

## 3.5.3 Responses in the Human

### [B] Endocrine System

Objectives – What you will need to know from this section

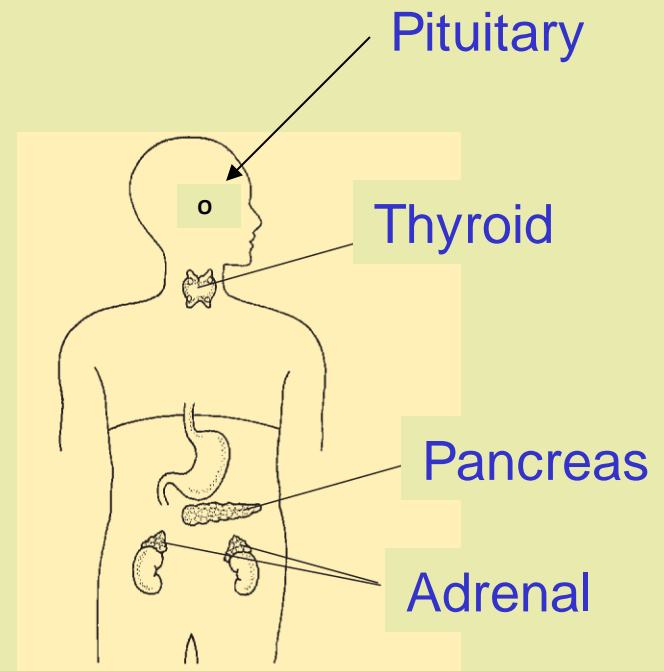
- Define the term: hormone.
- Outline the Endocrine System.
- Compare action, distinguishing between exocrine & endocrine glands.
- State the location of the principal glands in the human.
- Outline for each gland, one hormone & its function.
- Explain 1 Hormone giving a description of its deficiency symptoms, excess symptoms & corrective measures
- Name 2 examples of hormone supplements & their use.

# Response in the Human

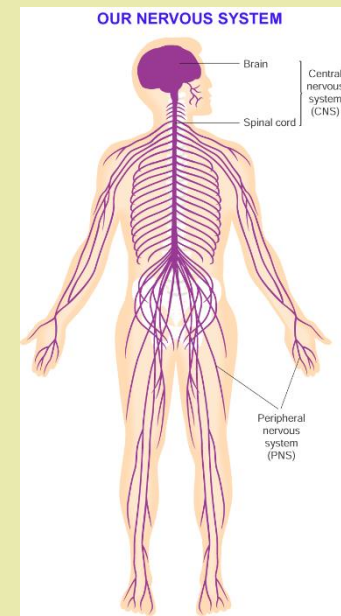
## ----- The Endocrine System

➤ The ability to detect change and to respond is called **sensitivity**. Response is a form of defence that allows organisms to survive.

➤ The **endocrine** system is a group of specialised tissues (glands) that produce chemicals called hormones, many of which are proteins.



- Hormones are chemical 'messengers', produced in specialised glands, and transported in the blood to a particular area (the target organ), where they have their effect.
- GLANDS- PRODUCE & EXPORT A SUBSTANCE)

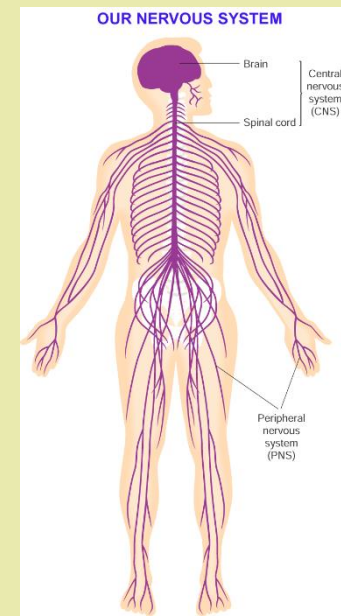


➤ The **endocrine** glands are often called ductless glands & CARRY products INTO the blood. E.g- pituitary gland

➤ **Exocrine** glands have ducts to carry (EXPORT) their secretions,  
e.g. tear glands

(sweat glands, salivary glands, kidneys, liver)

➤ The endocrine glands interact with the nervous system to provide the communication, co-ordination and control within the body. (ex adrenaline kicking in )



- The **action of hormones** is slower and more general than nerve action and they control mainly long-term changes such as growth, metabolism and sexual maturity.
- On passing through the **liver**, the hormones are broken down and excreted by the kidneys.
- The **nervous system** relies on electrical signals, carried by specialised cells, and is involved in fast responses.

