

ENDOCRINE SYSTEM – HORMONES

7



SYLLABUS

The endocrine system – names of endocrine glands - action of some hormones like adrenalin, thyroxine, insulin and pituitary hormone.

Our body has two types of glands — the exocrine glands and the endocrine glands. The exocrine glands are salivary glands, pancreas, *etc.* These glands send their secretions through ducts directly to the target organs. On the other hand, the endocrine glands are ductless glands. Their secretions are called hormones, which are poured directly into the blood and are thus carried to the target organs.

ENDOCRINE GLANDS

The hormone-producing glands are called **endocrine glands** such as pituitary gland, thyroid gland, *etc.* These glands have no duct but they pour their secretions directly into the blood (Fig 7.1). Therefore, they are also called **ductless glands**. Though the secretion of these glands, *i.e.*, hormone, is secreted in very small quantity, yet it is carried to all parts of the body. Each hormone has a specific function and its effect is produced in one or more specific part only.

Hormone is a chemical substance secreted from a gland, which is directly poured into the blood stream and which acts on the target organs or cells. It coordinates the functioning of our body.

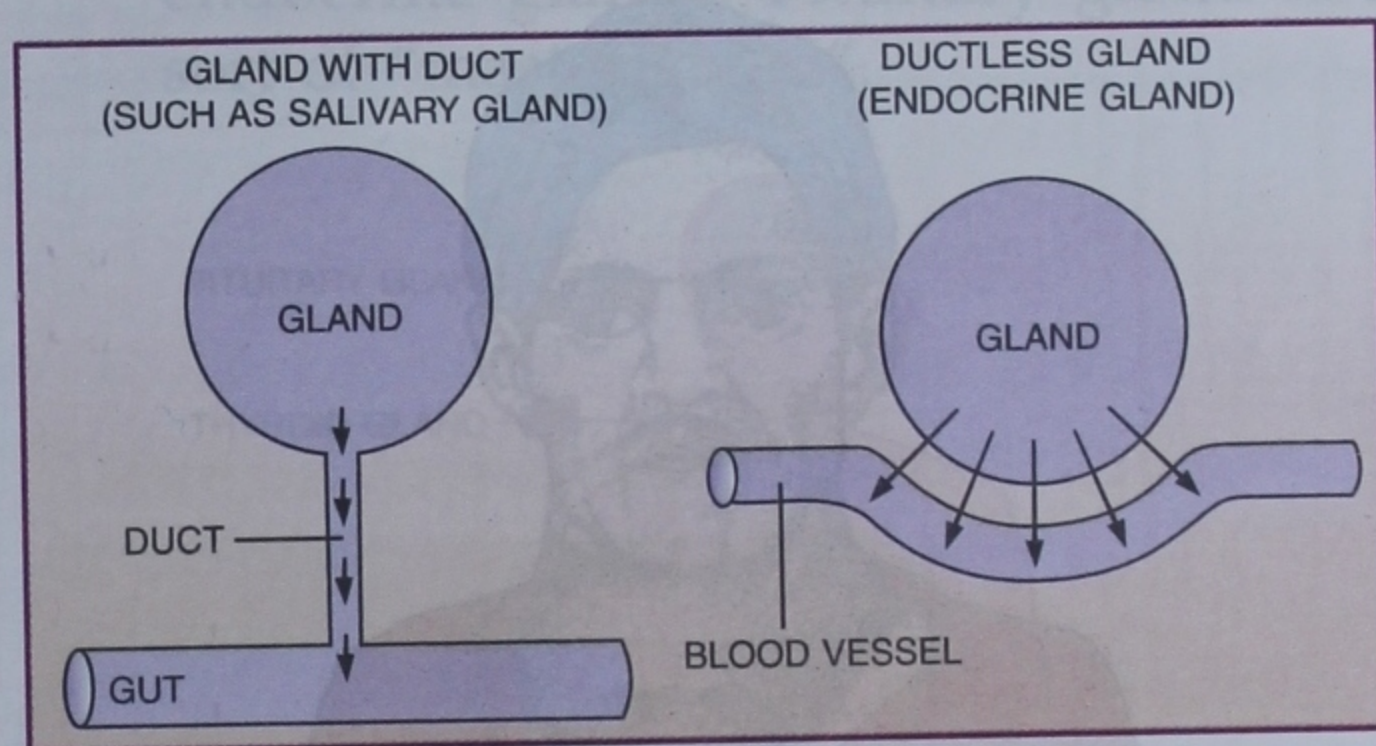


Fig. 7.1 Difference between the usual glands with ducts and the ductless glands

In this chapter, we shall describe only important glands, prescribed in the syllabus, namely thyroid, adrenal, pancreas, *etc.*

