

The Endocrine system

The endocrine system

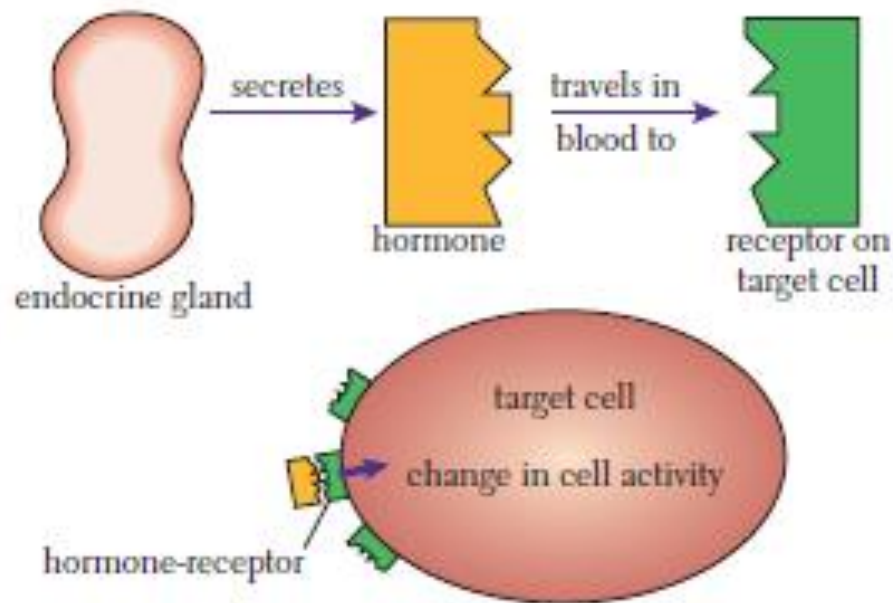
- controls and coordinates the activities in the body using chemical messengers called hormones.
- responds to changes in variables detected by receptor cells and often acts using a negative feedback mechanism to counteract the initial change.

Hormones

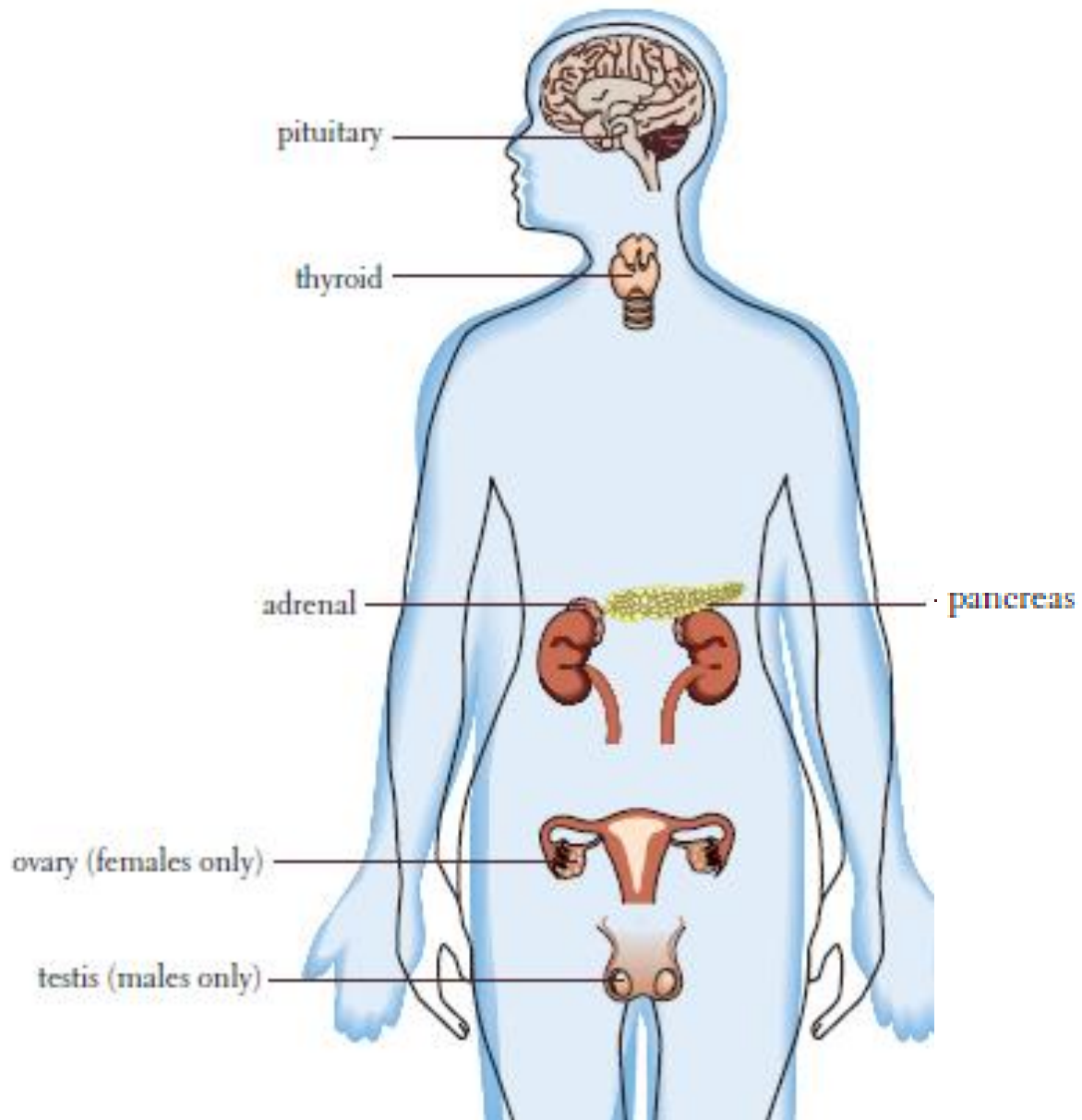
- are chemicals produced by your endocrine glands and released directly into your bloodstream.
- control and regulate functions like metabolism, growth, development and sexual reproduction.

