

Endocrine System

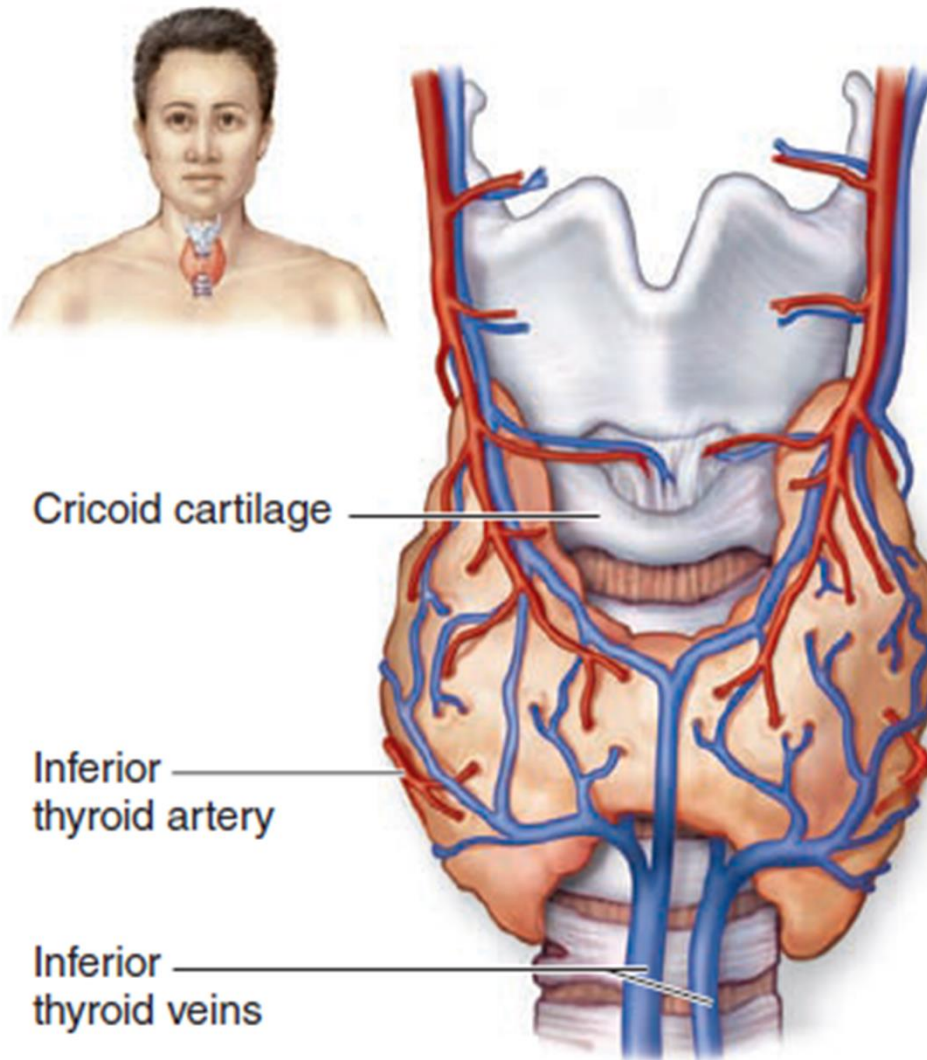
(Part 2)