# Comparison of the endocrine and nervous systems - 1

	Endocrine	
Cells involved	Gland	
Message	Chemical (Hormone)	
Carried by	Blood	
Message sent to	Cells throughout the body	
Received by	Target organ	

# Comparison of the endocrine and nervous systems - 1

	Endocrine	Nervous
Cells involved	Gland	Sense receptor
Message	Chemical (Hormone)	Electrical(Impulse)
Carried by	Blood	Nerve cell
Message sent to	Cells throughout the body	A specific cell or tissue
Received by	Target organ	Effector (muscle or gland)

# Comparison of the endocrine and nervous systems -- 2

	Endocrine	
Speed of transmission	Usually slow	
Effects	Can be widespread	
Duration	long-lasting (hours)	



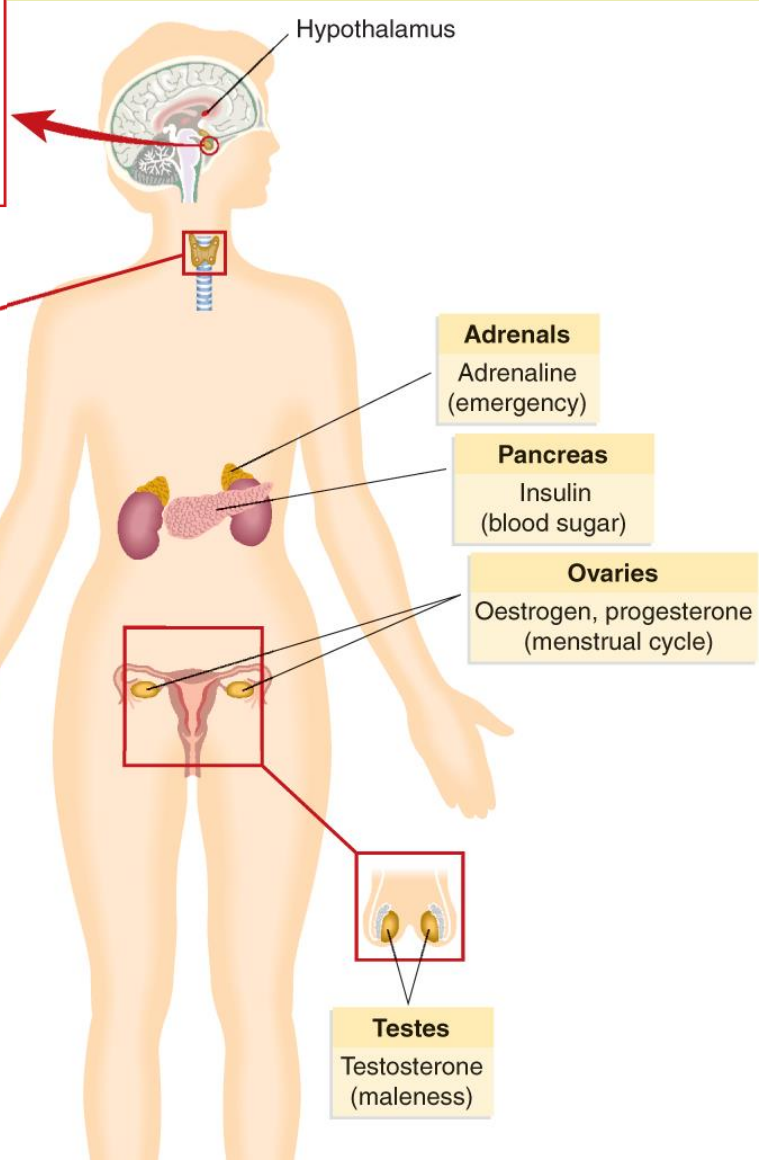
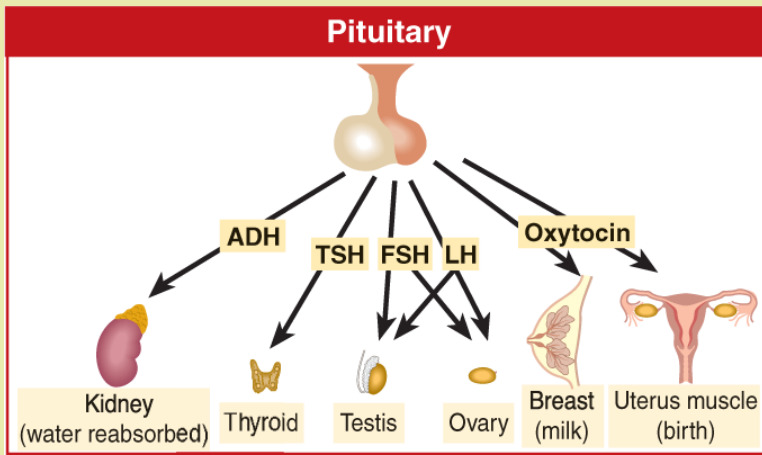
# Comparison of the endocrine and nervous systems -- 2

