

THYROID GLAND HORMONES -

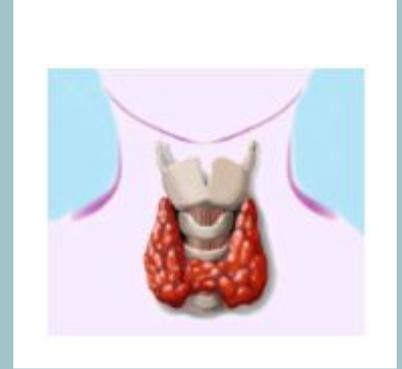
just 2 are released: **Thyroxin & Calcitonin!**

Thyroid gland

- Located in front of the trachea, similar to the letter H
- has a rich blood supply

Thyroxin:

- Responsible for the regulation of metabolism, body heat production & oxygen consumption in the mitochondria.
- Normal thyroxin output is necessary for normal body growth.



Normal Feedback Mechanism:

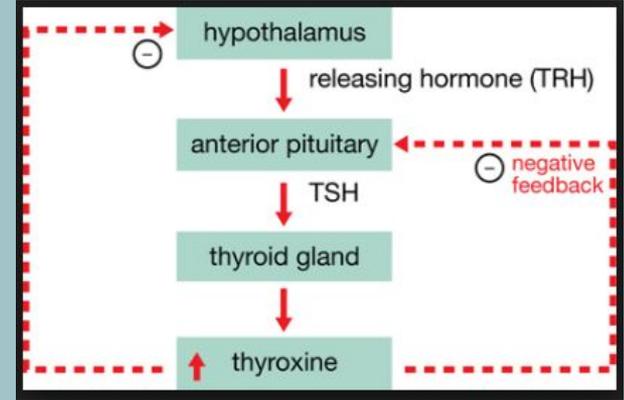
i) Hypothalamus senses low levels of thyroxin & decreases in body temperature

ii) Hypothalamus secretes Thyroid Releasing Factor (TRF) to stimulate the Anterior Pituitary Gland (APG) to release Thyroid Stimulating Hormone (**TSH**) into the Blood.

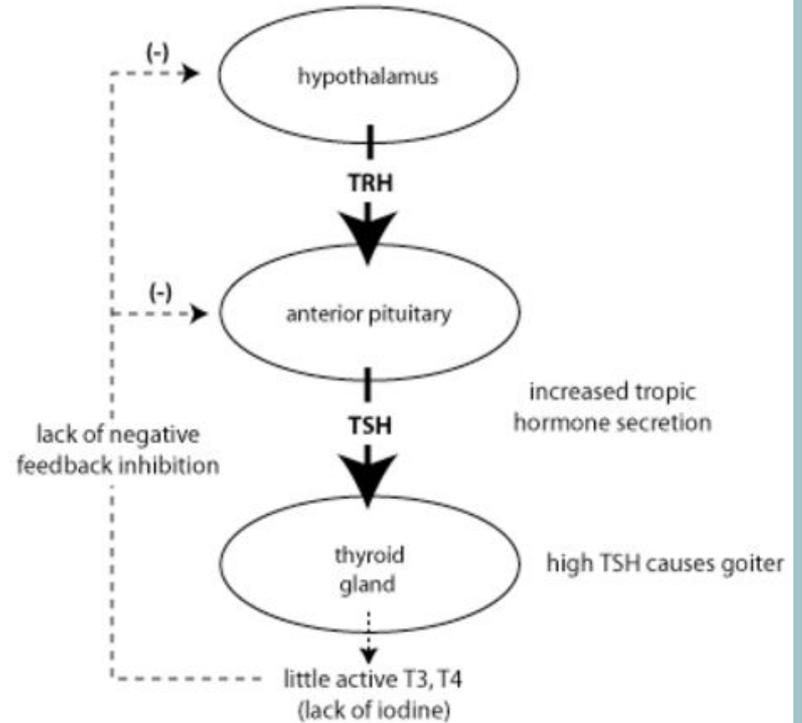
iii) **TSH** reaches its target à **Thyroid Gland**

iv) Thyroid Gland is stimulated to produce **Thyroxin** which is then released into the bloodstream. (**Thyroxin can only be made in the presence of Iodine**)

v) Thyroxin targets all body cells to promote cellular metabolism & growth.