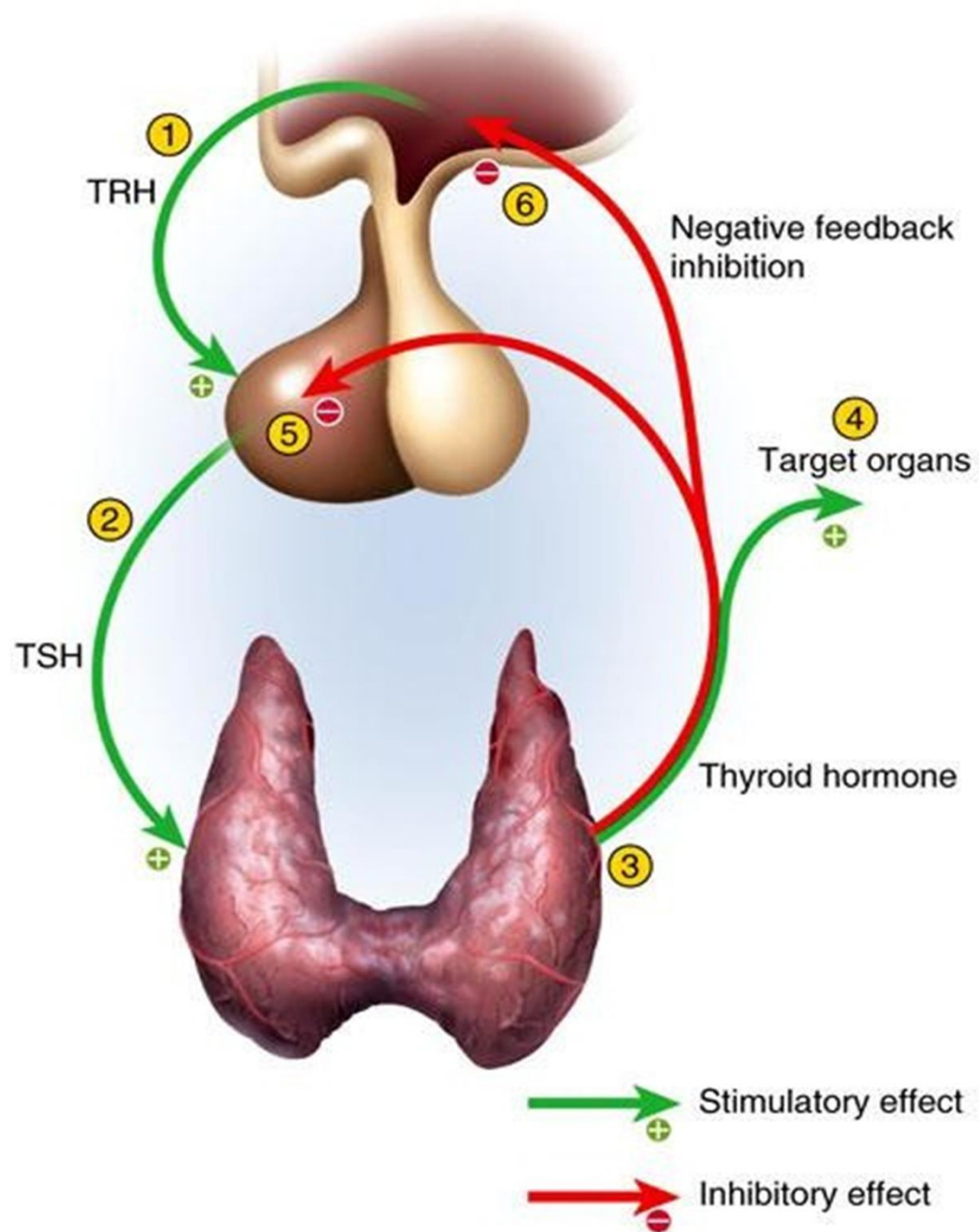
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The Thyroid Gland

- It is located in the front of the neck, anterior to the larynx and trachea.
- It releases two hormones:
 - 1. Thyroid hormone (Thyroxin)** this hormone regulates metabolism, growth and development.
 - 2. Calcitonin hormone** lower calcium level in the blood by decrease bone resorption.

