

3. CHEMICAL MESSAGES FOR HOMEOSTASIS

Homeostasis is maintained by the complementary activities of both quick neural system and slow hormonal system.

1. The chemical substances, secreted by the endocrine glands ?

→ **Hormones.**

2. Hormone secreting endocrine glands are also known as 'ductless glands'. Why ?

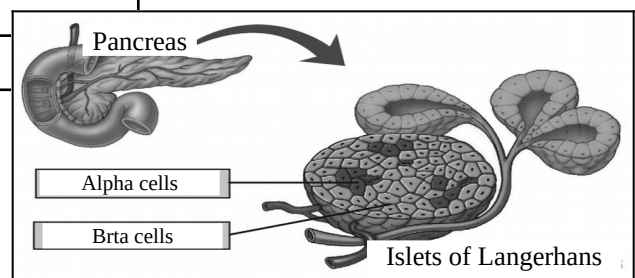
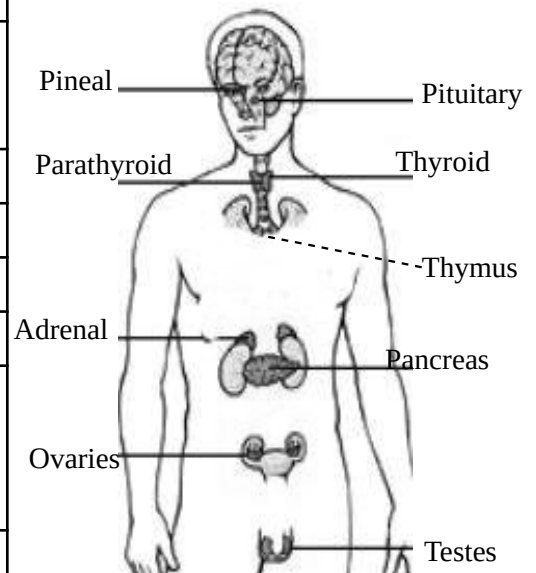
The hormones secreted by these glands are discharged directly in to blood, not through particular ducts.

3. Though hormones reach all parts of the body, each hormone act at its own target cells. How is this possible?

Though hormones reach all parts of the body through the blood stream, each hormone act only in its **target cells**, having specific receptors for accepting the same hormone. When hormone-receptor complex is formed in the plasma membrane, the enzymes in the cells become active.

4. The table and illustration showing the endocrine glands, site and producing hormones.

Endocrine glands	Producing hormones
*Hypothalamus	-Releasing hormones. -Inhibitory hormones, -Oxytosin, -Vasopressin(ADH)
Pituitary	-Tropic hormones (TSH, ACTH, GTH) -Somatotropin (STH/Growth hormone) -Prolactin
Pineal	-Melatonin.
Thyroid	-Thyroxine, -Calcitonin.
Parathyroid	-Parathormone.
Thymus	-Thymosine.
Adrenal	-Cortisol, -Aldosteron, -Sex hormones -Epinephrine (Adrenalin), -Norepinephrine (Noradrenalin)
Pancreas	-Insulin, -Glucagon.
Ovaries	-Estrogen, -Progesterone.
Testes	-Testosterone.



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5. What is the normal level of glucose in blood ?

Name the hormones which maintain this rate ?

70 – 110 mg /100 ml blood.

Insulin, Glucagon.

6. How is the normal blood glucose level maintained?

This rate is maintained by the antagonistic activities of insulin and glucagon , released from Islets of Langerhans of the pancreas.

When glucose increases in blood, beta cells in the Islets of Langerhans secretes **insulin**. It accelerates the process of glucose intake by the cells and conversion of the excess glucose in to glycogen.

When glucose decreases in blood, alpha cells in the Islets of Langerhans secretes **glucagon**, which converts glycogen and amino acids in to glucose.

7. Islets of Langerhans : Alpha cells : Glucagon ;

Islets of Langerhans : Beta cells :

→ Insulin.