If no thyroxin produced by the above mechanism then the APG continues to release TSH. The thyroid then becomes over stimulated and swells à **GOITRE**



A **goitre** (British English) or goiter (American English) (from the Latin gutteria) is a swelling of the neck or larynx resulting from enlargement of the thyroid gland (thyromegaly), associated with a thyroid gland that is not functioning properly. Worldwide, over 90% cases of **goitre** are caused by iodine deficiency.

Thyroxin Disorders

A) **Hypo-secretion of Thyroxin:**

(Under-active thyroid)

i) **Myxoedema:** Applies to adults who have low energy, frequently cold, skin swells/yellows and becomes leathery, weight gain & slow thinking

ii) **Cretinism:** Applies to children who display a form of dwarfism where the skeleton-brain-gonads fail to grow & develop normally. Cretins are usually born without a thyroid. Baby milestones are delayed.

iii) Thyroxin supplements are necessary for both disorders.

Think of the function of thyroxin and relate to why hypo-secretion would result in these symptoms.

Again, think of the function of thyroxin and relate it to the symptoms.

B) **Hyper-secretion of Thyroxin:** (Over-active thyroid)

i) **Graves Disease:** Applies to adults mainly.

- Metabolism is very high, skin is hot & flushed, profuse sweat, very thin, weak and fidgety-irritable and excitable.

-NOTE the protruding eyes called Exophthalmos where eye muscles loosen, thus eyes pop out-ward

ii) **Goitre:** An overactive thyroid but no secretion of Thyroxin. Thyroid gland swells to grapefruit size.



Calcitonin:

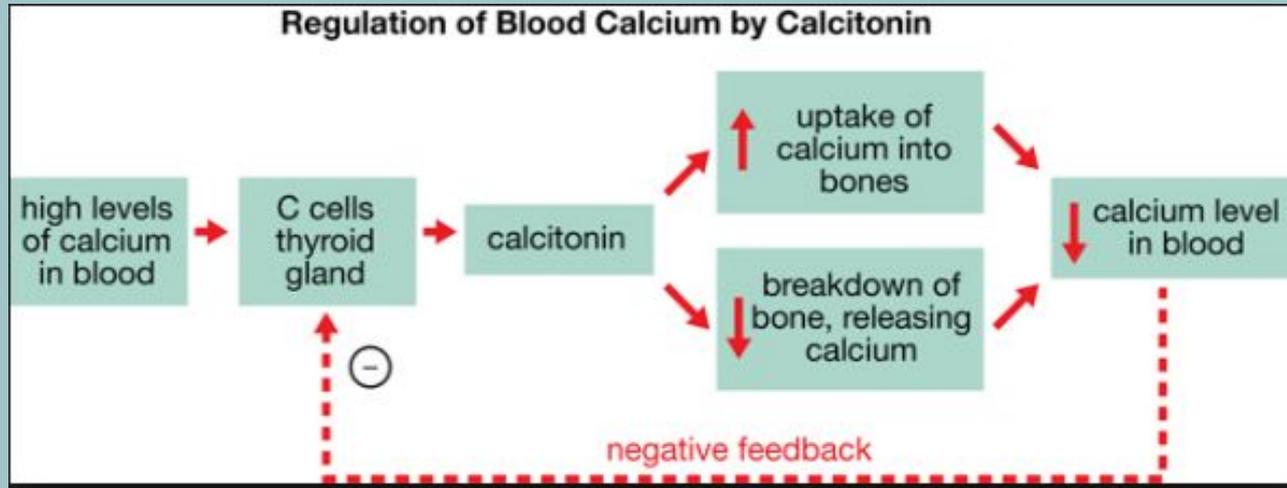
- responsible for the build up of bone by stimulating the bones to absorb Calcium & Phosphates from the blood.
- Excess blood calciums are also excreted through the action of calcitonin on the kidneys.

Calcium is needed for:

- Blood clotting
- Healthy bone growth
- Nerve conduction
- Muscle contraction

Normal Feedback Mechanism:

- i) You drink a glass of milk, yogurt or TUMS (something with calcium)
- ii) Blood calcium & phosphate levels rise
- iii) Chemoreceptors in Thyroid are stimulated to make & release Calcitonin
- iv) Calcitonin reaches its target à bones of body
- v) Bones are stimulated to absorb the calcium for structure and storage.