Thyroid Gland



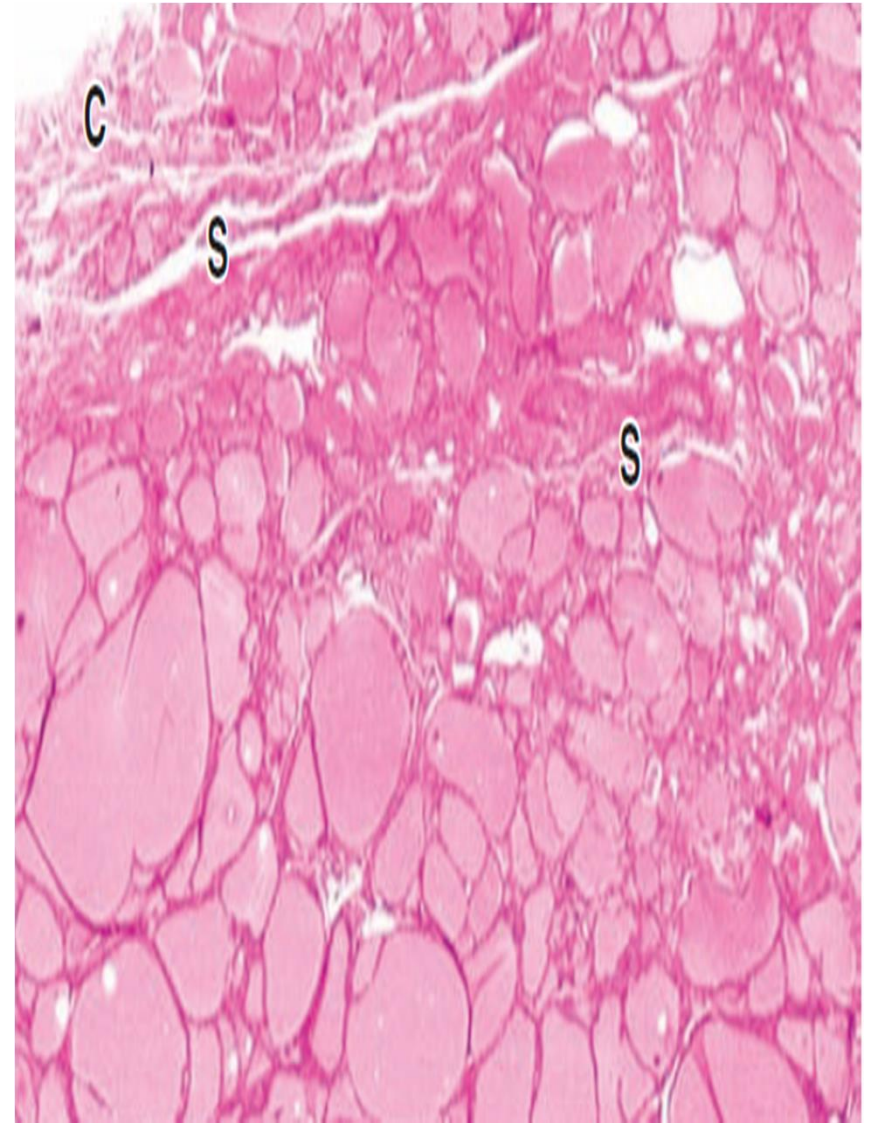


Feedback Mechanism

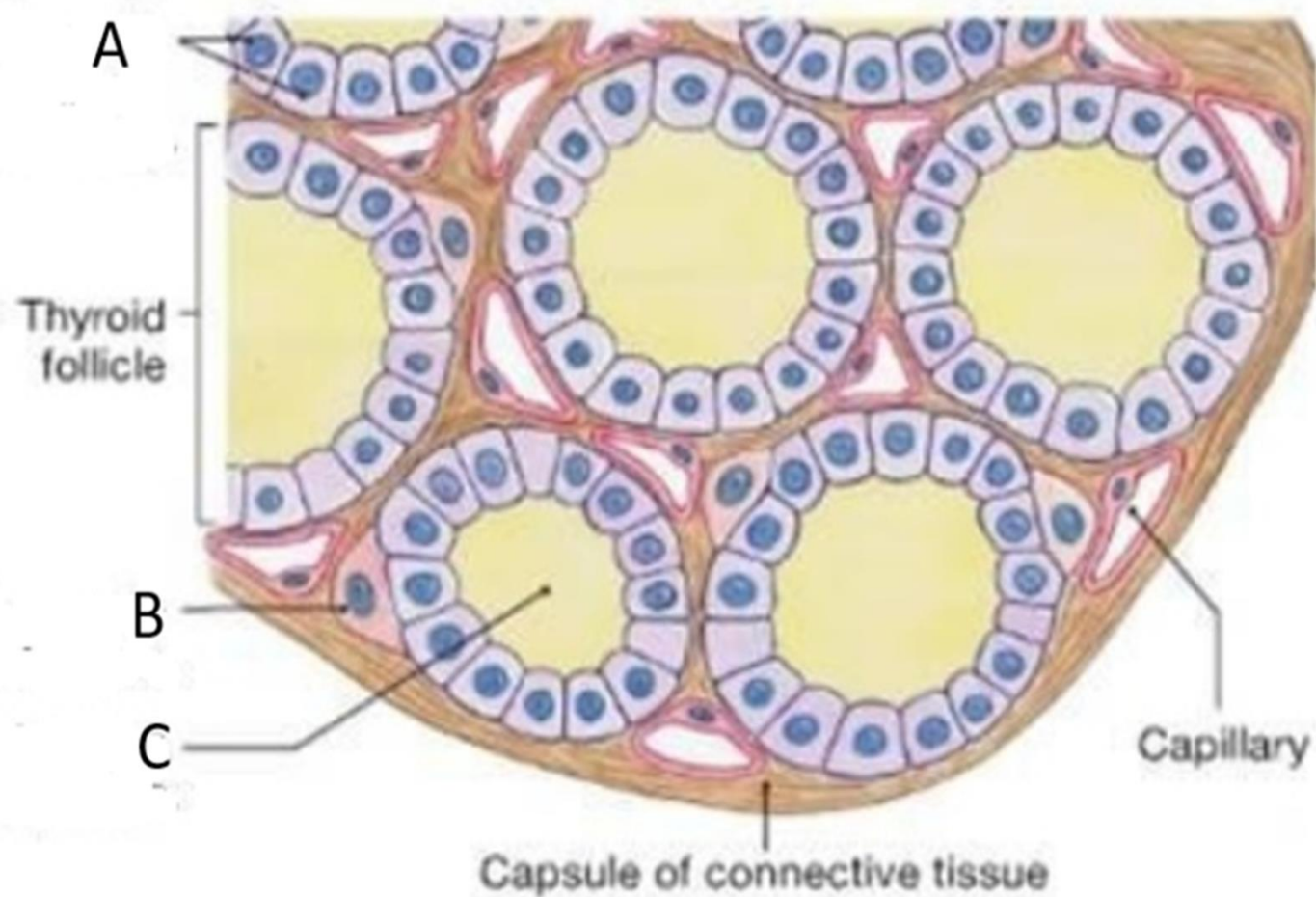
Structure of thyroid gland

1. **Stroma**

- A double capsule
- CT septa which dividing the gland into incomplete lobes and lobules
- Reticular fibers that form a network supporting the thyroid parenchyma