8. The reason for -----, (the blood glucose level more than 126mg/100ml) is the deficiency or inactivity of the hormone insulin.

Diabetes mellitus / (Disease). (Symptom : Increased appetite and thirst and frequent urination)

9. A test to detect the presence of glucose in urine ?

Benedict Test.

Take 2ml of urine in a test tube. Add 2ml of Benedict solution and heat for 2 minutes. We can understand the level of glucose by observing its colour change.

10. Patients having diabetes mellitus usually takes insulin injection. Why ?

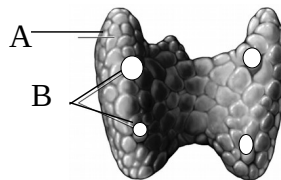
Insulin maintains the normal rate of glucose in our blood.

11. World Diabetics Day ?

November 14.

12. Name the endocrine glands A and B shown in the figure.

A- Thyroid gland, B- Parathyroid gland.



13. The chief metabolic hormone ?

→ **Thyroxine.**

14. The element needed for the proper functioning of thyroid gland ?

Iodine. (Deficiency of iodine may cause a disorder, **Goitre**, the abnormal growth of thyroid gland)

15. Mention the functioning of hormones secreted by thyroid gland.

Thyroxine – Increases the rate of metabolism and energy production, Accelerates the growth and development of brain in the foetal stage and infancy and also regulates growth in children.

Calcitonin – Maintains the level of calcium in blood by depositing excess calcium in bones or by preventing the mixing of calcium with blood.

16. Under secretion of thyroxine : Hypothyroidism,

Over secretion of thyroxine :? → **Hyperthyroidism.**

17. Deficiency of thyroxine during infancy may cause -----, stunted physical-mental growth in children ?

→ **Cretinism.**



18. Deficiency of thyroxine in adults may cause ----- ? → **Myxoedema.**

19. Symptoms seen in person with myxoedema (Hypothyroidism) ?

Low metabolic rate, sluggishness, increase in body weight, hypertension and inflammation in body tissues.

20. Symptoms seen in person having Hypothyroidism ?

High metabolic rate, rise in body temperature, excessive sweating, increased heart beat, weight loss and emotional imbalance.

21. Give examples for the conditions due to hyperthyroidism and hypothyroidism.

Hypothyroidism in children : Cretinism,

Hypothyroidism in adults : ----- ? ----- → **Myxoedema**



22. The hormones which maintain the normal rate of calcium in our blood ?

Calcitonin of thyroid gland, Parathormone of parathyroid gland.

23. What is the normal level of calcium in blood ? How is it maintained ?

9-11 mg /100 ml blood.

When the level of calcium in blood increases, thyroid gland secretes **calcitonin**, which lowers the level of calcium in blood, by depositing excess calcium in bones or by preventing the mixing of calcium with blood (from the bones).

When the level of calcium decreases, parathyroid gland secretes **parathormone**, which increases the level of calcium by helping in its re-absorption from kidneys or by preventing the deposition of calcium in bones.

24. The endocrine gland that active during infancy ? Name its hormone ?

Thymus gland (situated below the sternum / chest bone). Secretes the hormone **thymosin.**

25. Thymosin is also known as the '**youth hormone**'. Why ?

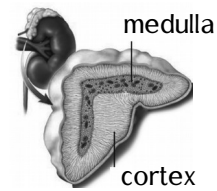
During infancy, thymosin helps in the maturation and activities of T-lymphocytes.

26. Name the gland that prepare our body to overcome emergencies.

Adrenal.



