

Endocrine System of Rabbit

Very Short Answer Questions

1. Distinguish between autocrine and paracrine signaling.

Ans. Action of some chemical messengers on neighboring cells is known as paracrine signaling.
Action of chemical messenger on the same cell that secreted it is called autocrine signaling.

2. Give two examples for lipid-soluble hormones.

Ans. Lipid soluble hormones are steroid and thyroid hormones.
Steroid hormones are corticosteroids, oestrogen, progesterone and testosterone.

3. How do adenohypophysis and neurohypophysis develop?

Ans. Adenohypophysis develops an outgrowth of ectoderm called the Rathke's pouch in the roof of the buccal cavity.
Neurohypophysis (posterior lobe) develops from the terminal region of an ectodermal outgrowth of hypothalamus.
Both of them belong to pituitary gland.

4. Distinguish between diabetes insipidus and diabetes mellitus.

Ans.	Diabetes insipidus	Diabetes mellitus
	1. It is caused by deficiency of Anti Diuretic Hormone (ADH).	1. It is caused by deficiency of Insulin.
	2. Large quantities of urine are excreted.	2. Urine along with glucose is sent outside.

5. Name the “fight-or-flight hormones”.

Ans. The epinephrine or adrenaline and norepinephrine or non-adrenaline hormone produced by adrenal medulla is called as “fight-or-flight hormones”.

6. Name the hormone that contributes to the setting of body's biological clock.

Ans. Melatonin of Pineal gland contributes to setting of body's biological clock.

7. Name the cells that secrete testosterone. Name the hormone that stimulates these cells.?

Ans. Interstitial cells of Leydig cells in testis secrete testosterone.
Interstitial cell stimulating hormone (ICSH) of pituitary gland stimulates Leydig cells to secrete testosterone.

Short Answer Questions

1. Compare the actions of nervous system and endocrine system.?

Ans.	Nervous system	Endocrine system
	1. Electrical and chemical mode of communication.	1. Chemical only

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|--|------------------------------------|
| 2. Neurotransmitters mediate | 2. Hormones mediate |
| 3. Close to site of release. | 3. far from site of release. |
| 4. Muscle and gland cells & neurons are the target cells | 4. all body cells are target cells |

2. Explain the various chemical classes of hormones.

Ans. The hormones are chemically classified into three classes. They are :

(1) Peptide & protein hormones, (2) Steroid and (3) Amine hormones.

1) Peptide hormones and protein hormones:

These hormones are polymers of amino acids.

Peptide hormones consist of chains of 3 to 49 amino acids.

E.g. Anti Diuretic Hormone and Oxytocin.

Protein hormones having 50 to 200 amino acids.

E.g. hGH, TSH and Insulin.

2) Steroid hormones : These are derived from cholesterol.

E.g. Corticosteroids, Oestrogens, Progesterone and Testosterone.

3) Amine hormones : These are derived from a single amino acid.

The catecholamines (epinephrine, norepinephrine) and thyroid hormones are derived from the amino acid tyrosine.

Melatonin is derived from the amino acid tryptophan.

3. Explain the transport of hormones and mechanism of hormone action.?

Ans. Water-soluble hormones circulate in the water blood plasma in a free form.

Lipid soluble hormones circulate in the blood mainly bound to plasma proteins which increase their solubility in blood.

Mechanism of Hormone action ::

The hormones are travel in the body through the blood. It affects only the specific target cells.

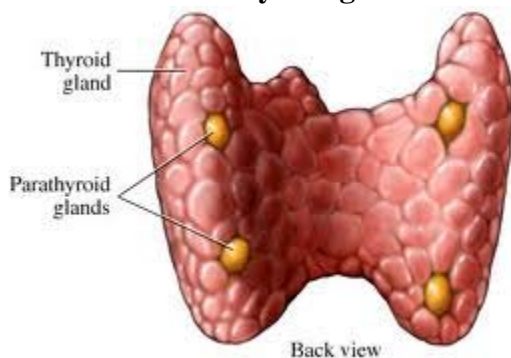
Some hormones affect many cells of different types of the cells of the receptors.

E.g. Growth hormone and thyroxine.

Lipid-soluble hormones diffuse through lipid bilayer of the plasma membrane. They bind to intracellular hormone receptors.

Water-soluble hormones are lipid-insoluble and cannot diffuse through lipid bilayer of the plasma membrane. They bind to receptors on the target cell membrane. It causes the production of many molecules of second messenger e.g., cyclic AMP inside the cell. It causes various intracellular effects by activating a cascade of enzymes.

4. Describe the thyroid gland.



Ans. **Thyroid gland:**

- ❖ Thyroid gland is the largest endocrine gland present ventral to larynx.
- ❖ It is homologous to endostyle of protochordates.
- ❖ It has right and left lobes connected by isthmus.
- ❖ Each lobe has many follicles.
- ❖ Follicular cells produce two hormones.
 - i) Thyroxine or Tetraiodothyronine (T_4)
 - ii) Triiodothyronine or T_3
- ❖ Parafollicular cells produce Calcitonin.