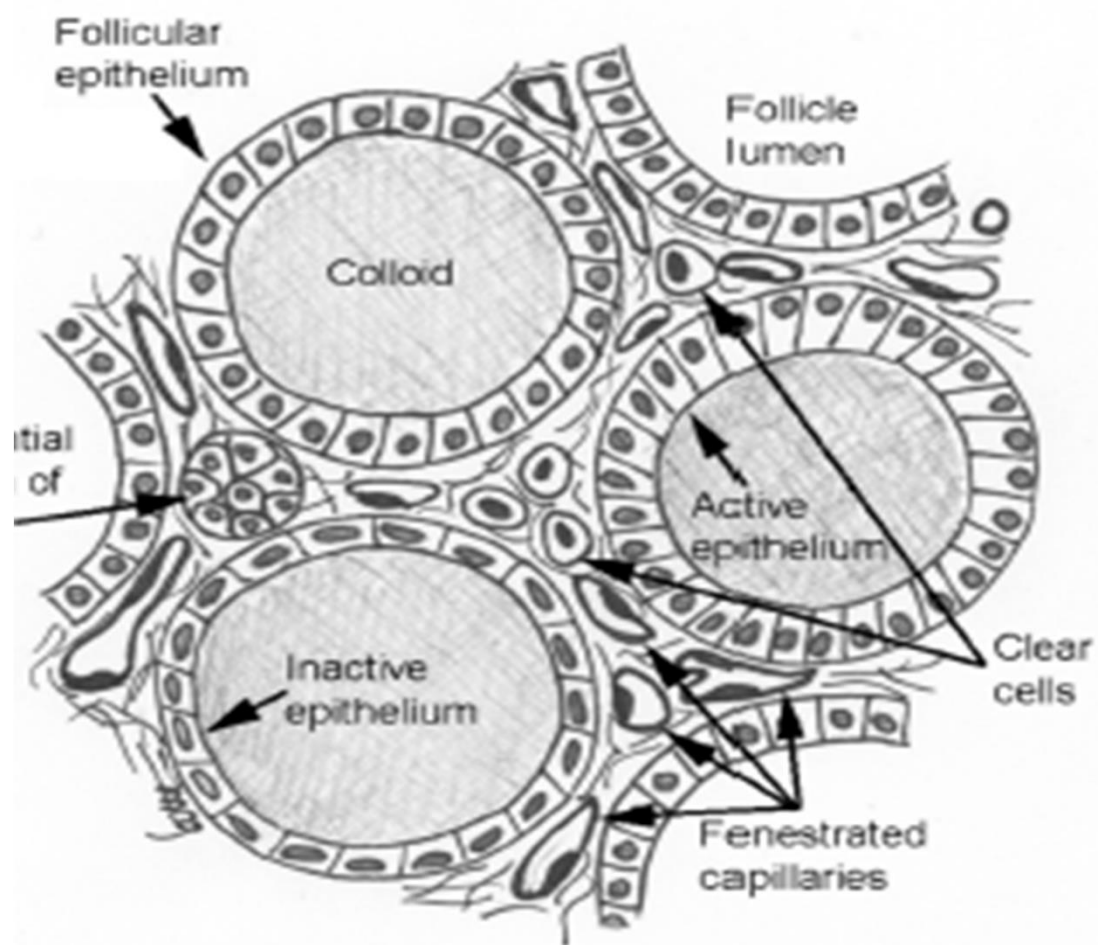
Thyroid Histology



2. **Parnechyma**

- The parenchyma of the thyroid is composed of millions of rounded epithelial structures called follicles. Each follicle consists of a simple epithelium and a central lumen filled with a gelatinous substance called colloid.

