

ENDOCRINE SYSTEM

29 MAY 2013

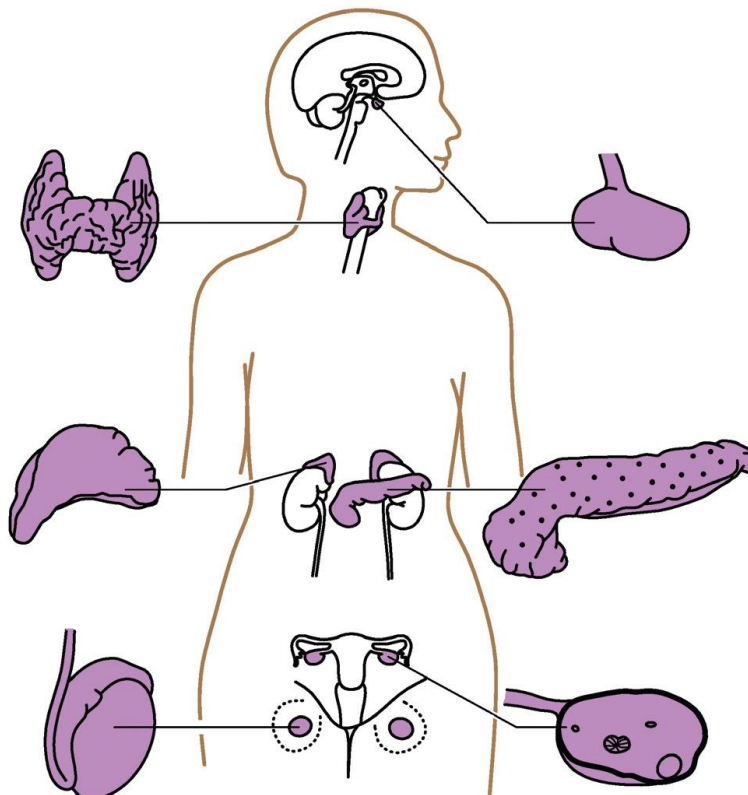
Lesson Description

In this lesson we:

- Discuss the characteristics of hormones.
- Explain the differences between endocrine and exocrine glands.
- Look at the location and the functions of hormones produced by the following endocrine glands in the body:
 - Hypothalamus (ADH)
 - Pituitary (GH, TSH, FSH, LH, prolactin)
 - Thyroid glands (thyroxin)
 - Adrenal (adrenalin, aldosterone)
 - Pancreatic islets/islets of Langerhans (insulin, glucagon)
 - Ovary (oestrogen, progesterone)
 - Testis (testosterone)
- Explain the principle of negative feedback mechanism using TSH and thyroxin as an example.
- Discuss the causes, prevention, symptoms and management of each of the following: Diabetes, Thyroid disorders & Growth disorders.

