

Thyroid gland

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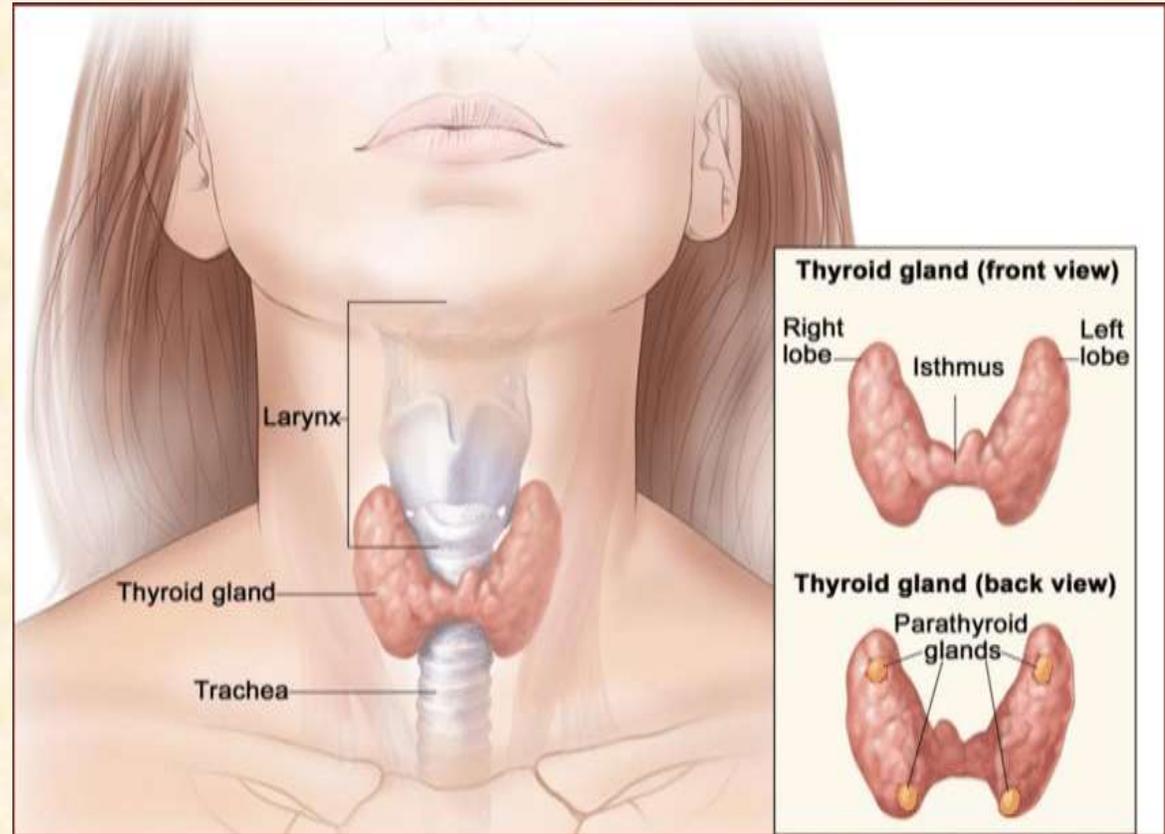
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Thyroid gland