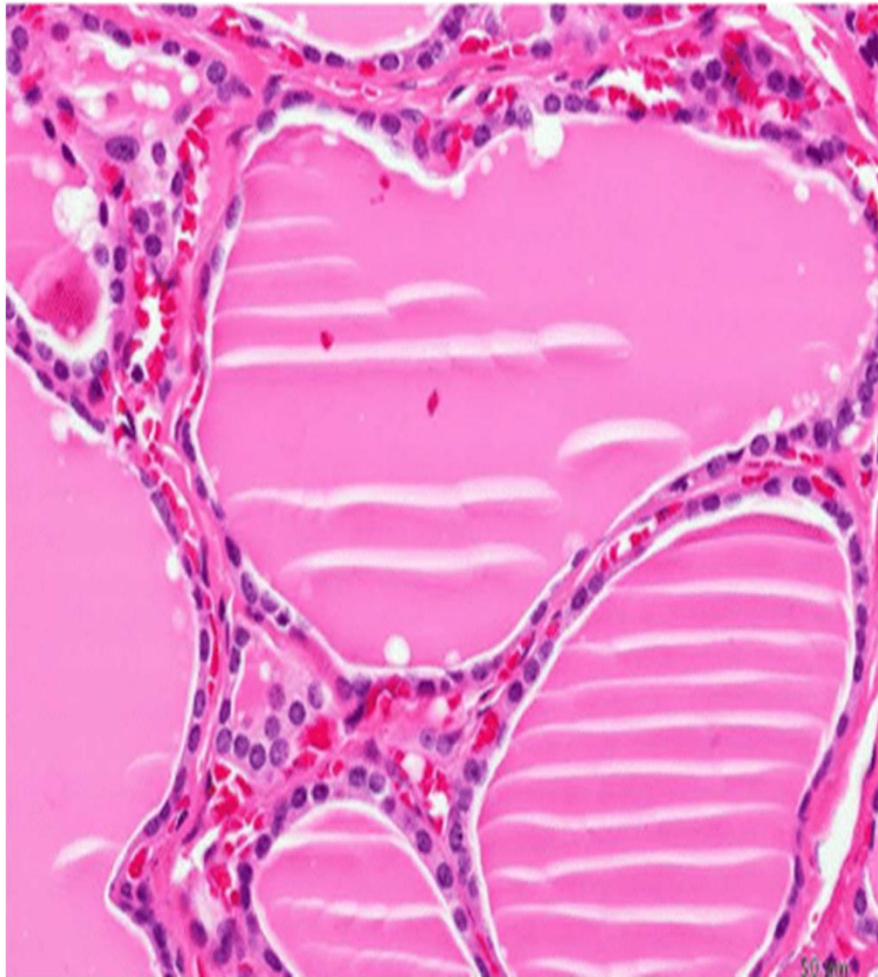
THYROID GLAND



The thyroid is the only endocrine gland in which a large quantity of secretory product is stored. In humans there is sufficient hormone in follicles to supply the body for up to three months with no additional synthesis. **Thyroid colloid contains the large glycoprotein thyroglobulin, the precursor for the active thyroid hormones.**

Follicular cells

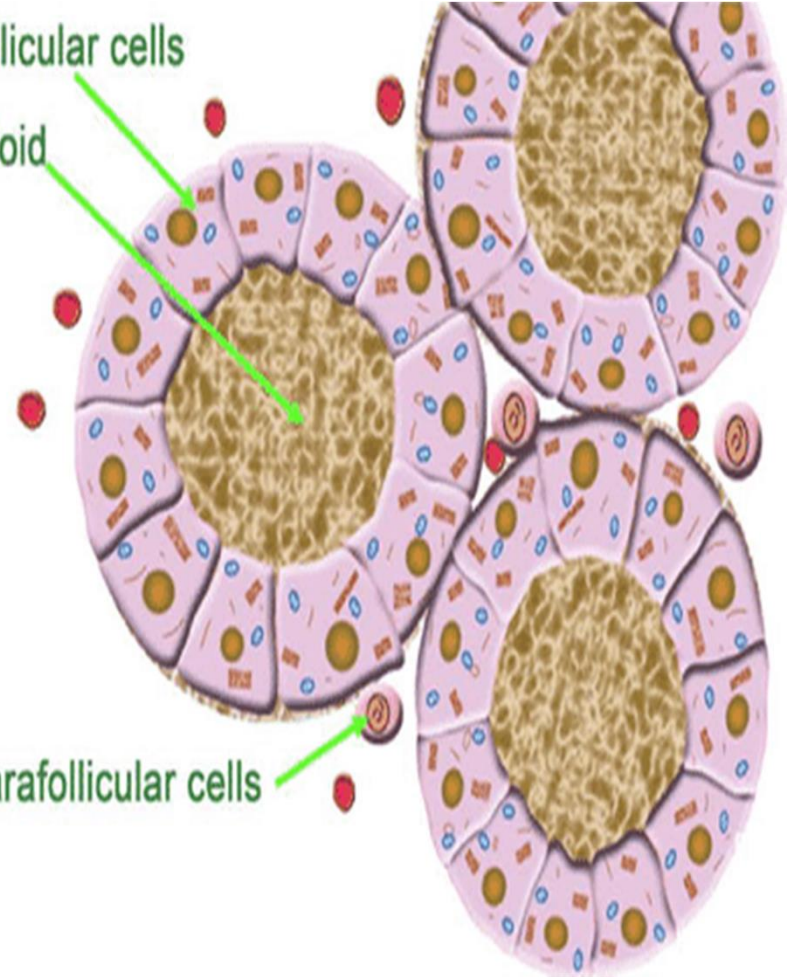
Follicular cells range in shape from squamous to low columnar. The size and cellular features of follicles vary with their functional activity. Active glands have more follicles of low columnar epithelium; glands with mostly squamous follicular cells are considered hypoactive.