Key Concepts

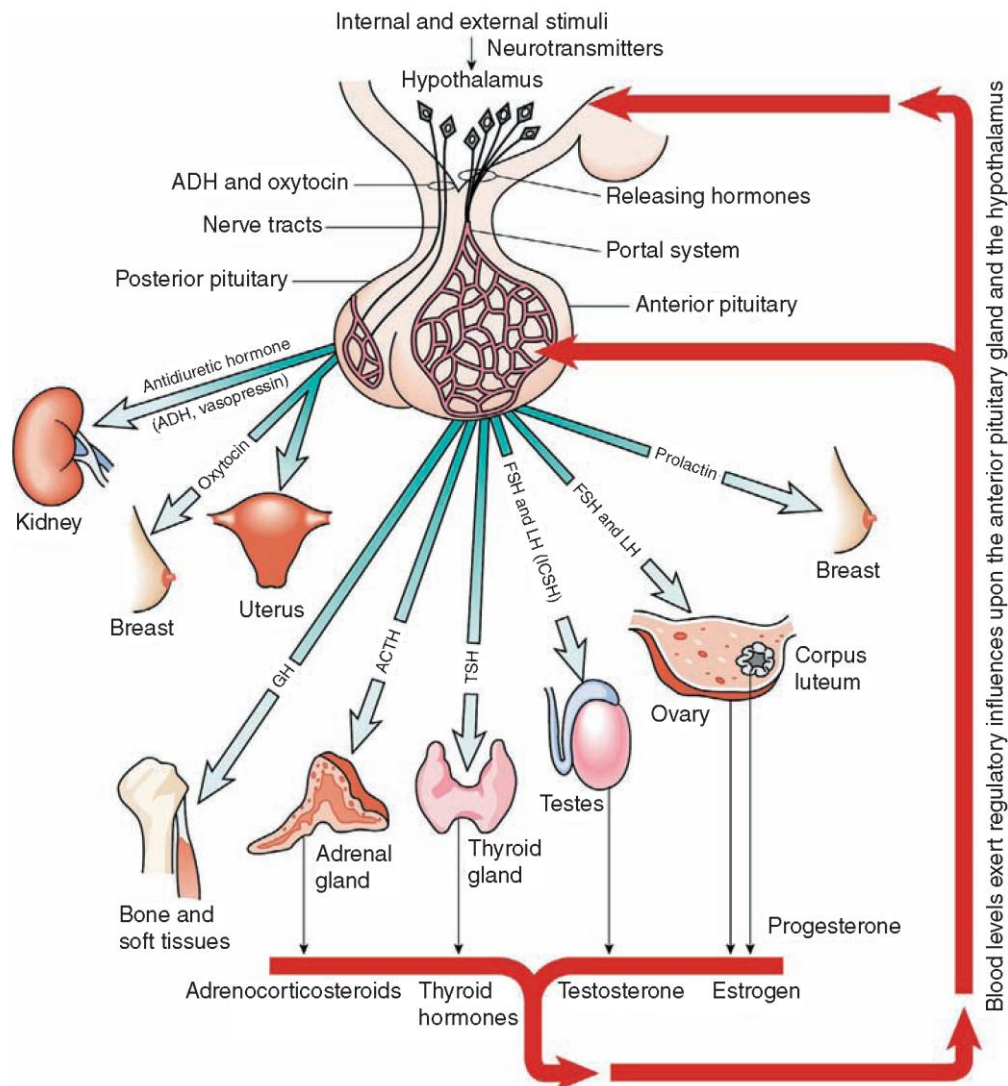
Endocrine System



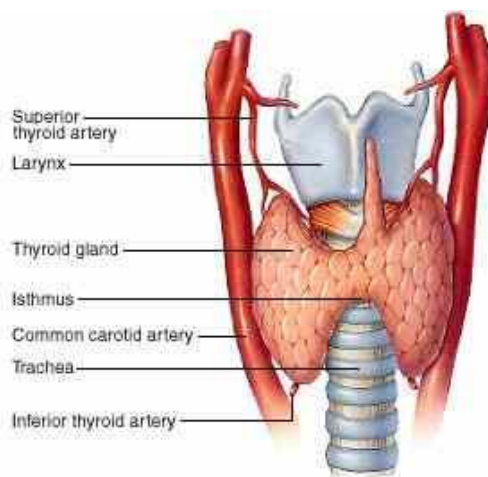
(Figure 2.38: The endocrine system, Life Sciences for All, Macmillan, p84)

Endocrine Glands & their Hormones

Hypothalamus & Pituitary Gland



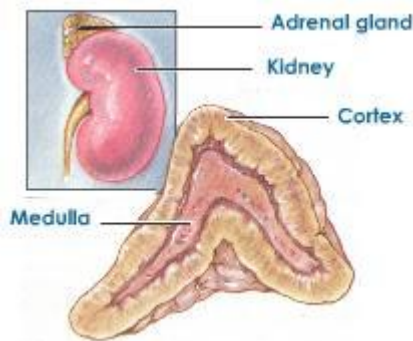
Thyroid Gland



Thyroxin:

- Regulates metabolic rate;
- Affects growth & development
- Affects functioning of the heart & nervous system