	Endocrine	Nervous
Speed of transmission	Usually slow	Rapid
Effects	Can be widespread	Localised usually
Duration	long-lasting (hours)	Usually brief (seconds)

# LEARNING CHECK

- What is sensitivity?
- What are endocrine glands?
- What are exocrine glands?
- What is the nervous system?
- Give the main differences between the nervous and endocrine systems.

# ENDOCRINE GLANDS



**Thyroid**  
Thyroxine (metabolism)

**Parathyroid**  
PTH (calcium)

**Adrenals**  
Adrenaline (emergency)

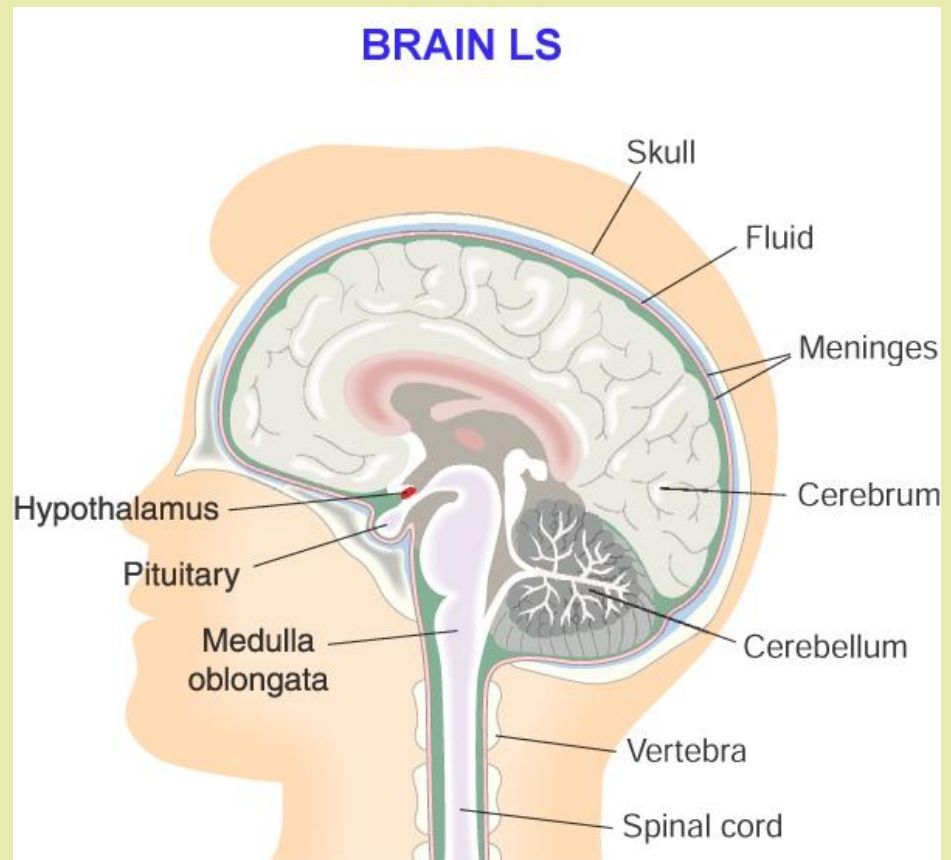
**Pancreas**  
Insulin (blood sugar)