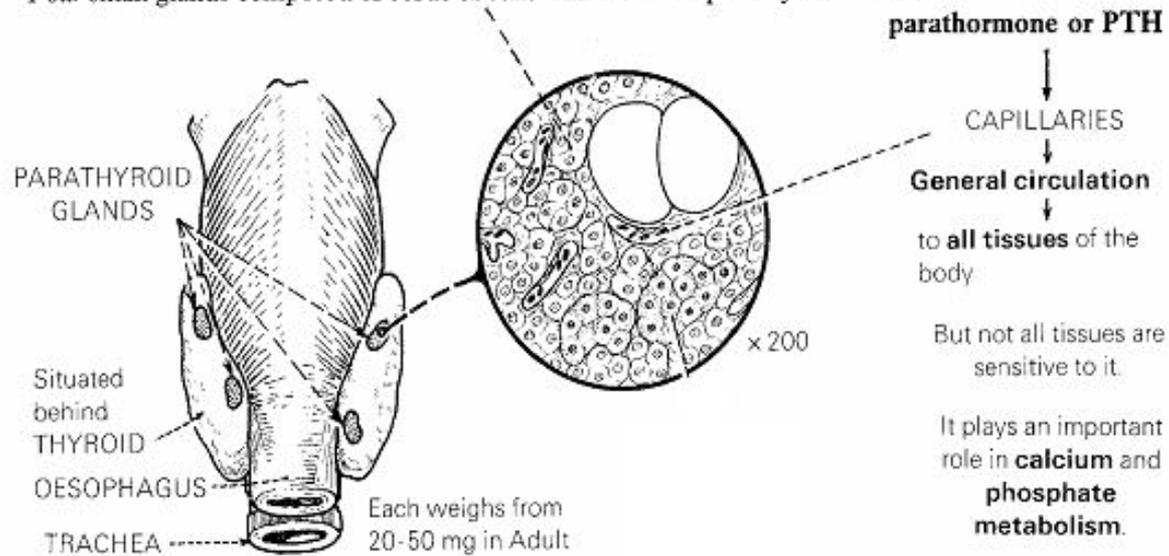
PARATHYROID GLAND HORMONES -

only 1 is released!

Parathyroid Hormone (PTH) is the only one released by the Parathyroid Gland.

- sometimes called Parathormone
- this hormone is responsible for the breakdown of bones in a simple way
- bones act as a storage site for blood calcium
- if blood calcium gets too low you lose the ability to clot blood, operate muscles and nervous tissue

Four small glands composed of cords of cells which secrete parathyroid hormone –



parathormone or PTH

↓
CAPILLARIES

↓
General circulation

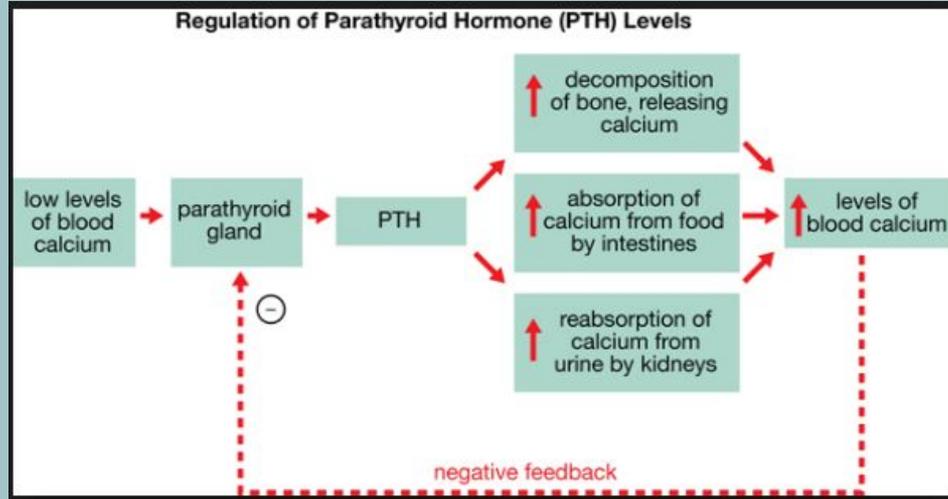
↓
to **all tissues** of the
body

But not all tissues are
sensitive to it.