THYROID GLAND

Thyroid is a bilobed gland situated on either side of the wind pipe, just below the

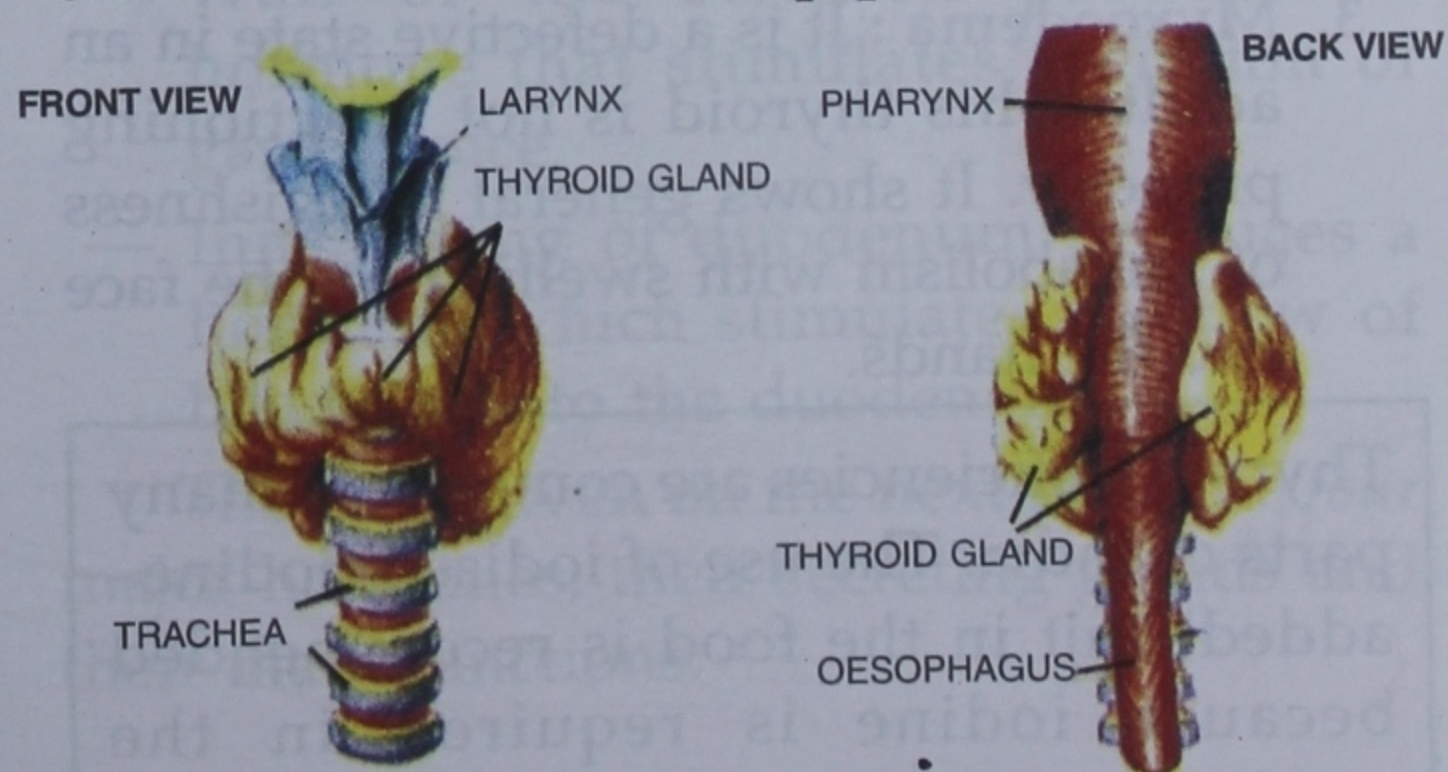


Fig. 7.2 The Thyroid Gland

neck. It secretes **thyroxine** which is an iodine containing protein. This hormone speeds up the rate of most of the activities of the body. It stimulates growth in young ones. The insufficient secretion or oversecretion of this gland has harmful effects on the body.