27. The outer part of adrenal gland : Cortex,
The inner part of adrenal gland : ----- ? → Medulla.



28. Table which shows the functions of adrenal hormones.

Adrenal Cortex	<p>-Cortisol : Synthesis of glucose from protein and fat, slows down the action of defense cells and controls inflammation and allergy.</p> <p>-Aldosterone : Maintains the salt-water balance and also blood pressure.</p> <p>-Sex hormones : Controls the development and functions of sex organs.</p>
Adrenal Medulla	<p>-Epinephrine (Adrenalin):</p> <p>-Norepinephrine : (Noradrenalin)</p> <p>} Act along with the sympathetic nervous system in order to prepare body to overcome emergency situations.</p>

29. Name the hormone that can be used as medicine against allergy and inflammation. Is it advisable to diabetic patients ? Why ?

Cortisol of the adrenal gland.

Since cortisol increases the synthesis of glucose, it is not advisable to diabetic patients.

30. How is epinephrine or norepinephrine prepare our body to overcome emergencies ?

When the sympathetic nervous system gets stimulated, the action of epinephrine or norepinephrine prolongs the body activities for more time. Due to these activities we get energy to resist or withdraw ourselves from such situations.

31. Why does the pineal gland, seen in the centre of our brain, called as a '**biological clock**' ?

Melatonin, the hormone of pineal gland, helps to maintain rhythm of our daily activities like sleeping, and waking up. So the pineal gland is called as a 'biological clock'.

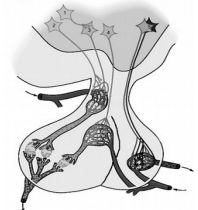
(Melatonin also controls the reproductive activities of organisms that have definite reproductive periods)

32. Name the bilobed gland situated just below the hypothalamus.

Pituitary.

33. The hormones secreted by the anterior lobe of pituitary. Mention their functions too.

- **Tropic hormones.**
 - TSH (Thyroid stimulating hormone)- Stimulates the activity of thyroid gland.
 - ACTH (Adreno cortico tropic hormone)- Stimulates the activity of adrenal cortex.
 - GTH (Gonado tropic hormone)- Stimulates the activity of sex organs.
- **STH (Somato tropic hormon /GH -Growth hormone)-** Promotes the growth of the body.
- **Prolactin** – Production of milk.



34. Hormones which are stored in the posterior lobe of pituitary ? Their functions ?

- **Oxytocin** - Facilitates child birth by stimulating the contraction of smooth muscles in the uterine wall
- Facilitates lactation .
- **Vasopressin** - Helps in the re-absorption of water in the kidneys and thus act as Anti Diuretic hormone (ADH). Thus, it regulates the level of water in the body.

35. Name the hormones of hypothalamus.

Releasing and Inhibitory hormones (towards the anterior lobe of pituitary to stimulate hormone production).

Oxytocin and vasopressin or ADH (towards the posterior lobe of pituitary)

36. How can hypothalamus control the entire endocrine system ?

Through the releasing and inhibitory hormones, hypothalamus induce the anterior lobe of pituitary to produce various tropic hormones, which in turn stimulate certain other endocrine glands.

(Releasing hormones stimulate hormones production of the pituitary, but inhibitory hormones suppress the production of hormones from pituitary).

37. What are the tropic hormones ?

Tropic hormones are stimulating hormones of pituitary to control the production of hormones of certain other glands.

TSH, ACTH, GTH are tropic hormones.

38. Why is the hypothalamus considered as the ‘chief controller’ of endocrine system ?

Through the releasing and inhibitory hormones, hypothalamus induce the pituitary to produce tropic hormones, which in turn stimulate certain other endocrine glands.

39. Name the growth disorders related to the growth hormone (somatotropin / STH) of the pituitary.

Dwarfism - The condition characterised by stunted physical growth due to decreased production.

Gigantism – Excessive growth of the body due to increased production of Somato Tropic Hormone.

Acromegaly – Excessive growth of the bones on face, jaws and fingers due to the prolonged production of STH even after the growth phase.

40. Mention the symptoms of acromegaly.

Excessive physical growth with excessive growth of the bones on face, jaws and fingers.



41. Describe about the reason for decreased production of urine during summer season.

During summer season, the production of vasopressin(ADH) increases and there fore re-absorption of water in the kidneys increases, to lower the quantity of urine.