Adrenal Gland



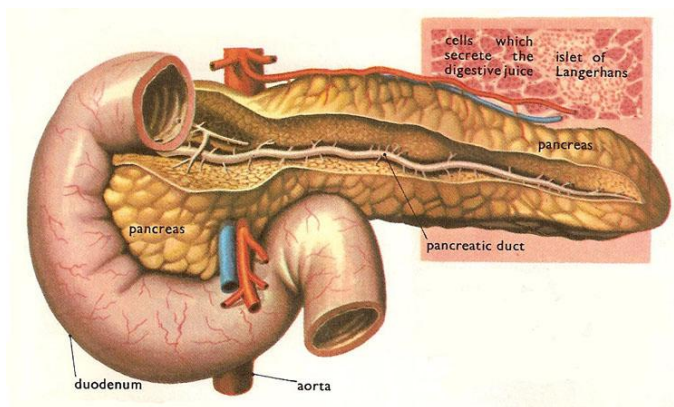
Adrenalin:

- Increases the heartbeat
- Raises blood pressure
- Speeds up the conversion from glycogen to glucose
- Causes pupils to dilate
- Increases the blood supply to the cardiac and skeletal muscles
- Increases skeletal muscle tone
- Increases rate and depth of breathing
- Causes the blood vessels of the digestive system and skin to constrict

Aldosterone:

- Regulates the amount of salts in the blood
- Works with ADH to bring about water balance

Islets of Langerhans of the Pancreas



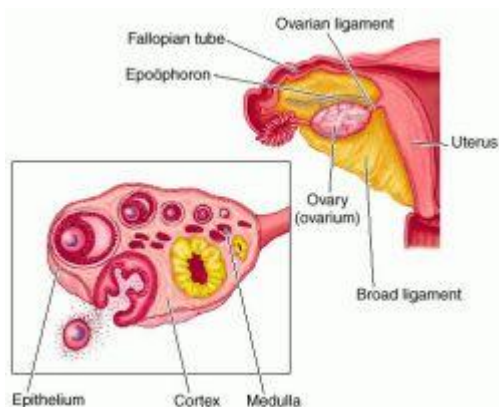
Insulin:

- Reduces the blood glucose level, by stimulating the conversion of glucose into glycogen and fat in the liver and muscles, and promoting the absorption of glucose from the blood into the cells, and increasing the use of glucose by the liver and muscles

Glucagon:

- Raises the blood sugar level by converting stored glycogen, from the liver or muscles, into glucose

Ovary



Oestrogen:

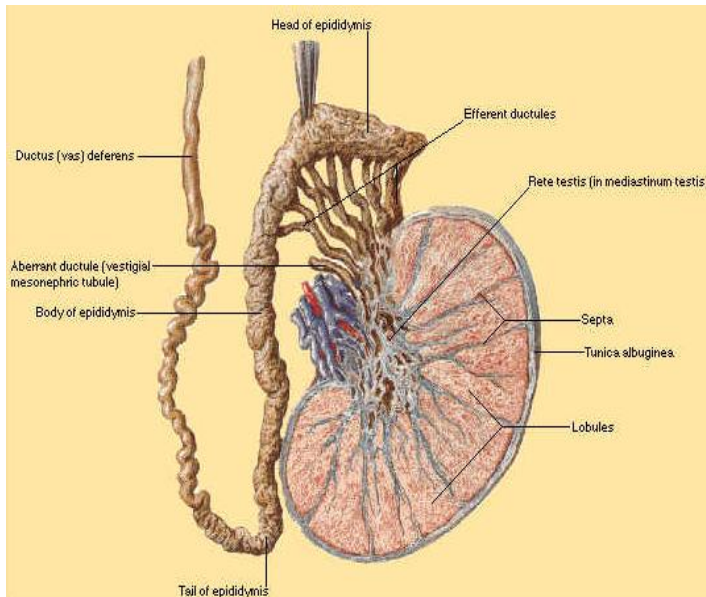
- Development of secondary sexual characteristics in girls e.g. development of breasts, soft skin, feminine voice, pubic hair
- Thickening of the lining of the uterus

Progesterone:

