

CH:22

Biology Chemical Coordination and Integration

1. Define the following:

- (a) Exocrine gland,
- (b) Endocrine gland,
- (c) Hormone.

Solution:

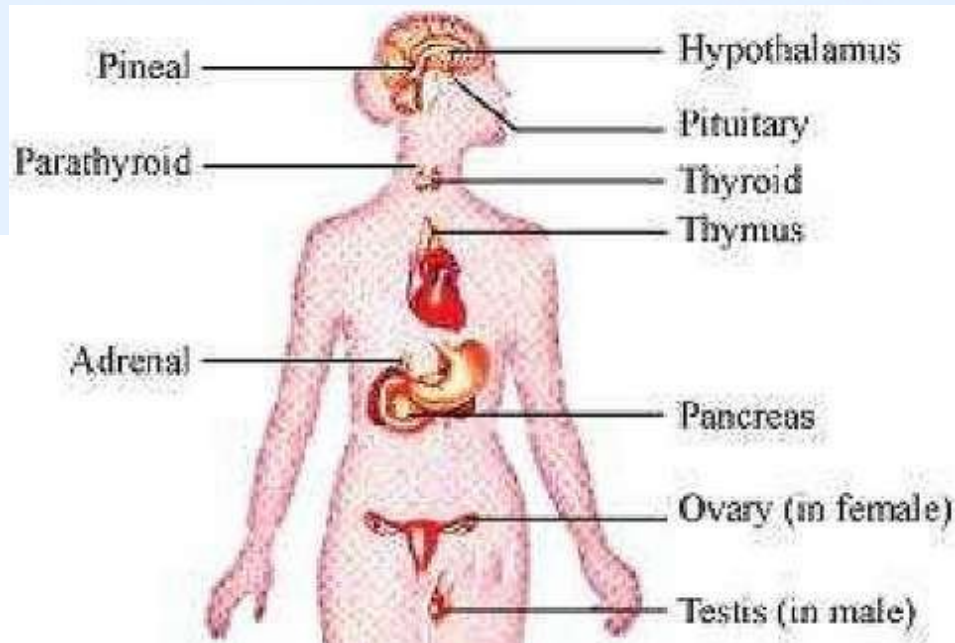
(a) Exocrine gland is a gland that pours its secretion on the surface or into a particular region by means of ducts for performing a metabolic activity, e.g., sebaceous glands, sweat glands, salivary glands and intestinal glands.

(b) Endocrine gland is an isolated gland (separates even from epithelium forming it) which secretes informational molecules or hormones that are poured into venous blood or lymph for reaching the target organ because the gland is not connected with the target organ by any duct. Therefore endocrine gland is also called ductless gland e.g. thyroid gland.

(c) Hormone is a substance that is manu-factured and secreted in very small quantities into the blood stream by an endocrine gland or a specialized nerve cell and regulates the growth or functioning of a specific tissue organ in a distant part of the body e.g insulin.

2. Diagrammatically indicate the location of the various endocrine glands in our body.

Solution:



3. List the hormones secreted by the following:

(a) Hypothalamus

(b) Pituitary

(c) Thyroid

(d) Parathyroid

(e) Adrenal

(f) Pancreas

(g) Testis

(h) Ovary

(i) Thymus

(j) Atrium

(k) Kidney

(l) G-I Tract.

Solution:

(a) Two types of hormones are produced by hypothalamus : releasing hormones (that stimulate secretion of pituitary hormones) and inhibiting hormones (that inhibit secretion of pituitary hormones).

These hormones are:

1. Thyrotrophin-releasing hormone
2. Adrenocorticotrophin-releasing hormone
3. Follicle-stimulating hormone-releasing hormone
4. Luteinizing hormone-releasing hormone
5. Growth hormone-releasing hormone
6. Growth inhibiting hormone
7. Prolactin releasing hormone
8. Prolactin inhibiting hormone
9. Melanocyte stimulating hormone-releasing hormone
10. Melanocyte stimulating hormone- inhibiting hormone.

(b) Different parts of pituitary secrete different hormones.

Hormones secreted by anterior lobe of pituitary are:

1. Follicle stimulating hormone
2. Luteinizing hormone
3. Thyroid stimulating hormone
4. Adrenocorticotrophic hormone
5. Somatotrophic or Growth hormone
6. Prolactin hormone or Luteotrophic hormone.

Middle (intermediate) lobe of pituitary : Melanocyte stimulating hormone.

Posterior lobe of pituitary:

(i) Oxytocin

(ii) Vasopressin or antidiuretic hormone.

(c) Thyroid secretes 3 hormones:

1. Thyroxine or tetraiodothyronine
2. Triiodothyronine
3. Calcitonin.

(d) Parathyroid gland secretes a single hormone called parathormone (PTH) or Collip's hormone.