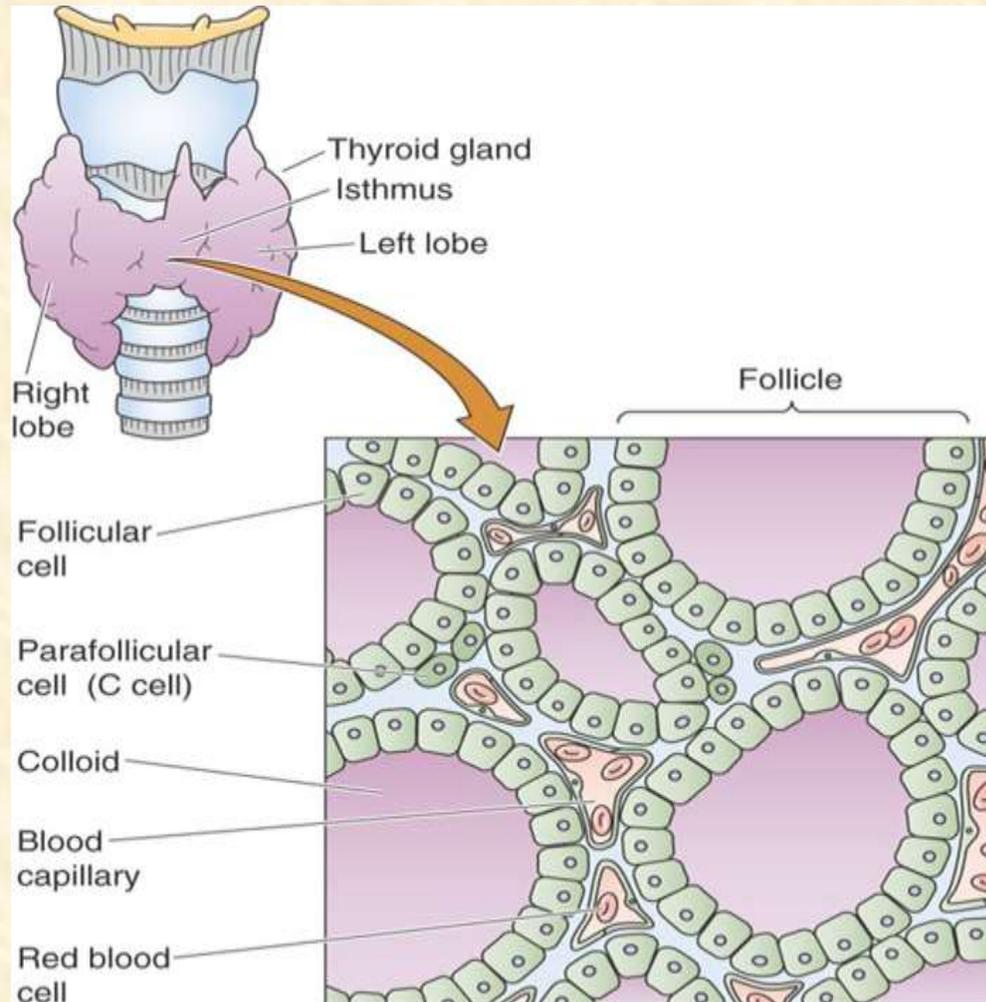
Thyroid Gland is one of the endocrine gland. Endocrine glands are ductless gland & their secretion directly pour into blood.

- **Location of thyroid glands:**

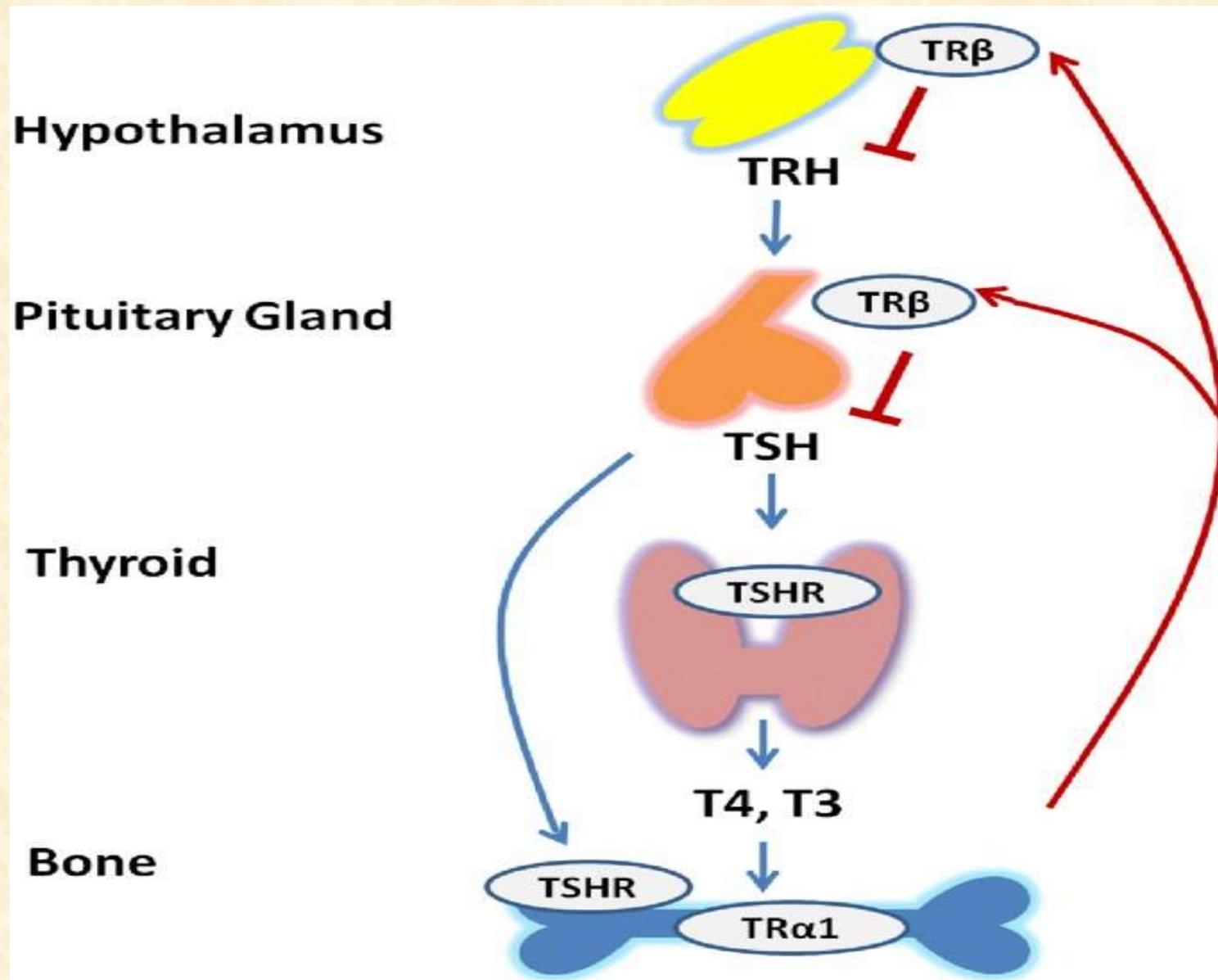
This organ is found at the front of the neck, under the voice box (larynx). It is butterfly-shaped: The two side lobes lie against and around the windpipe (trachea), and are connected at the front by a narrow strip of tissue. The thyroid weighs between 20 and 60 grams on average