- Thickening of the lining of the uterus, maintaining pregnancy

Testis

Testis, Epididymis & Ductus Deferens



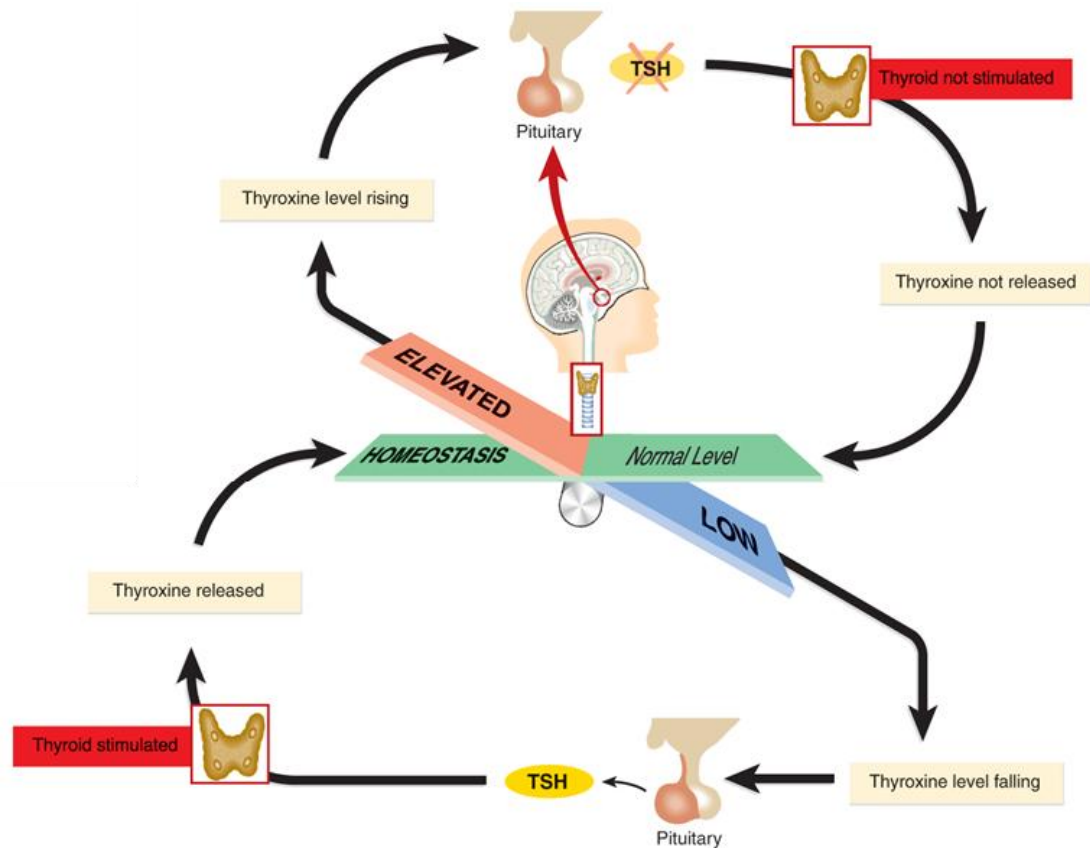
Testosterone:

- Development of secondary sexual characteristics, e.g. deep voice, more body hair, development of muscles

Negative Feedback Mechanisms

- A process whereby the response by the effector is opposite to and reverses the stimulus.

Interaction between Pituitary Gland and Thyroid Gland



Disorders



DISORDER	CAUSE	SYMPTOMS	MANAGEMENT
Endemic Goitre	Lack of iodine	Endemic/simple goitre	Increase iodine intake
Hypothyroidism	Thyroid produces too little thyroxine	Low metabolic rate – in adults – sluggishness, weight gain Children – cretinism – slow skeletal growth, slow mental development, skin becomes thick and dry Tongue enlarges & sticks out of the mouth	Medication
Hyperthyroidism	Thyroid produces too much thyroxine	High metabolic rate – irritability, hyperactivity, weight loss	Medication and therapeutic activities
Growth Disorders: Gigantism	Too much GH in childhood	The muscles and bones grow more rapidly than normal	All treated by medication
Dwarfism	Too little GH in childhood	The muscles and bones grow more slowly than normal	
Acromegaly	Too much GH in adulthood	The bones of the hands and legs and face become enlarged	
Diabetes mellitus	Shortage of insulin or insensitivity of target cells to insulin	Higher than normal glucose levels Glucose in urine Eyesight problems Slow healing of wounds	Medication Diet Exercise