**Ovaries**  
Oestrogen, progesterone (menstrual cycle)

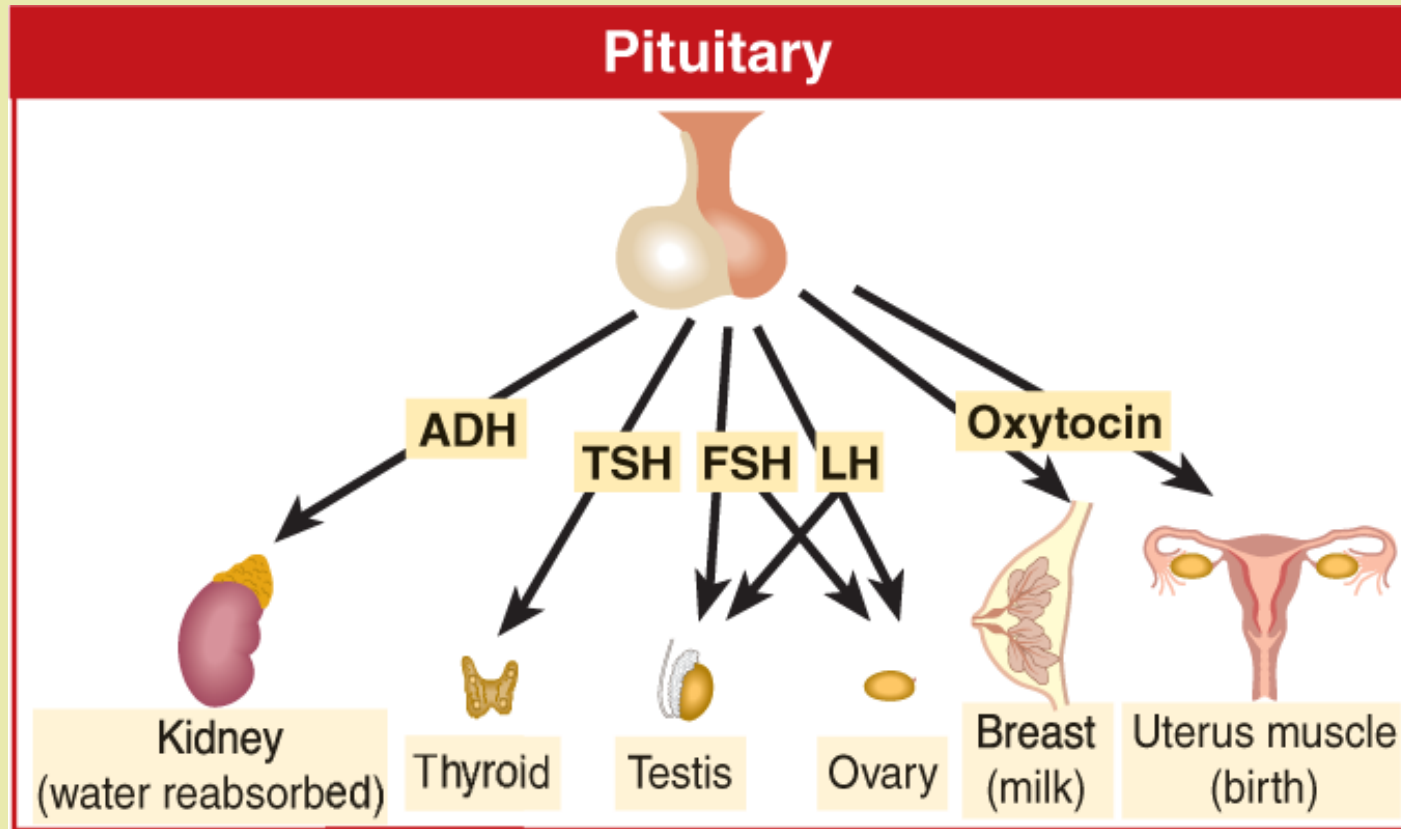
**Testes**  
Testosterone (maleness)

➤ The **brain** region keeps a check on internal organs and activities, such as the level of carbon dioxide or water in the blood.

