THYROID GLAND – NORMAL MORPHOLOGY AND FUNCTION

- **Thyroid gland consists of two lateral lobes connected by a thin isthmus, and a pyramidal lobe**
- **Usually located below and anterior to the larynx**
- **Thyroid is divided by thin fibrous septae into lobules composed of 20 to 40 follicles, lined by a cuboidal to low columnar epithelium and filled with PAS-positive thyroglobulin**
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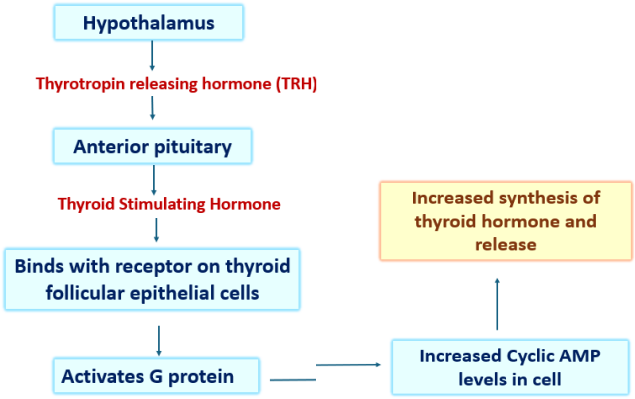

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THYROID – HORMONE SYNTHESIS

- **Iodide uptake and oxidation**
  - **Thyroid follicular cells actively transport iodide (I^-) from the blood into the follicular cell through Sodium iodide symporter (NIS)**
  - **It is influenced by TSH**
  - **Iodide is transported into colloid through a chloride iodide transporter called Pendrin**
  - **Iodide is further oxidized to iodine by the enzyme thyroid peroxidase which is attached to membrane in the presence of Hydrogen peroxide**
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- **Thyroglobulin synthesis**

- Thyroglobulin is a protein rich in tyrosine residue
- It is produced by thyroid follicular epithelial cells and is released into follicular lumen
- Colloid in the thyroid follicle contains thyroglobulin

- **Iodination of thyroglobulin**
  - Binding of iodine to tyrosine residues of thyroglobulin is catalyzed by thyroid peroxidase
  - This leads to formation of Mono iodotyrosine and di-iodotyrosine
- **Coupling reaction**
  - Iodinated thyroglobulin is then processed through coupling reactions
  - Mono iodotyrosine and Di iodotyrosine are coupled to form triiodothyronine (T3), while two di iodotyrosine molecules combine to form thyroxine (T4)
    - MIT + DIT = T3
    - DIT + DIT = T4
    - DIT + MIT =rT3
  - This step is enhanced by TPO enzyme
- **Release of thyroid hormone into circulation**
  - After coupling reaction, thyroglobulin molecule is taken up by follicular epithelial cells by a process called Endocytosis
  - Endocytic vesicle later combines with lysosomes and lysosomal enzymes are released into the vesicle causing cleavage of thyroglobulin molecule forming Tri iodothyronine and thyroxine
  - T4 is converted into T3 which is the most active form of thyroid hormones in the peripheral organs
  - T3 and T4 are transported through the bloodstream, primarily bound to thyroxine-binding globulin (TBG) and thyroxine-binding prealbumin