Dwarfism

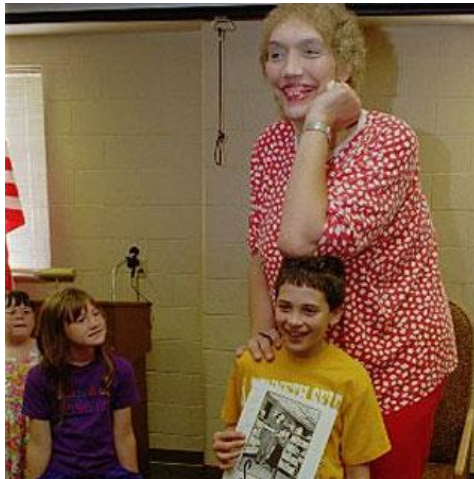


Gigantism



(Bao Xishun, a 7ft 8.95in herdsman from Inner Mongolia)

Acromegaly

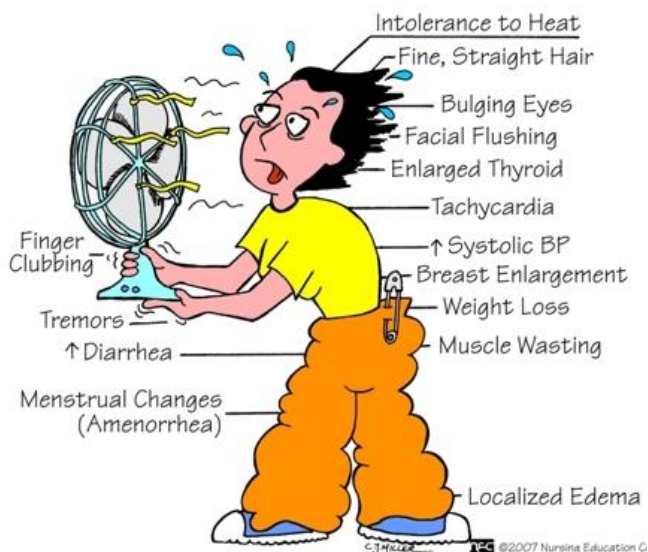


Endemic Goitre



Hyperthyroidism

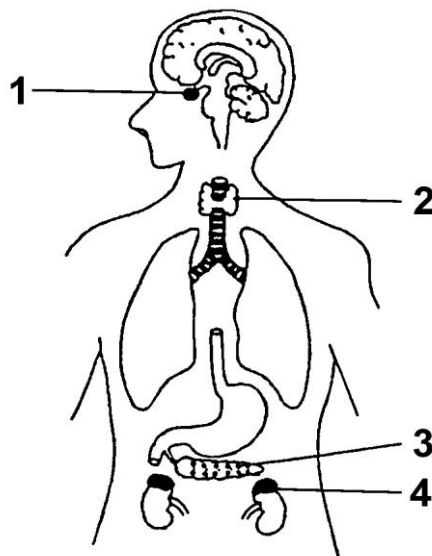


HYPERTHYROIDISM**HYPOTHYROIDISM****Questions****Question 1**

- What is a hormone?
- What are the characteristics of hormones?
- Distinguish between an endocrine gland and an exocrine gland and provide an example of each.

Question 2

Study the diagram below and answer the questions that follow.



- Label the parts numbered 1 to 4. (4)
- Write down only the NUMBER of the gland that:
 - Produces the hormone glucagon
 - Produces a hormone that controls the growth of long bones
 - Produces an iodine-containing hormone

- iv. Produces a hormone that is involved in the re-absorption of some salts by the kidneys (4)
- c.) Tabulate three differences between the nervous system and the endocrine system. (6)
- d.) Explain the mechanism between gland 1 and 2 when the metabolic rate is low. (5)

Question 3

(Adapted from Nov 2011, NSC, Paper 2, Version 1, Question 4.3)

Describe how the principle of negative feedback operates in controlling the glucose concentration of the blood in a normal healthy person. Also describe the causes, symptoms and management of the disease diabetes mellitus which results from an inability of the body to normalise the glucose concentration of the blood.

Content 17
Synthesis 3

Question 4

(Adapted from Mar 2013)

Describe the negative feedback mechanism involving TSH and thyroxin and describe the consequences if this mechanism does NOT function well.

Content 17
Synthesis 3