➤ Most hormone activity is controlled directly or indirectly by the **hypothalamus** and **pituitary** gland.

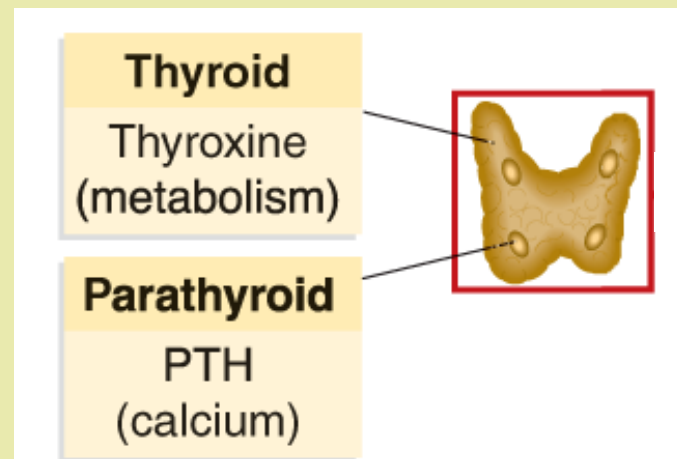


- The **pituitary** is often called the ‘**master gland**’, as many of its hormones trigger other glands to release theirs.



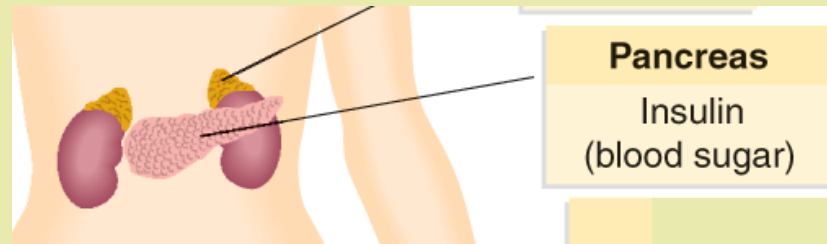
- It produces **ADH** to stimulate water reabsorption in the kidneys, **TSH** which stimulates the thyroid gland to release thyroxine, and **FSH** which controls the functions of the reproductive organs.

➤ The **thyroid** gland, in the neck, produces thyroxine, which stimulates metabolism.