Structure of Thyroid Gland

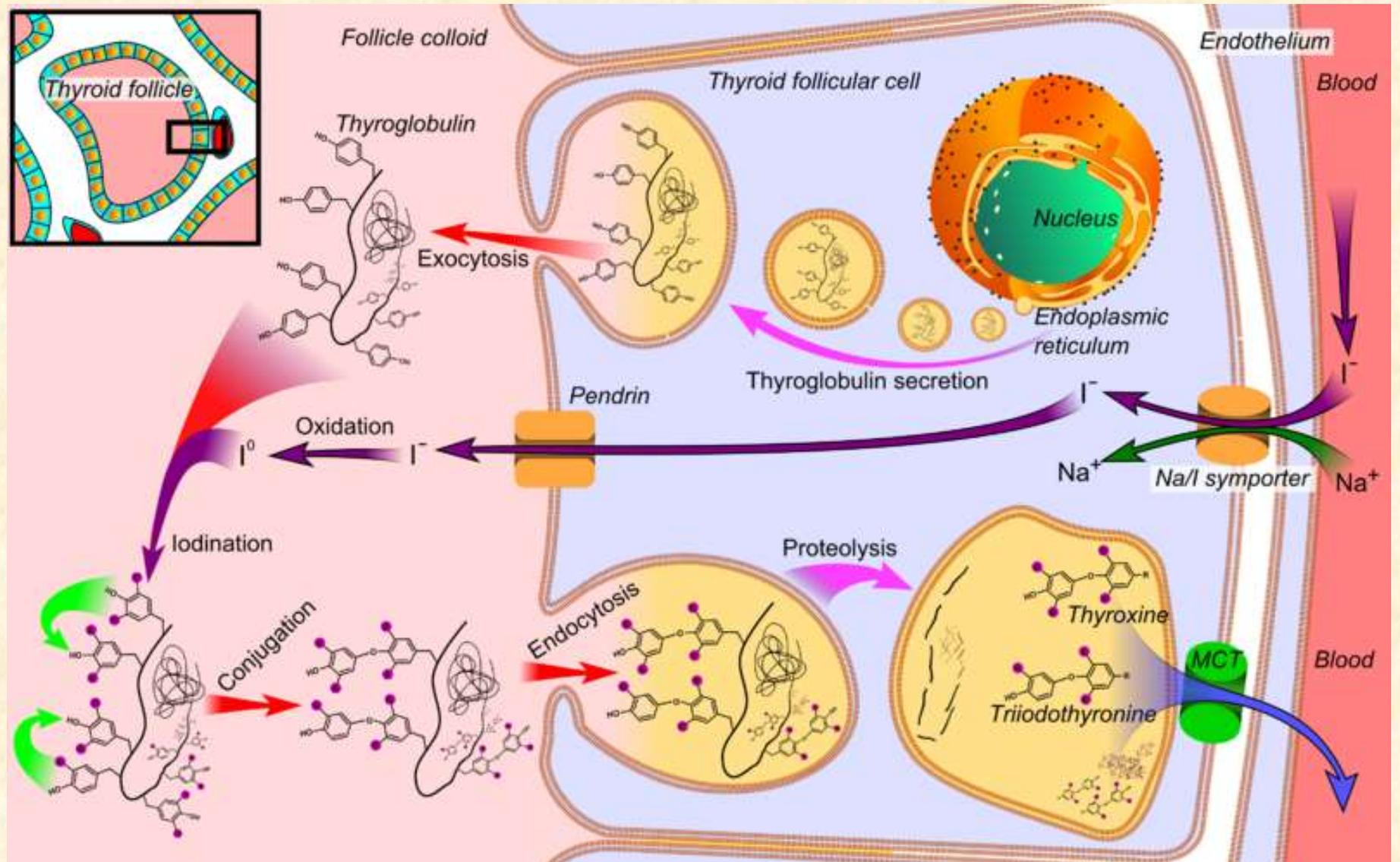


1. The lower two thirds of the lobes are connected by a thin band of tissue called the thyroid isthmus.
2. Thyroid follicular cells (also called thyroid epithelial cells or thyrocytes) are **the major cell type in the thyroid gland**, and are responsible for the production and secretion of the thyroid hormones thyroxine (T4) and triiodothyronine (T3).
3. The follicles are made up of a central cavity filled with a sticky fluid called colloid. Surrounded by a wall of epithelial follicle cells, the colloid is **the center of thyroid hormone production**



Cellular Structure

- The function of the Thyroid gland is to **produce and store thyroid hormones**.
- Thyroid epithelia form follicles filled with colloid – a protein-rich reservoir of the materials needed for thyroid hormone production.
- These follicles range in size from 0.02-0.3mm



Thyroid Hormone Synthesis

- There are six steps in the synthesis of thyroid hormone, and you can remember them using the mnemonic ATE ICE:
 1. **Active transport** of Iodide into the follicular cell via the Sodium-Iodide Symporter (NIS). This is actually secondary active transport, and the sodium gradient driving it is maintained by a Sodium-Potassium ATPase.
 2. **Thyroglobulin** (Tg), a large protein rich in Tyrosine, is formed in follicular ribosomes and placed into secretory vesicles.
 3. **Exocytosis** of Thyroglobulin into the follicle lumen, where it is stored as colloid. Thyroglobulin is the scaffold upon which thyroid hormone is synthesised.
 4. **Iodination** of the Thyroglobulin. Iodide is made reactive by the enzyme **thyroid peroxidase**. Iodide binds to the benzene ring on Tyrosine residues of Thyroglobulin, forming monoiodotyrosine (MIT) then diiodotyrosine (DIT).
 5. **Coupling** of MIT and DIT gives the Triiodothyronine (T3) hormone and coupling of DIT and DIT gives the Tetraiodothyronine (T4) hormone, also known as **Thyroxine**.
 6. **Endocytosis** of iodinated thyroglobulin back into the follicular cell. Thyroglobulin undergoes proteolysis in lysosomes to cleave the iodinated tyrosine residues from the larger protein. Free T3 or T4 is then released, and the Thyroglobulin scaffold is recycled.

Thyroid Gland Functions

- Along with thyrotropin-releasing hormone and TSH, T3 and T4 are both vital to the body's healthy function.
- These hormones control your metabolism, brain development, bone health, heart rate, digestion, and so much more.

More specifically, T4 is responsible for your mood, metabolism, and core temperature.

- while T3 is responsible for metabolic function and bone development. In a vital process called deiodination, the body converts T4 into T3, which is the biologically active form of the thyroid hormone.