Only particular target cells respond to a particular hormone.

A hormone has a specific shape that fits chemically into a receptor on the target cell's membrane.



The action of hormones



Major human endocrine glands

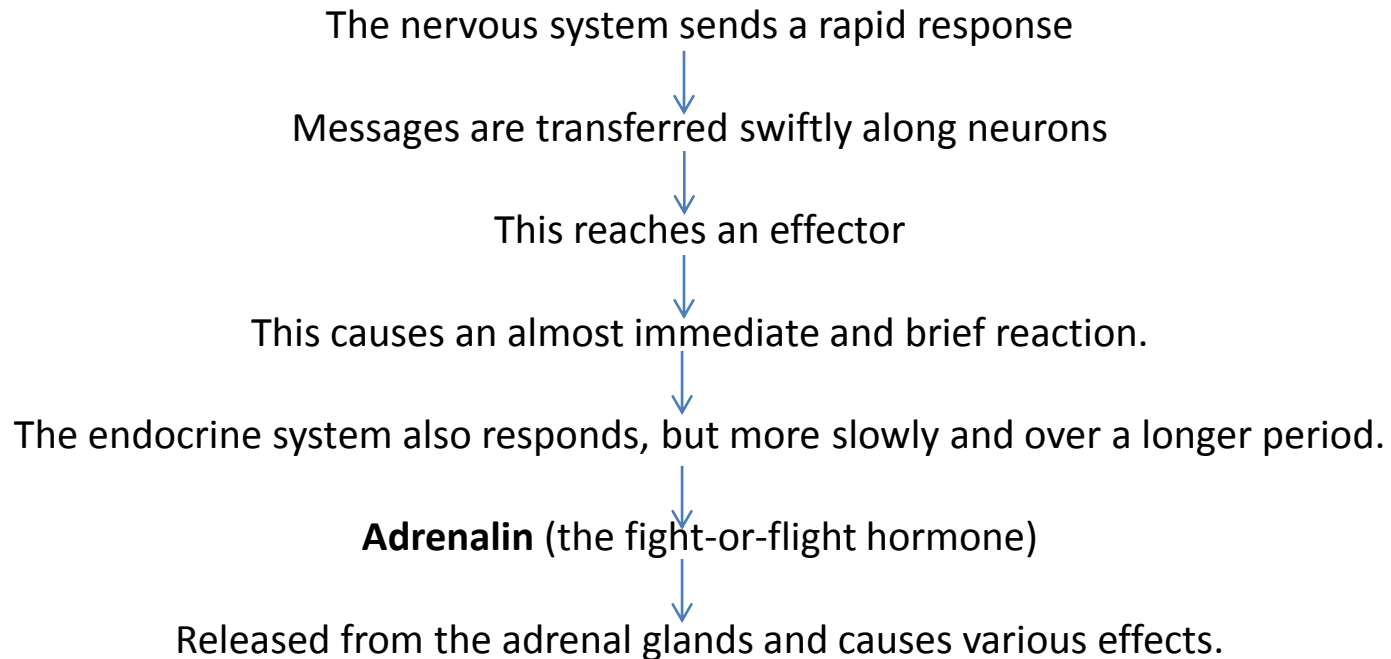
Gland or organ where the gland is found	Hormones produced	Functions controlled by the hormone
Adrenals	Adrenalin	Readiness or flight or fight
Pancreas	Insulin and glucagon	Blood glucose levels
Pituitary	Growth hormone (HGH) Antidiuretic hormone (ADH) Stimulating hormones	Cell growth and development Water balance Direct other glands to release hormones
Thyroid	Thyroxin	Rate of chemical reactions in cells
Ovaries	Oestrogen Progesterone	Female sexual development and the menstrual cycle Control of ovary and uterus in pregnancy
Testes	Testosterone	Male sexual development and sexual activity