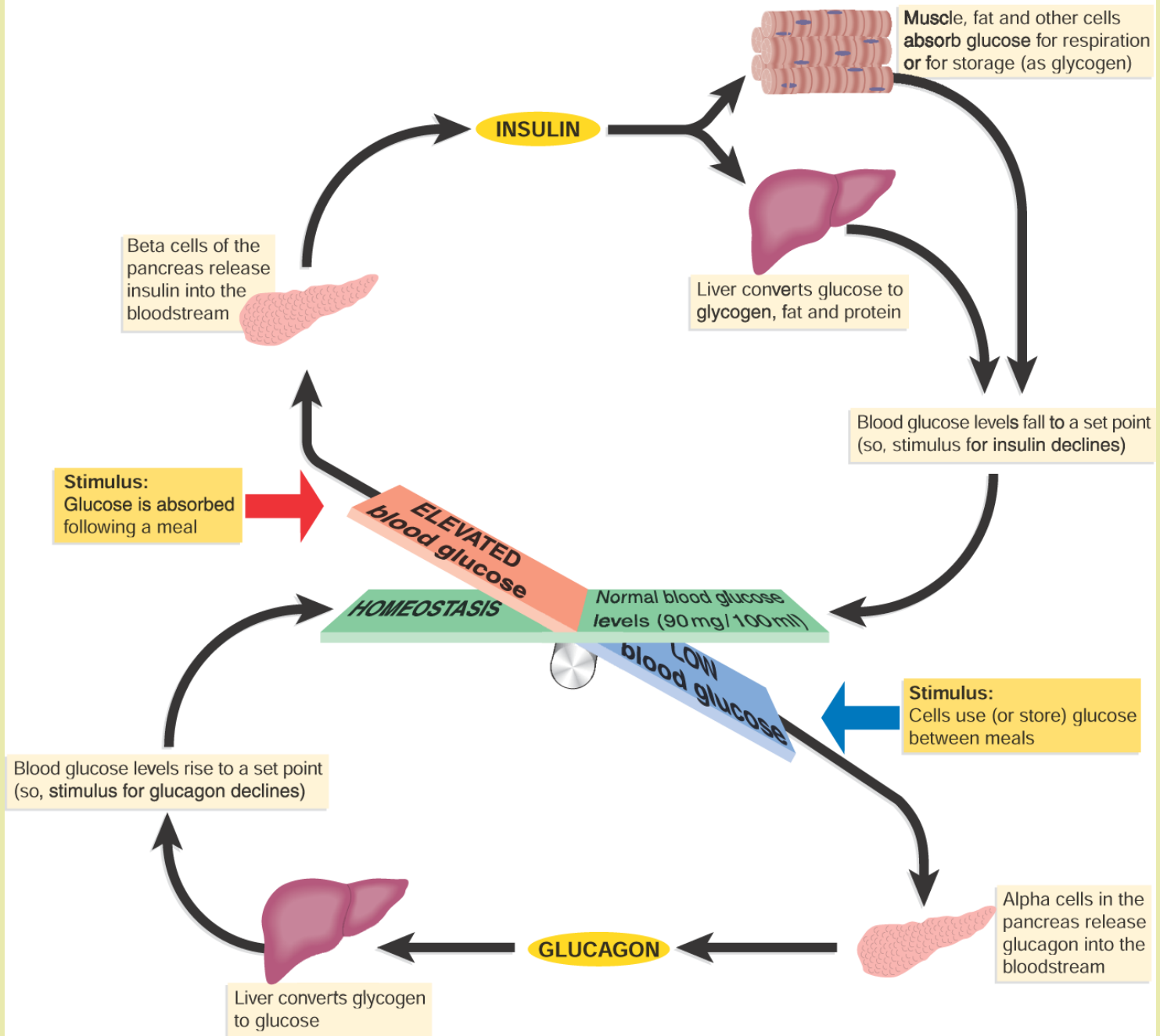
➤ The **parathyroid** produces parathyroid hormone, which increases blood calcium levels.

- The pancreas is both an **endocrine** and **exocrine** gland.
- The **Islets of Langerhans** produce insulin, while the rest produces enzymes for digestion.



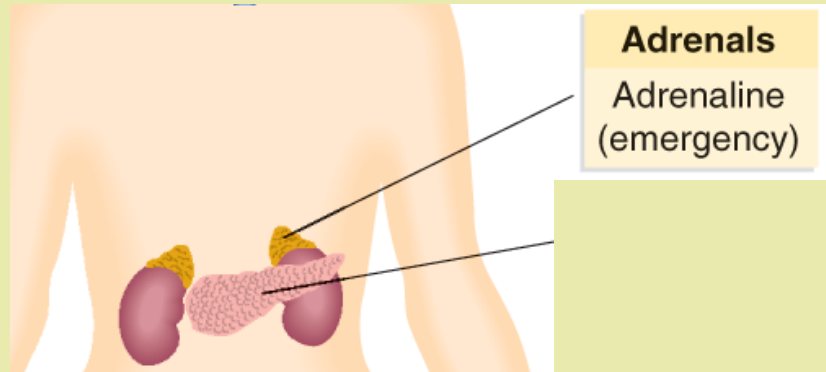
- **Insulin** stimulates cells to absorb glucose from the blood, and store it as glycogen.