Thyroid gland- hormonal disorders

- If your body is making too much TSH, this may indicate that your thyroid gland isn't making *enough* T3 or T4. When TSH is released into the bloodstream and the thyroid gland doesn't respond properly by making enough T3 or T4, the TSH floods your system.

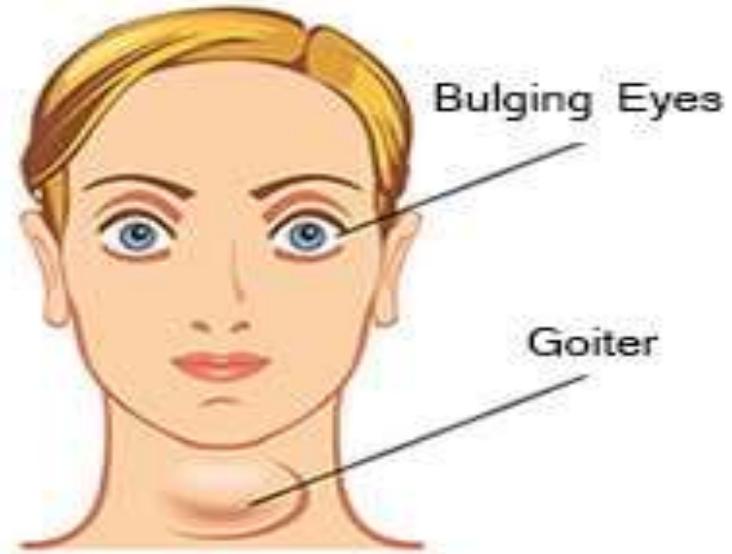
1 Hyperthyroidism (too much thyroid hormone) symptoms may include

- Rapid heart rate
- Anxiety
- Shaky hands
- Weight loss
- Hair loss
- Bulging eyes
- Sleeping issues

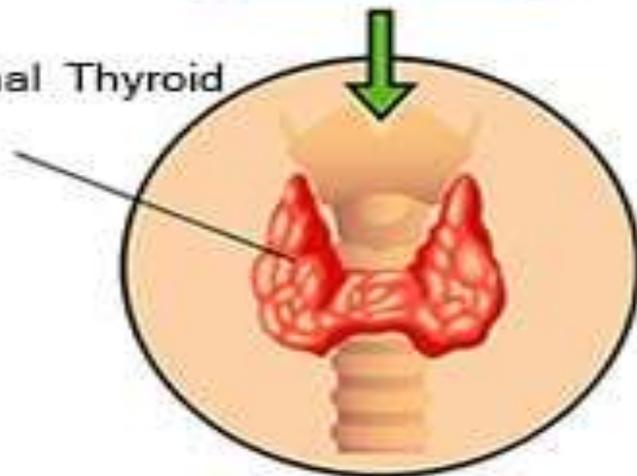
Healthy



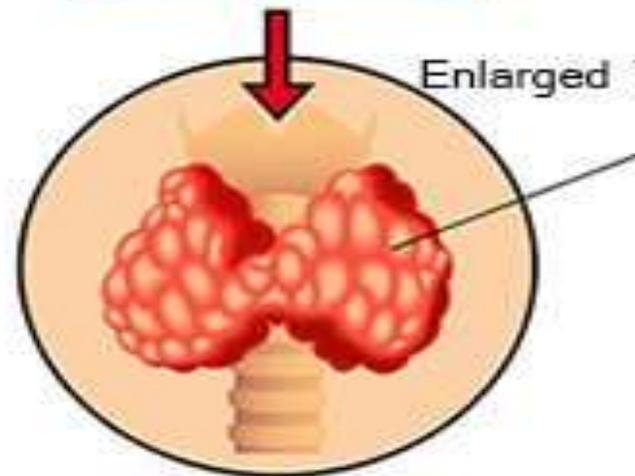
Hyperthyroidism



Normal Thyroid



Enlarged Thyroid



- If your TSH levels are far too low, this might indicate that your thyroid gland is making too much thyroid hormone. When this happens, your TSH hormone may then be suppressed.

Hypothyroidism (too little thyroid hormone) symptoms may include:

- Fatigue and sluggishness
- Weight gain
- Digestive issues, including constipation
- Hair loss
- Dry skin
- Slow heart rate

Disorder of the thyroid gland



References:

1. T.B. of Physiology-Guyton & Hall
2. T.B. of Physiology- G.N. Vankhede
3. References from Google

Thank You!