Slow and long-lasting control

- It can take minutes, hours or even days for the level of a hormone in blood to reach a peak.
- Concentrations are small, but when the hormone affects a cell, the effect is usually relatively long lasting.

A response to a stimulus generally involves both, the nervous and the endocrine systems.

Example: When you are frightened



- The heart beats faster (Your heart pounds)
- Breathing rate increases
- Blood is diverted to the muscles
- Pupils dilate
- Hairs on the skin stand on end
- The brain becomes more alert
- You get that sinking feeling in your stomach

The overall effect is to boost the speed of your reaction to the fright.

Comparison of endocrine and nervous systems

Factor	Endocrine system	Nervous system
Speed of message	<ul style="list-style-type: none">•Slow•Generally takes longer to have an effect	<ul style="list-style-type: none">•Fast•Generally has a rapid effect
Length of response	<ul style="list-style-type: none">•Often long lasting	<ul style="list-style-type: none">•Usually short-lived
Spread of effect	<ul style="list-style-type: none">•The hormones affect only target cells.	<ul style="list-style-type: none">•Very localised
How message travels through the body	<ul style="list-style-type: none">•In the bloodstream	<ul style="list-style-type: none">•Along nerves
Type of message	<ul style="list-style-type: none">•Hormone (chemical)	<ul style="list-style-type: none">•Electrical impulse•Neurotransmitter (chemical)



The nervous system provides rapid messages.

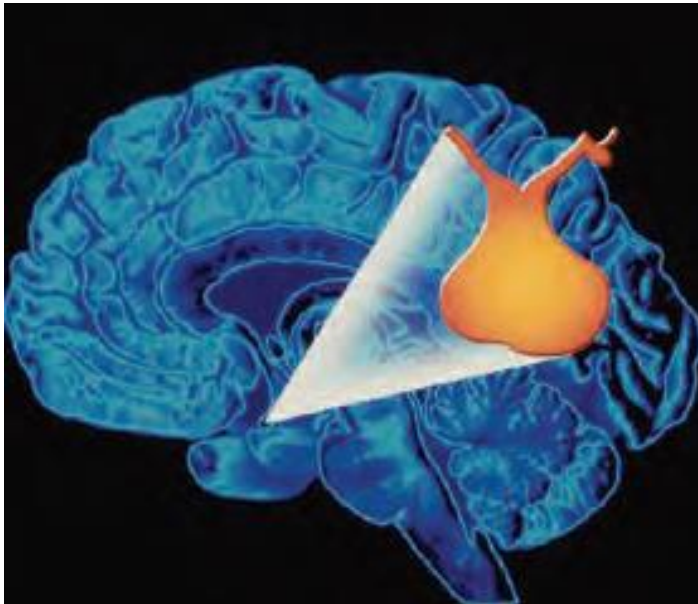


Hormones provide slower messages.