# HOMEOSTASIS --- BLOOD SUGAR

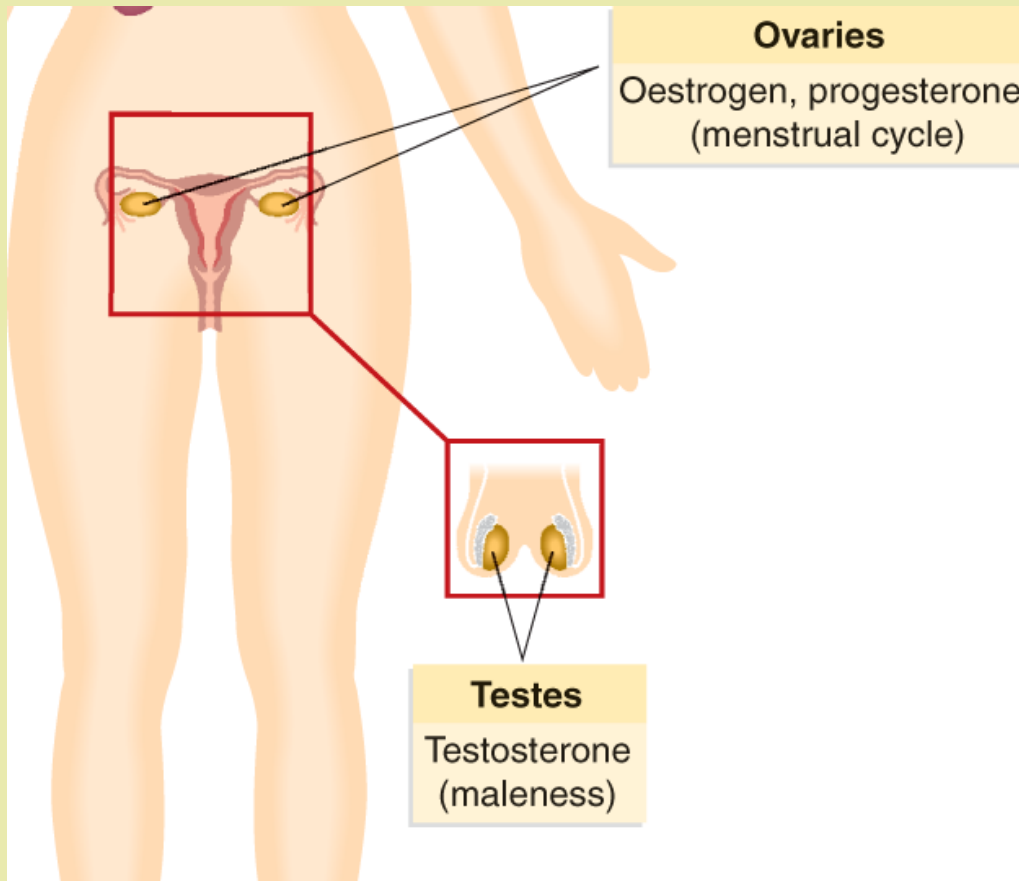




- The adrenal gland produces **adrenaline**, which helps the body cope with emergencies —the ‘flight or fight’ hormone.



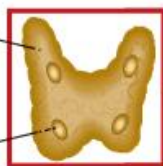
- The ovary produces **oestrogen** and **progesterone** to prepare the female for pregnancy.



- The testes produce **testosterone** which triggers sperm production and growth in the male.

**Thyroid**

Thyroxine  
(metabolism)



**Parathyroid**

PTH  
(calcium)



**Adrenals**

Adrenaline  
(emergency)



**Pancreas**

Insulin  
(blood sugar)