A. Insufficient secretion of thyroxine causes three ailments :

1. **Simple goitre** : It is the ailment caused due to the enlargement of thyroid. It shows swelling in the neck. It occurs due to the insufficient iodine in our daily food.

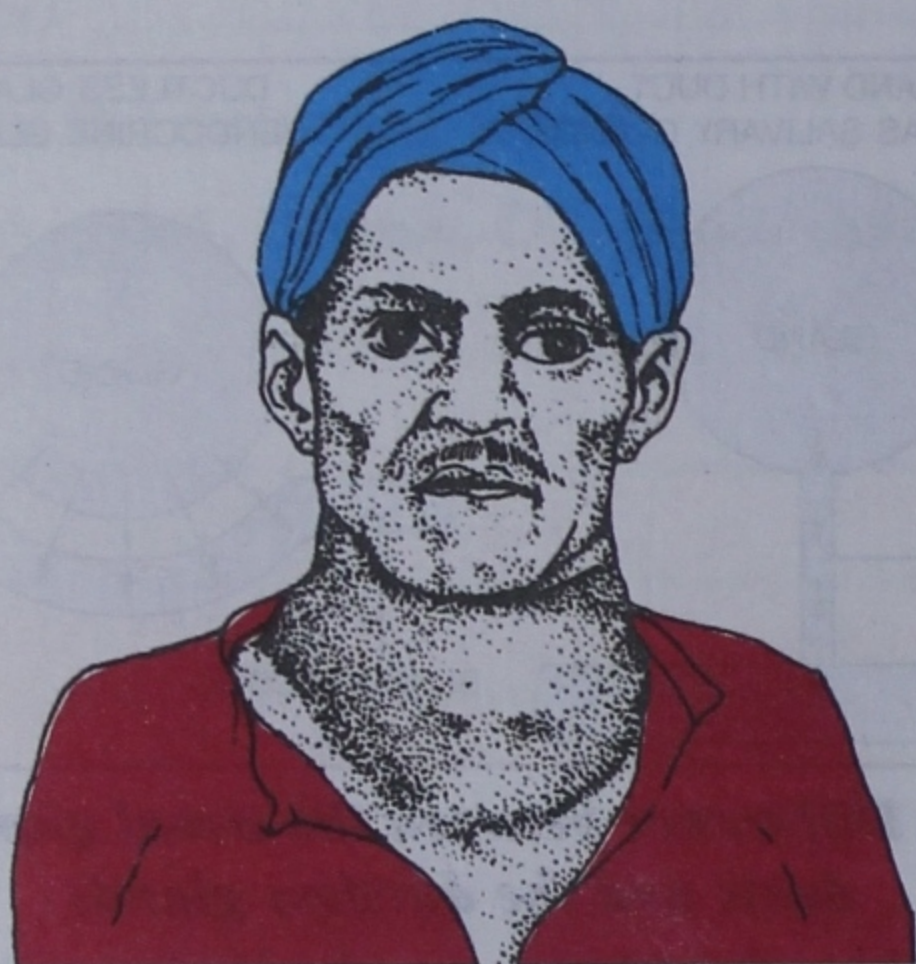


Fig. 7.3 Simple goitre

2. **Cretinism** : It is the ailment which brings about abnormal development in the child. It may cause dwarfism and mental retardation of the child.
3. **Myxoedema** : It is a defective state in an adult if his thyroid is not functioning properly. It shows general sluggishness of metabolism with swelling on the face and the hands.

Thyroid deficiencies are common in many parts of India. The use of iodised (iodine-added) salt in the food is recommended because iodine is required in the production of thyroxine.

B. Oversecretion of thyroxine causes enlargement of gland, an increased metabolic rate, increased heart beat and general restlessness.

ADRENAL GLANDS

The adrenal glands are like caps over the two kidneys. Each adrenal gland consists of two parts – a central **medulla** and a peripheral **cortex**.

Medulla secretes adrenaline (emergency hormone). This hormone is secreted when a person is under severe stress (physical or emotional), fearful or angry. This hormone prepares the body to meet any emergency situation for "fight" *i.e.*, to face the danger. This hormone provides an extra energy and strength to the body in any adverse situation. It increases the heart beat and the rate of respiration accompanied by rise in blood pressure, increase in blood supply to the muscles and release of more glucose into the blood by the liver (like putting more fuel into the engine). Thus, adrenaline energises the person to face any situation.

