two lobes of thyroid gland.

→ Secreate a peptide hormone Called Parathyroid hormone [PTH]

→ Secreation of PTH is regulated by Circulating level of Calcium ions.

* Function

→ Act on bones and stimulate the process of bone resorption

→ ~~Act on bone and stimulates the proce~~

→ Increase Ca^{2+} level in blood, Hence it is a Hypecal~~mic~~cemic hormone.

→ stimulate reabsorption of Ca^{2+} by renal tubules and increase Ca^{2+} absorption from digested food.

Date
Page No.

* THYMUS

→ Labular structure located on dorsal side of heart and aorta.

→ Secretes peptide hormone Called Thymosins.

→ Thymosins play important role in differentiation of T-lymphocytes. which provide cell-mediated immunity.

→ also promote production of antibodies to provide Humoral immunity.

ADRENAL GLAND

→ Our body has one pair, one at anterior part of each kidney.

→ Composed of two type of tissues
(i) Centrally located Adrenal Medulla.
(ii) Outside lie Adrenal Cortex.

* Adrenal Medulla
→ Secreate Adrenaline or Epinephrine and Noradrenaline or norepinephrine.
→ These are Commonly Called Catecholamines.

→ Rapidly secreted in response to stress of any kind and during Emergency situation. and are Called Emergency hormone or Hormones of Fight or Flight.

→ Increase alertness, pupilary dilation and piloerection [raising of hairs], sweating etc.

→ Catecholamines stimulate breakdown of glycogen result in increased Concentration of glucose in blood.

* Adrenal Cortex :

→ Divide into three layer
(i) Zona reticularis [inner layer]
(ii) Zona fasciculata [middle layer]
(iii) Zona glomerulose [outer layer].

→ Secretes many hormones, Commonly Called Corticoids.

Glucocorticoids : Involved in Carbohydrate metabolism
→ Cortisol is main Glucocorticoids

Mineralocorticoids : Corticoids involved in regulation of water and electrolytes in our body.
→ Aldosterone is main mineralocorticoid.

* Function of Glucocorticoids:
- ⊙ Stimulate, gluconeogenesis, lipolysis and proteolysis.
- ⊙ Inhibit cellular uptake and utilisation of amino acid.
- ⊙ Glucocorticoids, particularly Cortisol, produce anti inflammatory reaction and suppress immune response.
- ⊙ Stimulate RBC production.

* Function of Aldosterone
- ⊙ act on renal tubules and stimulate the reabsorption of Na^+ and water and excretion of K^+ and phosphate ion.
- ⊙ Maintain body fluid volume, electrolytes, Osmotic pressure and blood pressure.
- ⊛ Androgenic steroids secreated by adrenal Cortex play role in growth of axial hair, public hair and facial hair.

PANCREAS

→ Act as both exocrine and endocrine gland.
→ Endocrine pancreas Consist of 'Islets of Langerhans'

→ Two main type of Cells in Islet of Langerhans are Called.
(i) α-Cells: Secrete a hormone Called glucagen
(ii) β-Cells: Secrete Insulin.

Date
Page No.

⊙ Glucagon : → peptide hormone
→ Maintain Normal blood glucose level.

→ act on liver cells [hepatocytes] and stimulates glycogenolysis result in increased blood sugar [hyperglycemia]

→ Reduce cellular glucose uptake and utilization.

→ Glucagon is Hyperglycemic hormone.

⊙ Insulin : peptide hormone
→ Regulate glucose homeostasis.

→ Act on hepatocytes and adipocytes [cells of adipose tissue]

→ Enhance cellular glucose uptake and utilisation

→ Rapid movement of glucose from blood to hepatocytes and adipocytes result in decreased blood glucose level. [Hypoglycemia]

→ Stimulate Conversion of glucose to glycogen [glycogenesis].

⊙ Diabetes Mellitus:

→ Prolonged hyperglycemia lead to this disorder
→ Associated with loss of glucose through Urine. and formation of Harmfull Compound known as ketone bodies.

→ Treated with Insulin therapy.

TESTIS

→ Present in Scrotal Sac of Male.
→ Composed of Seminiferous tubules and Interstitial tissue

→ Leyding cells / Interstitial Cell Secreates group of Hormones Called Androgen mainly Testosterone.

* Function of Androgen :

→ Regulate development, maturation and function of Male accessory Sex Organ.
→ Stimulate muscular growth, growth of facial and axillary hair.
→ Stimulate process of Spermatogenesis.
→ act on Central Neural System and influence Male Sexual behaviour.

OVARY

→ Located in abdomen.
→ produce two groups of hormone Estrogen and progesterone.
→ Estrogen is Synthesize and secreted by growing Ovarian follicle.
→ After Ovulation Corpus luteum secreate Progesterone.

* Function of Estrogen :

→ Stimulate growth and activities of secondary sex Organ and development of female secondary sex character.

* function of Progesterone
→ Support pregnancy.
→ Act on mammary glands and stimulate formation of alveoli and milk secretion.

Hormones Of Heart, Kidney And Gastrointestinal Tract

- Atrial wall of our heart secretes peptide hormone called Atrial natriuretic factor [ANF] which decreases blood pressure, when blood pressure is increased.
- ANF cause dilation of blood vessels. This reduces blood pressure.
- Juxtaglomerular cells of kidney produce peptide hormone called Erythropoietin which stimulate RBCs production.
- Endocrine cells of Gastro-intestinal tract secreate four major peptide hormone

1. Gastrin: act on gastric gland and stimulate the secreation of HCL and pepsinogen
2. Secretin: Act on exocrine pancreas and stimulate secreation of water and bicarbonate ion.
3. Cholecystokinin: act on pancreas and gall bladder and stimulate secreation of Enzyme and bile juice. Respectively.

⊙ Gastric Inhibitory peptide [GIP]
→ Inhibit inhibit gastric secretion and motility.

→

⊙ Non-Endocrine tissue secrete hormones Called growth factors.

Essential for Normal growth of tissue and their repairing / regeneration.

* MECHANISM OF HORMONE ACTION

⊙ Hormones produce their effect on target tissue by binding to specific protein Called Hormone receptor.

⊙ Membrane bound receptor: Present on Cell membrane of target Cell.

⊙ Intracellular receptor: Present inside the target cell.

⊙ Nuclear receptor: Present in Nucleus.

⊙ Hormone Receptor Complex: Binding of ~~receptor~~ hormone to it's receptor lead formation of Hormone receptor Complex.

→ Receptor is specific.

⊙ Hormone receptor complex leads to certain biochemical changes in target tissue.

⊙ Target tissue metabolism and physiological function are regulated by hormone.

Hormones

- Peptide, Protein Hormone
  eg: Insulin
  glucagon
  pituitary hormone
- Steroids
  Cortisol
  Testosterone
  Estradiol
- Iodothyronines
  Thyroid hormone
- Amino acid derivatives
  eg: Epinephrine.

⊙ Hormone which interact with membrane-bound receptor do not enter target cell but generate second messenger [Cyclic AMP, IP_3, Ca^{++} etc] which in turn regulate cellular metabolism

⊙ Hormone which interact with intracellular receptor [eg: steroid hormone] regulate gene expression or chromosome function by Interaction of hormone – receptor Complex with genome.