(e) Adrenal glands have two regions, namely, outer adrenal cortex and inner adrenal medulla. Both these regions secrete different hormones.

Hormones of adrenal cortex are grouped into three categories:

1. Glucocorticoids, e.g., cortisol
2. Mineralocorticoids, e.g., aldosterone
3. Sexcorticoids e.g testosterone. Adrenal medulla secretes two hormones
 - (i) Epinephrine (adrenaline)
 - (ii) Nor-epinephrine (nor-adrenaline).

(f) Pancreas secretes following hormones:

1. Insulin
2. Glucagon
3. Somatostatin.

(g) Testis secretes androgens such as testosterone.

(h) Ovary secretes:

1. Estrogens such as estradiol
2. Progesterone
3. Relaxin.

(i) Thymus secretes thymosin hormone.

(j) Atrium secretes atrial natriuretic factor (ANF).

(k) Kidney secretes:

(i) Renin (ii) Erythropoetin

(l) G.I. tract secretes :

1. Gastrin
2. Secretin
3. Cholecystokinin
4. Enterocrinin
5. Duocrinin
6. Villikinin.

4. Fill in the blanks:

Hormones

Target gland

(a) Hypothalamic hormones

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- (b) Thyrotrophin (TSH)
- (c) Corticotrophin (ACH)
- (d) Gonadotrophins (LH, FSH)
- (e) Melanotrophin (MSH)

Solution:

- (a) Pituitary
- (b) Thyroid
- (c) Adrenal cortex
- (d) Gonads -Testes in male and ovaries in female
- (e) Skin.

5. Write short notes on the functions of the following hormones:

- (a) Parathyroid hormones (PTH)
- (b) Thyroid hormones
- (c) Thymosin
- (d) Androgens
- (e) Estrogens
- (f) Insulin and Glucagon.

Solution:

- (a) Parathyroid hormone increases the level of calcium and decreases the level of phosphate in the blood.
- (b) Thyroid gland secretes three hormones: thyroxine, triiodothyronin and calcitonin. Thyroxine and triiodothyronin control the general metabolism of the body, promote growth of body tissues and stimulates tissue differentiation. Calcitonin regulates the concentration of calcium in the blood.
- (c) Thymosin is secreted by thymus. It accelerates cell division, stimulates the development and differentiation of T-lymphocytes and also hastens attainment of sexual maturity.
- (d) Androgens are secreted by testis. They stimulate the development of male reproductive system, formation of sperms, development of male accessory sex characters and also determines the male sexual behaviour and the sex urge.
- (e) Estrogens are secreted by ovaries. They stimulate the female reproductive tract to grow to full size and become functional, differentiation of ova and development of accessory sex characters.
- (f) Insulin is secreted by the β -cells of the pancreas. It lowers blood glucose level, and promotes synthesis of proteins and fats. Glucagon is secreted by the α -cells of the pancreas. It increases the level of glucose in the blood.

6. Give example(s) of

- (a) Hyperglycemic hormone and hypoglycemic hormone
- (b) Hypercalcemic hormone
- (c) Gonadotrophic hormones
- (d) Progestational hormone
- (e) Blood pressure lowering hormone
- (f) Androgens and estrogens.

Solution:

- (a) Glucagon, Insulin
- (b) Parathormone (PTH)
- (c) Follicle stimulating hormone (FSH) and Luteinizing hormone (LH)

- (d) Progesterone
- (e) Atrial natriuretic factor
- (f) Testosterone and Estradiol.

7. Which hormonal deficiency is responsible for the following:

- (a) Diabetes mellitus
- (b) Goitre
- (c) Cretinism.

Solution:

- (a) Insulin
- (b) Thyroxine and Triiodothyronine
- (c) Thyroxine and Triiodothyronine.

8. Briefly mention the mechanism of action of FSH.

Solution: (Folliclestimulatinghormone)being glycoprotein is insoluble in lipids, therefore,

cannot enter the target cells. It binds to the specific receptor molecules located on the surface of the cell membrane to form hormone – receptor complex. This complex causes the release of an enzyme adenylate cyclase from the receptor site. This enzyme forms the cell cyclic adenosine monophosphate (cAMP) from ATP. The cAMP activates the existing enzyme system of the cell. This accelerates the metabolic reactions in the cell. The hormone is called the first messenger and the cAMP is termed the second messenger. The hormone- receptor complex changes the permeability of the cell membrane to facilitate the passage of materials through it. This increases the activities of the cell as it receives the desired materials.

9. Match the following :

Column I	Column II
(a) T ₄	(i) Hypothalamus
(b) PTH	(ii)Thyroid
(c) GnRH	(iii)Pituitary
(d) LH	(iv) Parathyroid.

Solution:

- (a) – (ii); (b) – (iv); (c) – (i); (d) – (iii)