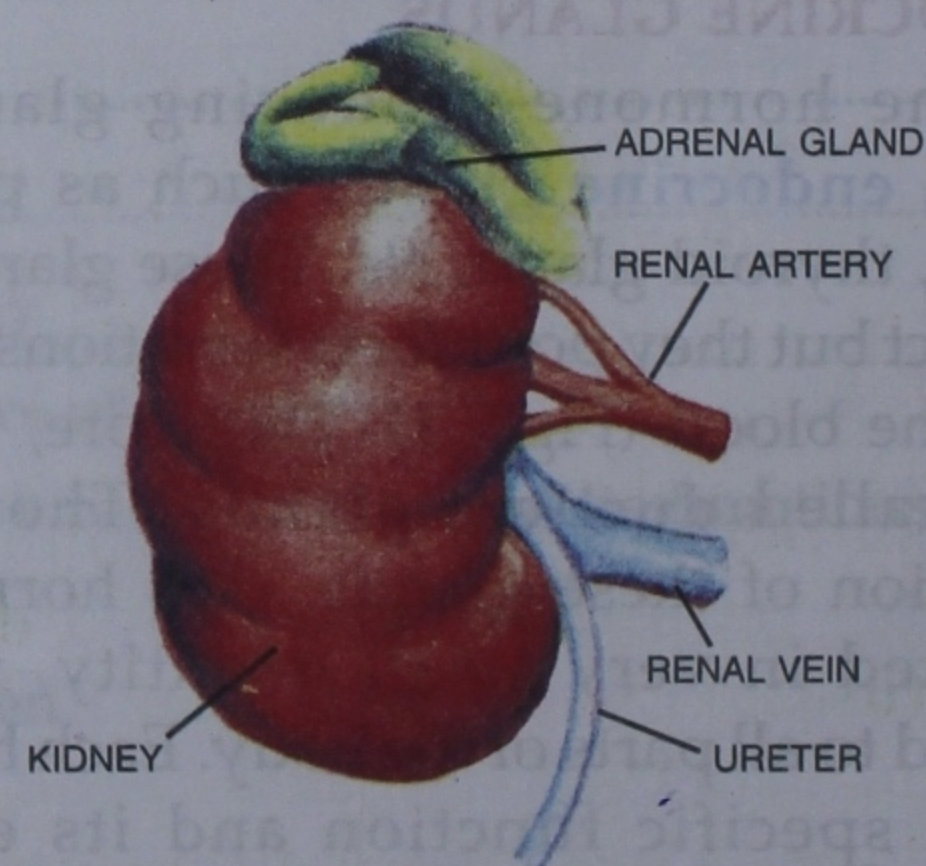


Fig. 7.4 The adrenal gland

The adrenal **cortex** secretes many hormones, but the well known hormone is **cortisone**. In general, the cortical hormones influence carbohydrate, fat, and protein metabolism. Also, it regulates salt and water

balance in the body. They adapt the body to “stresses” such as extreme heat, cold, burns, infections, *etc.*

PANCREAS

The pancreas is situated behind the stomach. Although it is mainly a digestive gland, it has cluster of hormone secreting cells called **Islets of Langerhans**. They secrete two hormones – **insulin** and **glucagon**.