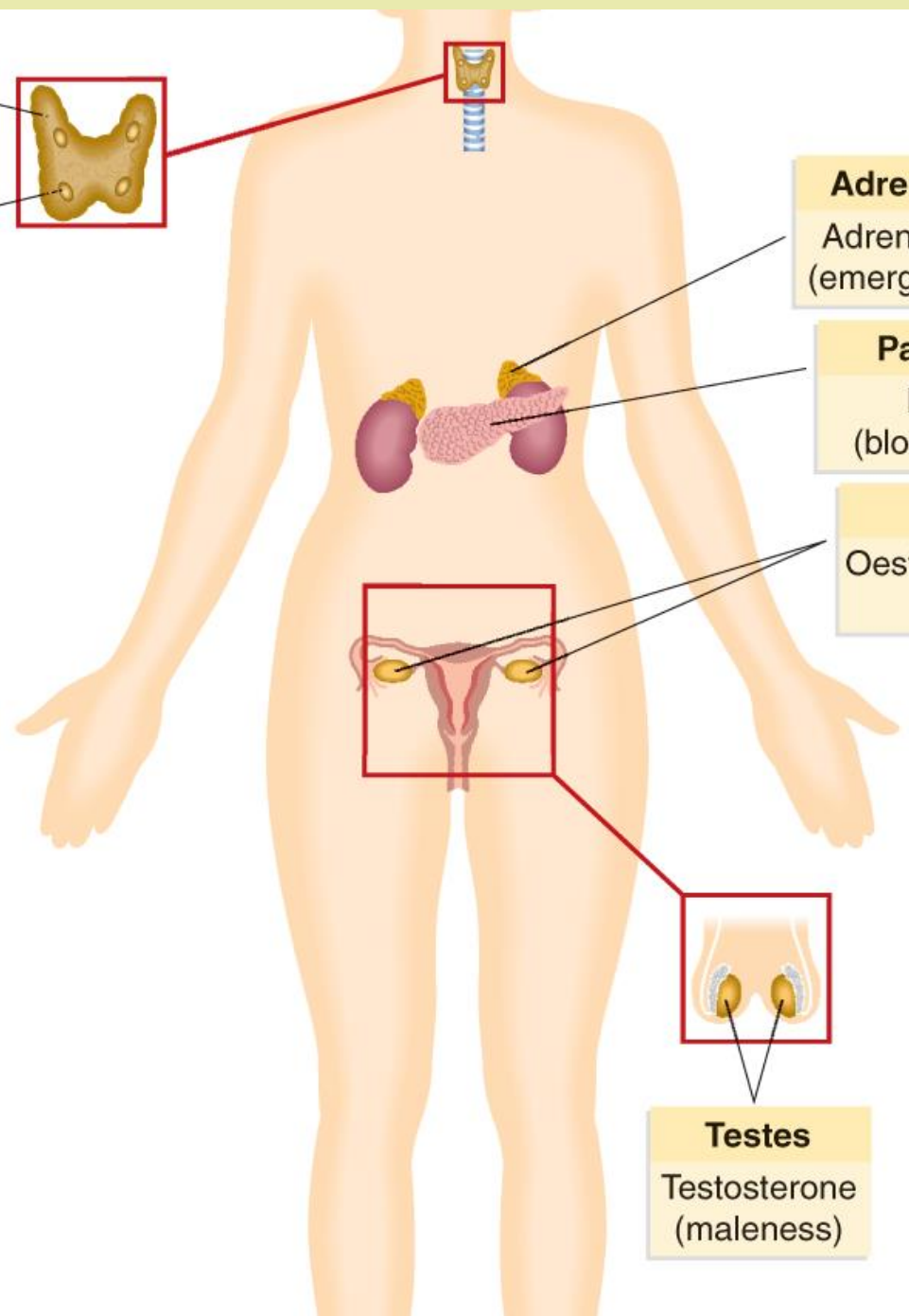
**Ovaries**

Oestrogen, progesterone  
(menstrual cycle)



**Testes**

Testosterone  
(maleness)



# LEARNING CHECK

- Name the main endocrine gland in the body.
- Name one hormone produced by each gland.
- Give one function for each hormone.
- Why is the pituitary often called the “master gland”?
- Where would you find the Islets of Langerhans?

# DISORDERS of the Endocrine System

Endocrine glands can sometimes *malfunction*

## THYROID gland:

- **Low** levels of thyroxine reduce the rate of metabolism.
- Taking the hormone in tablet form once a day can solve the problem – **hormone supplement**
- **Excess** thyroxine can greatly increase metabolic rate.
- **Treatment** is often by removal of part of the gland.

## HORMONE SUPPLEMENTS

### PANCREAS gland:

- In some people, the pancreas cannot produce insulin, which results in **diabetes** mellitus.
- Glucose cannot get into cells, which disrupts metabolism.
- Regular daily **injections** of insulin are required – **hormone supplement**.

### OVARIES gland:

- In oral **contraceptives**, oestrogen and progesterone are taken to prevent pregnancy – **hormone supplement**

# Feedback Mechanism

- Feedback Mechanism-When the level of one hormone controls the level of another or itself-effect can be positive or negative
- If Thyroxine rises
- Detected by Pituitary Gland
- It produces less TSH
- Stimulates thyroid to produce less thyroxine

# LEARNING CHECK

- Name some disorders of the endocrine system.
- For each one, give the symptoms and a possible treatment for the disorder.
- What are hormone supplements?