42. The condition in which excess amount of urine is excreted, even in summer season, due to the insufficient production of vasopressin, is known as ----- ?

Diabetes insipidus .

43. Insulin : Diabetes mellitus : Glucose,

Vasopressin : -----?----- : water. —► Diabetes insipidus.

44. Table showing sex organs, hormones and their functions.?

Sex organs	Hormones	Functions
Testis	Testosterone	Controls secondary sexual characters (change in voice, growth of hair, development of reproductive organs) and sperm production.
Ovaries	Estrogen	Controls secondary sexual characters, ovulation, menstrual cycle etc.
	Progesterone	Controls ovulation, menstrual cycle and implantation of embryo in the uterus.

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45. Hormonal disorders.

Goitre	Abnormal growth of thyroid lobes [bulged throat] due to iodine deficiency.
Cretinism	Retarded physical – mental growth in children, due to hypothyroidism during early period of growth.
Myxoedema	Inflamed condition of body in adult due to deficiency of thyroxine.
Dwarfism	Stunted growth of bones due to under secretion of somatotropin in children.
Gigantism	Growing tall and heavy due to over secretion of somatotropin in children.
Acromegaly	Excessive growth of the bones on face, jaws and fingers due to the prolonged production of somatotropin even after the growth phase.
Diabetes mellitus	The condition of excessive loss of glucose through urine due to deficiency or inactivity of insulin.
Diabetes insipidus	The condition of excessive loss of water through urine due to deficiency of vasopressin /ADH.

46. Define pheromones. How is it useful to animals ?

Pheromones are chemical substances that are secreted by certain animals to the surroundings to facilitate communication.

It help in attracting mates, informing about food, determining the path of travel, signalling dangers, help honey bees and termites to live in colonies etc.

47. Give examples of pheromones

The **musk** in the musk deer,

The **civeton** in civet cat ,

Bombycol in female silkworm .

48. Ants can follow one after another during their trail. How is this possible ?

Because of the chemicals, *pheromones*, that released to their surroundings.

49. How are pheromones helpful in agricultural fields ?

Pheromone traps are used for pest control in agricultural fields.

50. How the life activities are controlled and coordinated in plants ?

Certain plant hormones (plant growth regulators) control and coordinate life activities in plants.

51. Table showing the natural plant hormones and their activities.

Plant hormones	Activities
Auxin	Cell growth, cell elongation, promoting terminal buds growth, fruit formation.
Cytokinin	Cell growth, cell division, cell differentiation.
Gibberellin	Stimulates break down of stored food to facilitate germination, sprouting of leaves
Ethylene	Ripening of leaves and fruits, excess amount causes dropping of leaves and fruits.
Abscisic acid	Dormancy of embryo, dropping of ripened leaves and fruits.

52. Name the plant hormone in gaseous form.

Ethylene.

53. The uses of artificial or synthetic plant hormones in agricultural sector.

Auxins	-To prevent the dropping of premature fruits, for the sprouting of roots and as a weedicide.
Gibberellins	-For increasing fruit size in grapes and apple and also for preventing ripening of fruits to assist marketing.
Ethylene	- Used for the flowering of pineapple plants at a time and for the ripening of tomato, lemon, orange etc. Ethyphon , a liquid chemical gets transformed into ethylene, when used in rubber trees and it increases the production of latex.
Abscisic acid	- Used for harvesting fruits at the same time.

54. Give examples of situations where artificial plant hormones are applied .

Ethylene is used for the flowering of pineapple plants at a time and for the ripening of tomato, lemon, orange etc.

Ethyphon, in liquid form gets transformed into ethylene, increases the production of latex.

Gibberellins are used for increasing fruit size in grapes and apple and also for preventing ripening of fruits to assist in marketing.

55. Though artificial plant hormones are useful, its application should be with utmost care. What is your opinion ?

True. Majority of the synthetic plant hormones are strong chemicals.