

CHAPTER 12 ENDOCRINE SYSTEM

ENDOGRINE GLANDS - are ductless glands that secrete their secretions internally i.e. without any duct and pour their secretions directly into the blood.

These secretions are called hormones

Hormones are secretions from specific cells/glands in the body and are carried to all parts of body through blood, but their effect is produced in one or more specific parts (target organs/cells) only. Thus hormones help in bringing out chemical coordination in the body to regulate various activities occurring inside the body

EXOCRINE GLANDS are duct glands which secrete their secretions through duct

Activities are regulated through a coordinated manner in our body through nervous and endocrine system

Characteristics of Hormones

- 1) Hormones are information molecules or chemical regulators secreted in response to environmental changes in or outside the body
- 2) They are directly poured into the blood from their source.
- 3) Their site of synthesis and the organ of influence (target organ) are entirely different.
- 4) Hormones produced in one species usually have similar influence in other species.
- 5) They are produced in small quantities and are effective in extremely low concentration
- 6) They can be amino acid derivative, proteins or steroids
- 7) They have low molecular weight and diffuse readily through the cell membrane.

- 8) They regulate physiological processes by chemical means.
- 9) Abnormal production (less or more) may have serious consequences for the body.
- 10) They are not stored in the body and are excreted from the system.

Differences between Hormonal and Nervous control is given in Table 12.1 Page 152 of Text book.

Endocrine glands in Humans

Main glands are - 1) Adrenal 2) Pancreas

3) Thyroid 4) Pituitary 5) Parathyroid

6) Thymus 7) Gonads (Testis/Ovaries)

1) Adrenal Gland

Location - located like cap on the top of each kidney

It has two parts - 1) Medulla (central) 2) Cortex (Peripheral)

- 1) Adrenal Medulla secretes Adrenaline (also called epinephrine and noradrenaline)

Function of Adrenaline

It is called 'flight or fight' hormone as it prepares an organism to either 'run away' or face the danger/stressful situation. Extra energy is provided to the body in emergency situation [by enhancing the respiration rate & breaking down of glucose (or stored glycogen)]. Extra hormone is released into the blood at the time of emotional stress [i.e. when excited or angry]. Gland itself is stimulated by nerve endings of the autonomous nervous system.

[Table 12.2 is giving a detailed effect of adrenaline on various body organs
Page 154 of text book]

Thus we see that Adrenaline

- 1) Increases heartbeat with increase in blood pressure
- 2) Increases blood supply to muscles while decreasing it to visceral organs
- 3) More glucose is released into blood by the liver.

2) Adrenal Cortex secretes many hormones, the best known of which is Cortisone

Cortical hormones may be categorised as -

i) Minerlocorticoids [Eg Aldosterone]

They regulate mineral metabolism and control Na^+ & K^+ ratio in the body

ii) Glucocorticoids [Eg Cortisone]

- 1) They regulate carbohydrate, protein and fat metabolism
- 2) They increase glucose level in blood
- 3) They influence fat and protein metabolism
- 4) These are produced in response to stressful situations like shock, pain, extreme cold or infection
- 5) These regulate salt and water balance in body.

iii) Sex hormones [Eg Androgens]

They stimulate the development of secondary sexual characters in males and females (i.e. characteristics which differ a male from female & viceversa) Eg appearance of beard in males, development of breasts in females etc. An overgrowth of cortex in young children leads to premature sexual maturity.

Disorders in adrenal activity.

i) Hyposecretion of ^{cortisone from} adrenal cortex - Addison's disease

Symptoms - Loss of energy, skin pigmentation, Loss of weight, nausea, hypoglycemia, sensitivity to cold and pain, increased susceptibility to infections etc.

ii) Hypersecretion of cortisone from Adrenal cortex causes Cushing's syndrome

Symptoms Obesity, hyperglycemia [increased blood sugar level], osteoporosis [bone disorder], weakness salt and water retention [imbalance]

iii) Adrenal virilism - If there is overgrowth of adrenal cortex (sex corticoids - androgens, are secreted in excess) then -

- A mature woman develops certain male characteristics like, beard, moustaches and deep male voice.
- A mature male develops feminine characteristics like enlargement of breasts.

2. PANCREAS

Location - lies behind the stomach

Pancreas is both a duct as well as ductless gland

Endo exocrine gland - As duct gland its pancreatic juices are poured into duodenum for digestion. As ductless glands, it has special group of hormone secreting cells called Islets of Langerhans, which are scattered in the entire gland.

Islets of Langerhans produce three hormones - Insulin, Glucagon, Somatostatin released from three different kinds of cells - Beta, alpha and delta cells respectively.

ii) Insulin - secreted by beta cells checks rise in blood sugar level by -

- It promotes glucose utilization (use up/consumption) by the body cells, hence reducing blood sugar level
- It stimulates deposition of extra glucose of the blood as glycogen in liver and muscles.

Glucose $\xrightarrow{\text{Insulin}}$ Glycogen

i Hypo secretion (under secretion) of Insulin causes Diabetes mellitus - Hyperglycemia

Word mellitus means honey referring to passage of sugar in urine because liver is unable to convert excess glucose into glycogen, hence blood sugar level increases A diabetic person has -

- (i) High concentration of sugar in blood.
- 2) Excretes a great deal of urine loaded with sugar
- 3) Feels thirsty because of loss of water through too much urination Diabetes means passing out excessive amounts of urine.
- 4) Loses weight and becomes weaker and weaker may also lose eye sight or vision.

Treatment - By administering insulin into patients body

ii Hypersecretion of Insulin [oversecretion] causes Hypoglycemia [lowered sugar level in blood]

Brain may enter a state of coma if the level becomes too low even for few minutes

If an overdose of insulin is given to a diabetic patient - the patient may become unconscious because of lowering of sugar level drastically

This is referred to as Insulin shock or hypoglycemia

Treatment A prompt bite of sweet biscuit or sugar candy is helpful.

2 GLUCAGON

It is secreted from alpha cells It acts opposite to insulin It stimulates the breakdown of glycogen in the liver to glucose thus it raises blood sugar level.

Glycogen $\xrightarrow{\text{Glucagon}}$ Glucose

Note for students

Please go through the chapter in the notes and as given in the text book. Learn the various hormones, their functions, their deficiency disorders - released from Adrenal gland and Pancreas. It may require multiple readings to grasp the content completely.

Home Assignment.

Q1 To carefully understand the location of various glands in the body - Draw a well labelled diagram of 'Principal Endocrine glands' Fig 12.1 in your notebooks

[given on Page 154 of your textbook]

Q2 Answer the following questions from 'Review questions' [given on Page 164 of text book] in your notebook.

E Structured / Application / Skill type

Q.No 1 and 3.

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