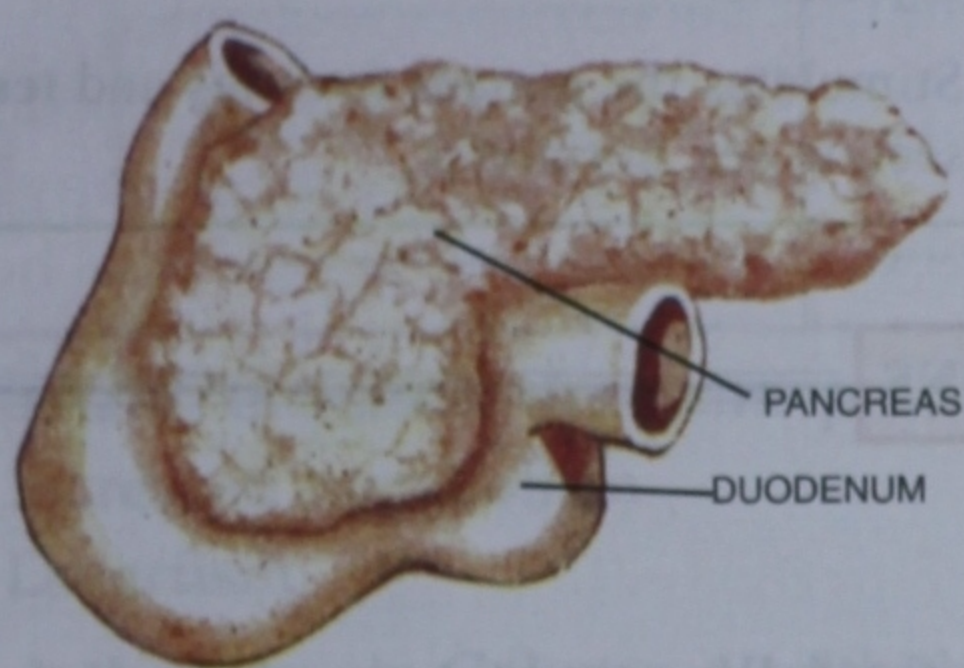


Fig. 7.5 The Pancreas Gland

Insulin removes excess glucose from the blood stream in three ways :

- (i) Insulin converts extra glucose to glycogen which is ultimately stored in the liver and muscles.
- (ii) Insulin induces the cells to burn extra glucose to produce heat and energy for the body.
- (iii) Insulin causes the cells to convert extra sugar into fat.

Insufficient secretion of insulin causes **diabetes** (more correctly called **diabetes mellitus**). A diabetic person has a high concentration of sugar in the blood. He excretes a great deal of urine loaded with sugar and feels thirsty because of the loss of water through too much of urination. Usually, he loses weight and tends to become weak.

In certain persons, the glucose level comes down due to oversecretion of insulin. This is very harmful and may have serious consequences.

Glucagon stimulates the breakdown of glycogen in the liver to glucose. Thus it raises the sugar level in the blood.

SOME OTHER HORMONE-PRODUCING GLANDS

— Pituitary gland is located below the brain. It secretes several hormones, some of which regulate the activity of other endocrine glands. Pituitary gland is a sort of “master gland”.