ROLE OF HORMONES:

- ❖ I) Thyroid hormones increase basal metabolic rate by stimulating the use of cellular oxygen to produce ATP.
- II) Thyroid hormones stimulate protein synthesis.
- III) Along with growth hormone and insulin, thyroid hormones accelerate body growth mainly the growth of nervous tissue.
- IV) Thyroxine is essential for metamorphosis in amphibians.
- ❖ Calcitonin is hypocalcaemic hormone which lowers the amount of blood calcium and phosphates by inhibiting bone resorption by osteoclasts and by accelerating uptake of calcium and phosphates into bone matrix.

5. **Explain the role of pancreas as an endocrine gland.?**

- ▶ The pancreas is a mixed gland present in the loop of duodenum.
- ▶ Exocrine part has acini and produce digestive enzymes.
- ▶ Islets of Langerhans are present among the acini.
- ▶ Each islet has 4 types of cells which secrete hormones in the following manner.....
 - 1) **Alpha cells:** secrete glucagon. It is hyperglycemic hormone. It stimulates glycogenolysis and gluconeogenesis in hepatocytes and increases glucose level.
 - 2) **Beta cells:** secrete insulin. It is a hypoglycemic hormone. It accelerates facilitated diffusion of glucose into body cells. It accelerates glycogenesis, lipogenesis and slows down glycogenolysis and gluconeogenesis and thus brings and brings down sugar level in the blood.
 - 3) **Delta cells:** Secrete somatostatin which inhibits secretion of insulin and glucagon.
 - 4) **F cells:** secrete pancreatic polypeptide. They inhibit somatostatin secretion, gallbladder contraction and secretion enzymes by pancreas.

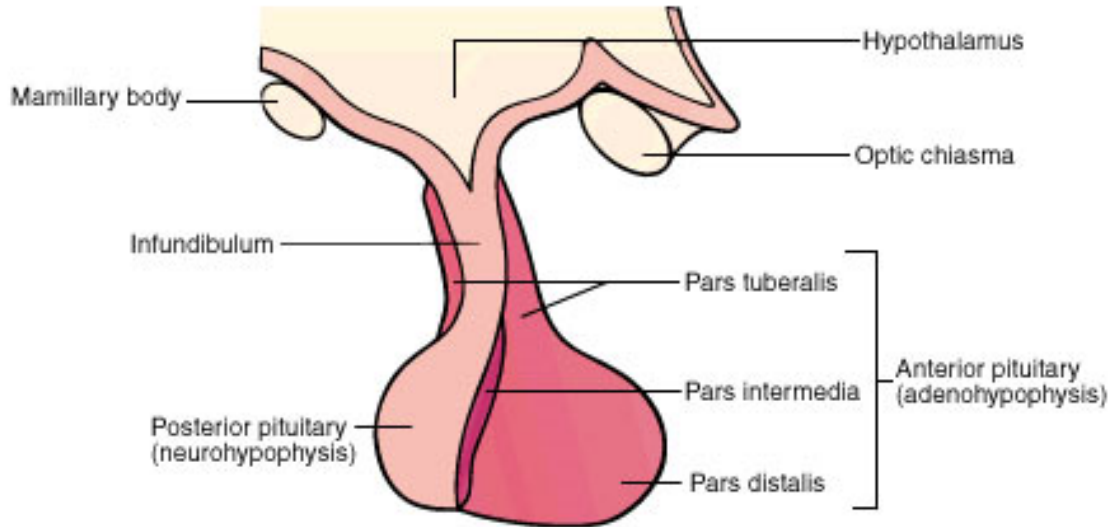
6. **Write short notes on gastrointestinal hormones.**

Ans. The mucosa layer of stomach and duodenum secrete some hormones which help in the process of digestion.

- i) **Gastrin:** When food reaches the stomach, pyloric stomach produces gastrin hormone. It stimulates the gastric glands to secrete gastric juice and increases gastric motility.
- ii) **Cholecystokinin:** Mucosa of duodenum secretes it. It stimulates gall bladder to release bile juice and secretion of pancreatic juice rich in enzymes.
- iii) **Secretin:** It is secreted by duodenal mucosa. It stimulates the pancreas to release pancreatic juice.
- iv) **Enterogastrone:** It is secreted by the walls of the duodenum. It inhibits the secretion of gastric juice.
- v) **Enterocrinin:** It activates the intestinal glands to secrete intestinal juice.

Long Answer Questions

1. Give a detailed account of the pituitary gland.?



Ans. **Pituitary gland or hypophysis** : It is present in sella tursica of basisphenoid bone.