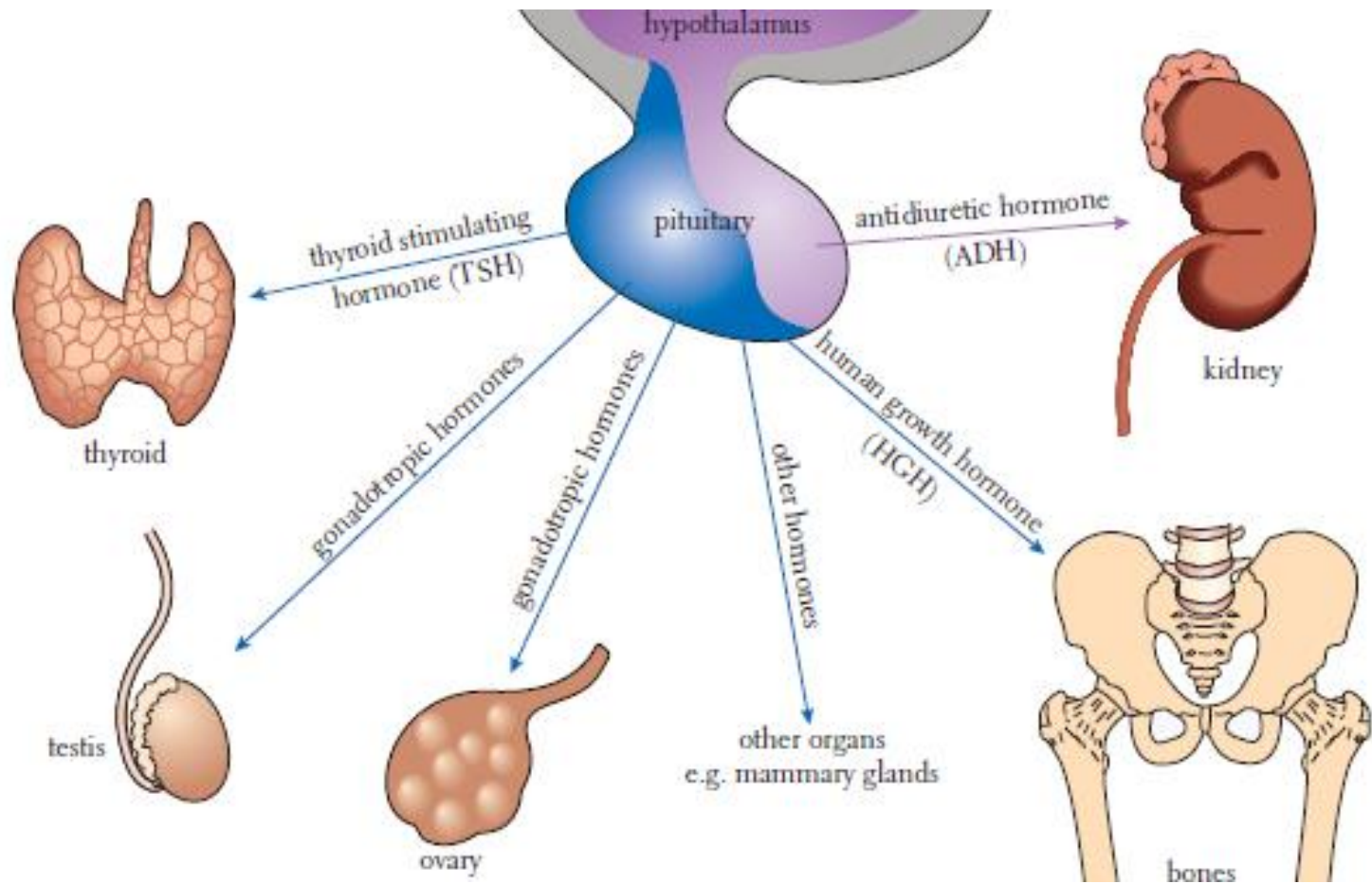
Fast and slow control

The **pituitary gland** is called the **Master gland**

- releases hormones that directly affect target cells
- instructs many other glands to release their hormones
- receives messages directly from the **hypothalamus** in the brain and thus provides a vital link between the nervous and endocrine systems



The pea-sized pituitary gland is located at the base of the brain.



The pituitary is the 'master' gland.

One sequence of events involves the hypothalamus and pituitary.

Under instruction from the hypothalamus, the pituitary releases thyroid-stimulating hormone (TSH). This causes the thyroid gland to release thyroxin.

Thyroxin

It controls the speed of cell reactions and therefore influences growth.

A deficiency of thyroxin in infancy results in cretinism, or stunted physical and mental growth.

Human growth hormone (HGH)

It influences total body growth.

Lack of HGH in childhood can lead to dwarfism.

Though small, these people have normal intelligence and are well proportioned.

Too much HGH in childhood leads to gigantism, producing an abnormally tall person.



Gigantism and dwarfism can result from abnormal levels of HGH. Some giants have grown to over 2.7 m tall, while dwarfs may be less than 0.6 m tall.

Research

- What are stem cells?
- Possible uses for stem cells
- Different types of stem cells
- Differing viewpoints around the use of embryonic stem cells