Follicular cells

Colloid

Parafollicular cells



Parafollicular cells

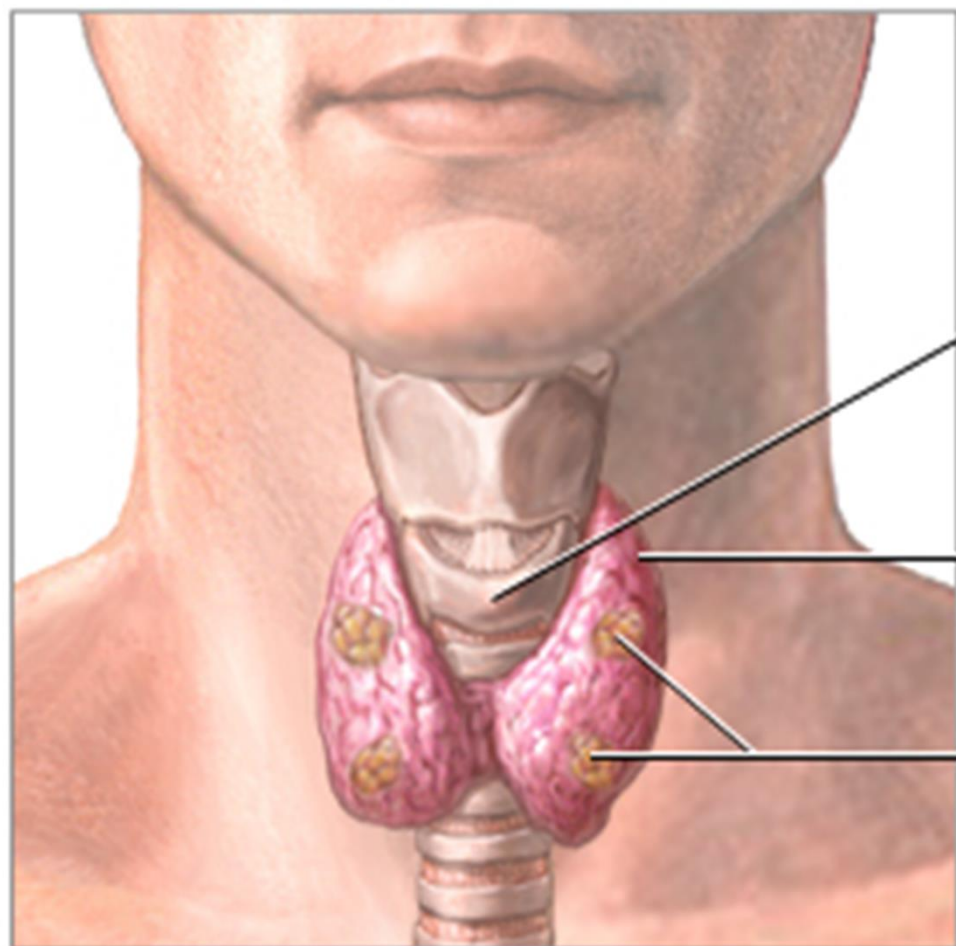
- Another endocrine cell type, the parafollicular, or clear cell (C cell), is also found inside the basal lamina of the follicular epithelium or as isolated clusters between follicles.
- Parafollicular cells are somewhat larger than follicular cells and stain less intensely. They have a smaller amount of rough ER, large Golgi complexes, and numerous small granules containing polypeptide hormone.

Parafollicular cells

These cells synthesize and secrete calcitonin, one function of which is to suppress bone resorption by osteoclasts. Calcitonin secretion is triggered by elevated blood Ca^{2+} levels

The Parathyroid glands

- The parathyroids are 4 small glands located behind thyroid gland.
- Despite their small size, these glands play a crucial role in regulating the body's calcium and phosphorus levels through the secretion of **parathyroid hormone (PTH)**.



Cricoid cartilage

Thyroid gland

Parathyroid glands

Functions of the parathyroid glands

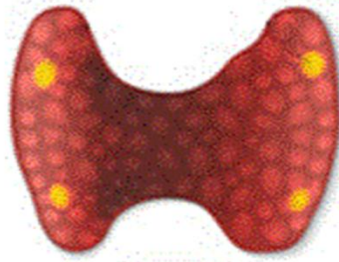
1. Calcium Regulation: The primary function of the parathyroid glands is to regulate calcium levels in the blood. When blood calcium levels drop below normal, the parathyroid glands release parathyroid hormone (PTH) into the bloodstream.

2. Bone Maintenance: PTH acts on the bones to release calcium stored in bone tissue, which helps to maintain normal levels of calcium in the blood.