It has two parts. (a) Adenohypophysis and (b) Neurohypophysis.

a) Adenohypophysis : It develops as an outgrowth of ectoderm from the roof of buccal cavity as Rathke's pouch. It has three parts. Pars intermedia, Pars anterior, Pars tuberalis. (The last two parts will form anterior lobe).

b) Neurohypophysis : It develops as an ectodermal outgrowth of hypothalamus. It has Pars nervosa (posterior lobe).

HORMONES SECRETED FROM PITUITARY GLAND:

i) **ADENOHYPHYSIS**: It secretes 7 protein hormones. They are....

a) **Growth hormone (GH) or Somatotropin**: It stimulates the cells in the liver, skeletal muscle, cartilage, bone and other tissues to secrete

Insulin-like growth factors (IGFs) which help the cells to grow and multiply.

b) **Thyroid – stimulating Hormone (TSH)**. It stimulates the thyroid gland to secrete thyroid hormones.

c) **Adrenocorticotrophic hormone (ACTH)** : It stimulates the cortex of adrenal gland to secrete glucocorticoids

d) Follicle-stimulating Hormone (FSH): In females, FSH initiates the development of ovarian follicles. In males, FSH stimulates spermatogenesis in the seminiferous tubules.

e) Luteinizing Hormone (LH): In females, LH stimulates ovulation, formation of corpus luteum and secretion of progesterone. In males, this hormone is known as interstitial cell stimulating hormone

(ICSH) which stimulates Leydig cells to secrete testosterone.

f) Prolactin (PRL): It maintains milk secretion by mammary glands.

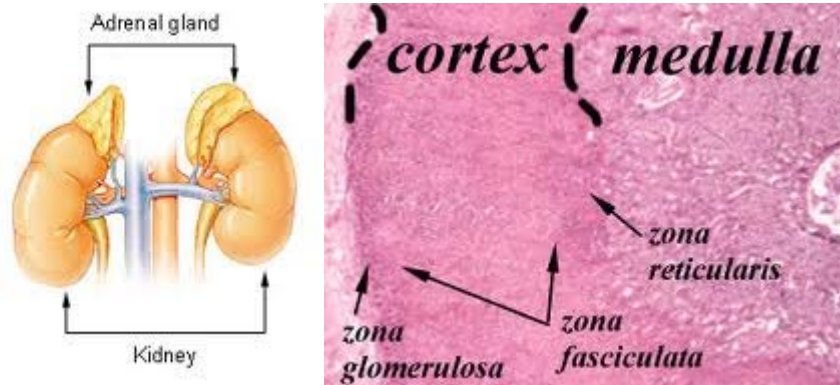
g) Melanocyte –stimulating Hormone (MSH) : secreted by cells of Pars intermedia. It increases skin pigmentation in lower vertebrates by stimulating the dispersion of melanin granules in melanocytes.

Hormones of neurohypophysis : Neurosecretory cells of hypothalamus secrete hormones which enter into neurohypophysis. They are

- a) **Oxytocin** : It increases the contraction of smooth muscles in the wall of uterus during parturition. After parturition, it stimulates ejection of milk.
- b) **Vasopressin or Antidiuretic hormone (ADH)**: It causes the kidneys to reabsorb more water into the blood. ADH causes constriction of arterioles. It increases blood pressure.

2. Describe the adrenal gland in detail.

Adrenal Gland



Ans. **Adrenal glands (suprarenal)**: Adrenal glands are present anterior to kidneys. It has outer cortex and central medulla.

Adrenal Cortex : It is influenced by ACTH of pituitary gland.

- ▶ Adrenal cortex has three zones.

A) outer Zona glomerulosa -- secretes mineralocorticoids

B) middle Zona fasciculata -- secretes glucocorticoids and sex hormones.

C) inner Zona reticularis --- secretes sex hormones.

1) **Mineralocorticoids** : They regulate homeostasis of minerals. Aldosterone increases reabsorption of Na and water and secretion of K and H.

2) **Glucocorticoids**: Cortisol, corticosterone and cortisone .

Cortisol is more abundant. They regulate carbohydrate, protein and fat metabolism. They have anti-inflammatory effect and help combat stress.

3) **Sex corticoids**: androgens and female sex hormones.

Adrenal Medulla: It is a modified sympathetic ganglion. It has chromaffian cells without axons.

- ▶ Chromaffian cells secrete two major hormones Epinephrine or adrenaline and norepinephrine or noradrenaline.
- ▶ About 80% of cells secrete epinephrine. The remaining 20 % secrete norepinephrine.
- ▶ These hormones are responsible for 'fight-or-flight' response. They increase cardiac output and blood pressure. They increase blood flow to the heart, liver, skeletal muscles and adipose tissue.
- ▶ They dilate lungs, and increase blood levels of glucose and fatty acids.