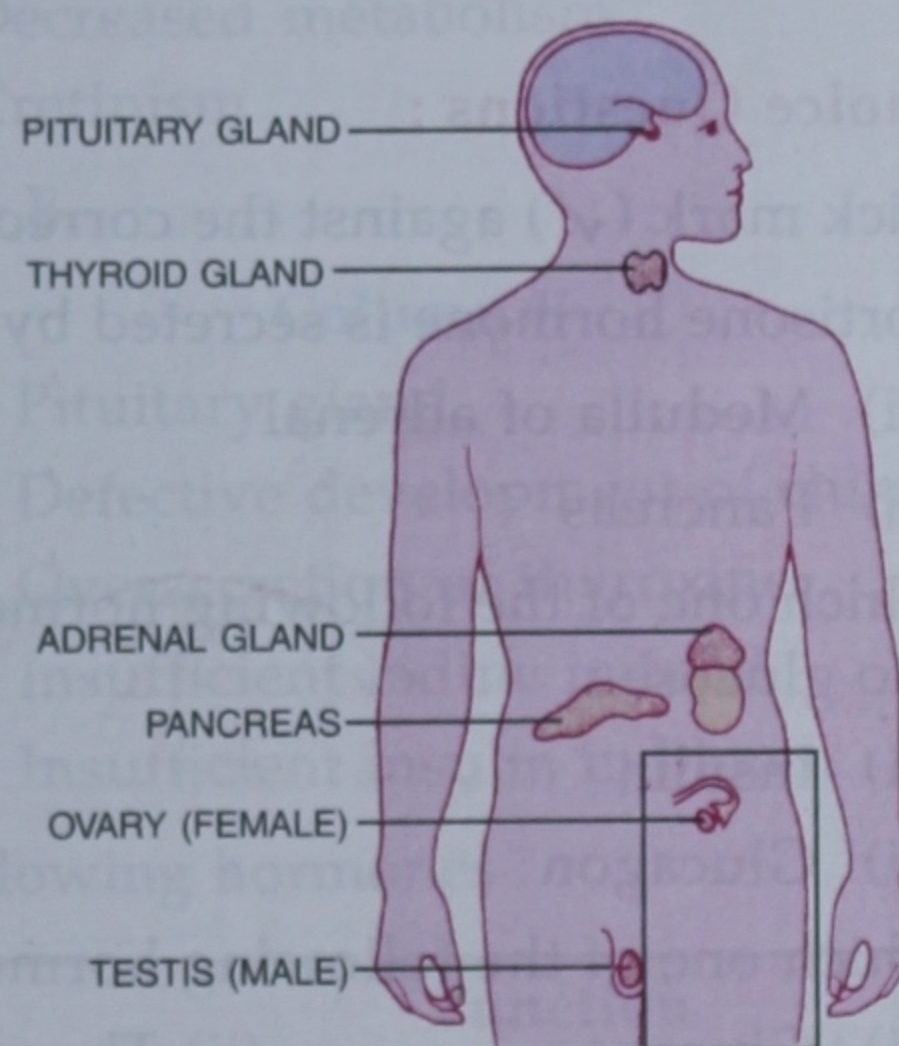


Fig. 7.6 Some major hormone – producing glands in humans

- Wall of the stomach produces a hormone that stimulates secretion of gastric juice.
- Inner lining of duodenum produces a hormone which stimulates the flow of bile juice into the duodenum.

The table given on the next page the *four* major hormones, their secreting glands and their main functions.

Table 8.1 : Some of the main hormone-producing glands and their secretions in the human body

Gland	Hormone	Function
Thyroid	Thyroxine	Controls the metabolic rate.
Adrenal	Adrenaline	Prepares the body for action.
Pancreas	Insulin	Regulates the amount of sugar in the blood.
Pituitary	(i) Growth hormone	Speeds up growth.
	(ii) Thyroid-stimulating hormone	Stimulates the thyroid gland to secrete thyroxine.
	(iii) Gonad - stimulating hormone	Stimulates the gonads (ovaries and testes) to secrete sex hormones.

REVIEW QUESTIONS

Multiple Choice Questions :

- Put a tick mark (✓) against the correct alternative in the following statements :
 - Cortisone hormone is secreted by :

(i) Medulla of adrenal	(ii) Cortex of adrenal
(iii) Pancreas	(iv) Thyroid
 - Which one of the following hormones stimulates the breakdown of glycogen in the liver into glucose :

(i) Insulin	(ii) Adrenaline
(iii) Glucagon	(iv) Thyroxine
 - Which one of the following hormones converts excess of glucose into glycogen :

(i) Glucagon	(ii) Thyroxine	(iii) Insulin	(iv) Adrenaline
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 - Which one of the following glands is also called master gland :

(i) Pituitary gland	(ii) Adrenal gland
(iii) Thyroid gland	(iv) Ovary
 - The emergency hormone to face the danger or to fight is secreted by :

(i) Islets of Langerhans	(ii) Adrenal cortex
(iii) Pituitary	(iv) Adrenal medulla

Short Answer Questions :

- What is a hormone ?

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2. Which one of the following endocrine glands produces its hormone in large quantities as a result of emotional stimulation ?

- (a) Thyroid (b) Islets of Langerhans (c) Adrenal medulla (d) Adrenal cortex

3. Name **four** endocrine glands, the hormones they secrete, and the function they perform, in a normal person.

S. No	Name of the gland	Hormone produced	Function
1.
2.
3.
4.

4. In humans, increased thyroxine production results in (tick the correct answer) :

- (a) Increased metabolism (b) Decreased metabolism
(c) Dwarfism (d) Cretinism

5. Match the items in Column A with those in Column B.

Column A

- (a) Cretinism
(b) Diabetes mellitus
(c) Increased metabolic rate
(d) Simple goitre
(e) Growth hormone

Column B

- (i) Pituitary gland
(ii) Defective development of child
(iii) Oversecretion of thyroxine
(iv) Insufficient iodine in food
(v) Insufficient insulin in blood.

6. Name the source and the function of each of the following hormones :

	Hormone	Source	Function
(a)	Glucagon	.....	.....
(b)	Thyroxine	.....	.....
(c)	Adrenaline	.....	.....
(d)	Insulin	.....	.....
(e)	Cortisone	.....	.....