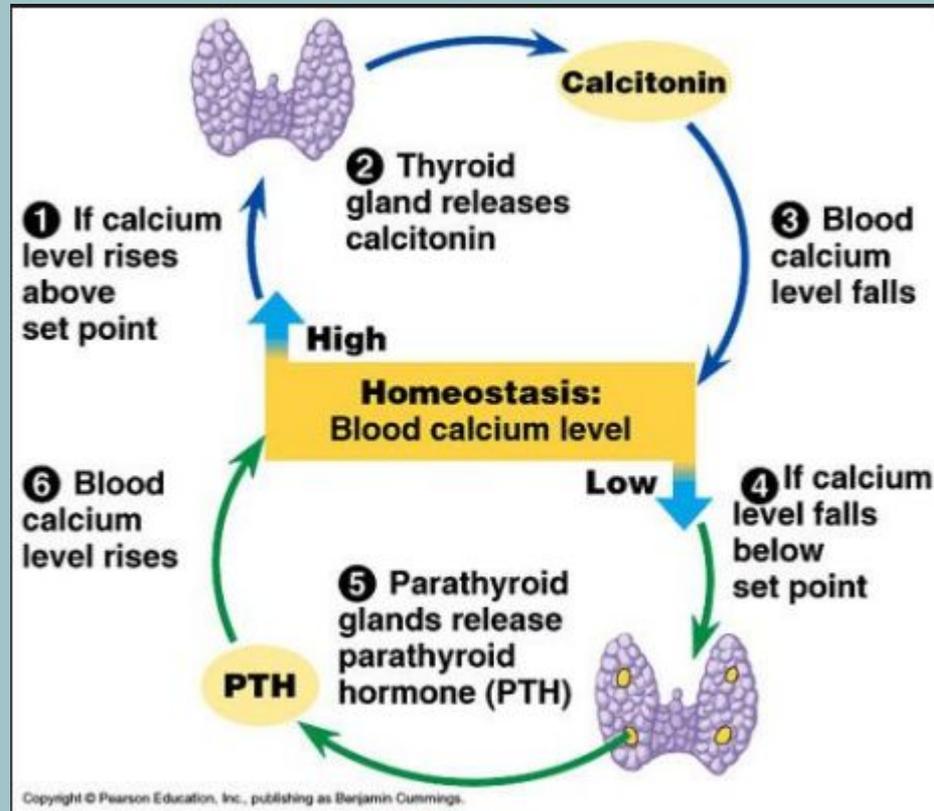
It plays an important
role in **calcium** and
phosphate
metabolism.

Normal Feedback Mechanism:

- i) blood calcium levels fall (lost through urine)
- ii) Parathyroid chemoreceptors are activated
- iii) Parathyroid releases PTH into blood
- iv) PTH reaches its target à bones
- v) Bones begin to release calcium and phosphate into the blood
- vi) Parathyroid gland senses increasing calcium and ceases PTH release



Calcitonin and parathyroid hormone are **antagonistic hormones**.



PTH Disorders:

A) *Hypo-secretion*: leads to tetany (tense-stiff muscles) and convulsions.

- treat with calcium & Vitamin D injections

B) *Hyper-secretion*: leads to soft bones & deformity, often due to a tumour.

- treat via parathyroid gland (tumour) removal

- Thyroid gland releases thyroxin and calcitonin.
- Thyroxin regulates metabolism.
- Calcitonin causes calcium to be absorbed into bones.
- Parathyroid releases parathyroid hormone.
- Parathyroid hormone regulated blood calcium levels by causing release of calcium by the bones.

Summary

- The hypothalamus controls the pituitary gland.
- The pituitary gland has two hormones, which are regulated by negative feedback mechanisms.
- The APG releases HGH along with several other hormones that target organs through out the body.
- The PPG releases ADH and oxytocin made in the hypothalamus.
- Thyroid gland secretes hormones that regulate cell metabolism, growth, and development.
- Thyroxine secretion is regulated by the release of TSH from the APG and negative feed back loop.
- The thyroid gland also produces calcitonin, which helps lower blood calcium levels.
- The parathyroid glands secrete parathyroid hormone (PTH), which raises blood calcium levels.