3. Kidney Function: PTH also acts on the kidneys to increase the reabsorption of calcium from the urine back into the bloodstream. Additionally, PTH stimulates the kidneys to convert vitamin D into its active form, **Calcitriol**, which helps enhance the absorption of calcium from the intestines.

4. Phosphorus Regulation: In addition to regulating calcium levels, PTH helps to regulate phosphorus levels in the blood. PTH decreases phosphorus reabsorption in the kidneys, leading to increased excretion of phosphorus in the urine.

Parathyroid Glands

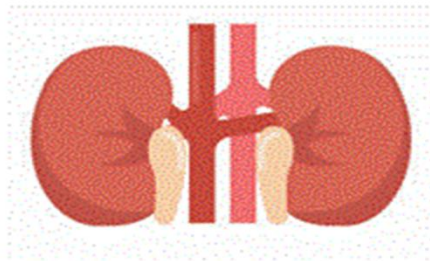


Parathyroid hormone (PTH)



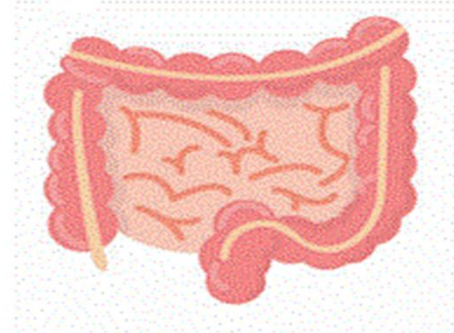
Bones

Release calcium



Kidneys

Reduce Calcium
clearance
Vitamin D activation



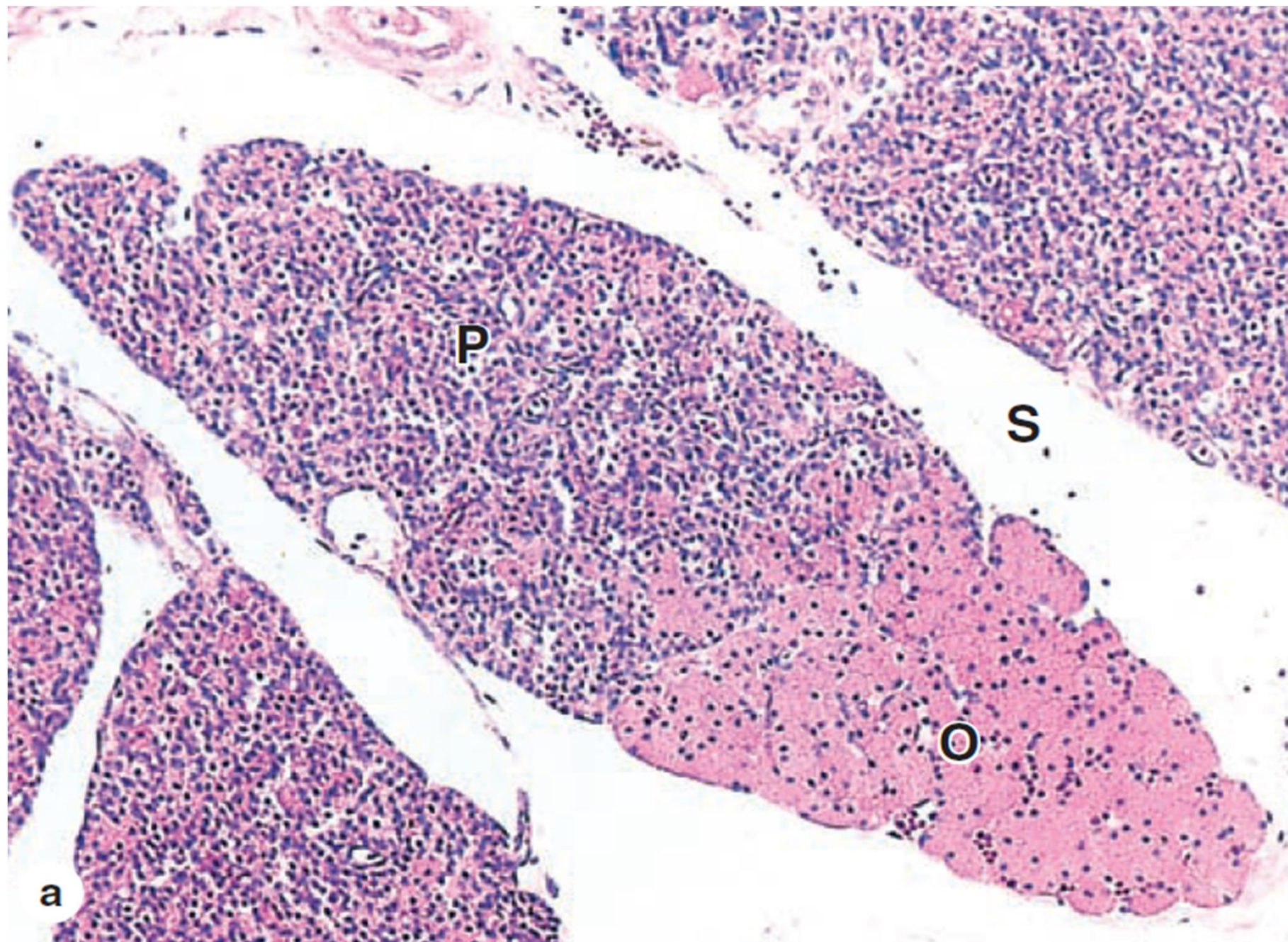
Intestines

Activated vitamin
D helps absorb
calcium in gut

Parathyroid gland histology

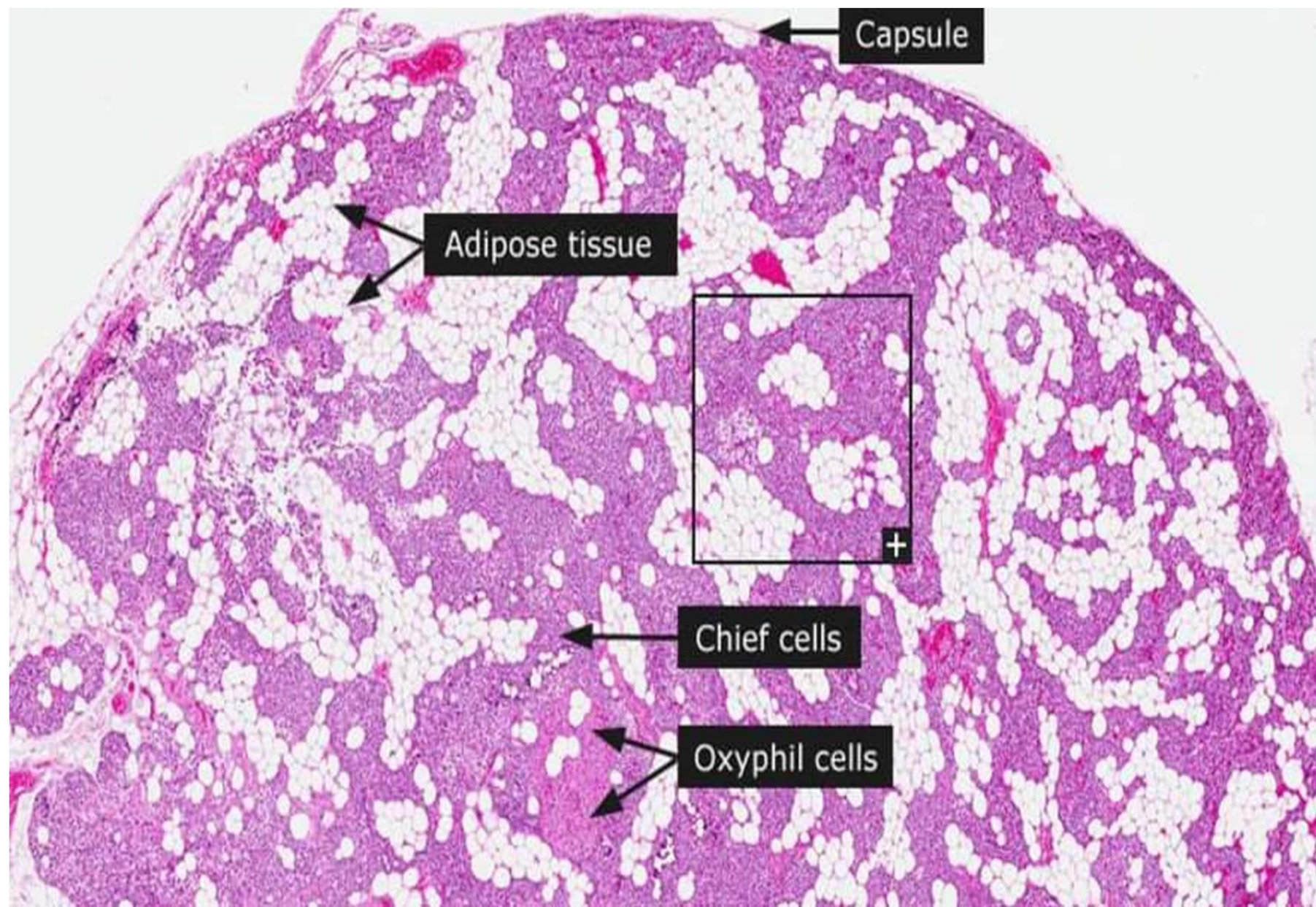
1. Stroma

- Each gland is surrounded by a thin capsule
- CT septa
- Network of reticular fibers that support the parenchyma cells



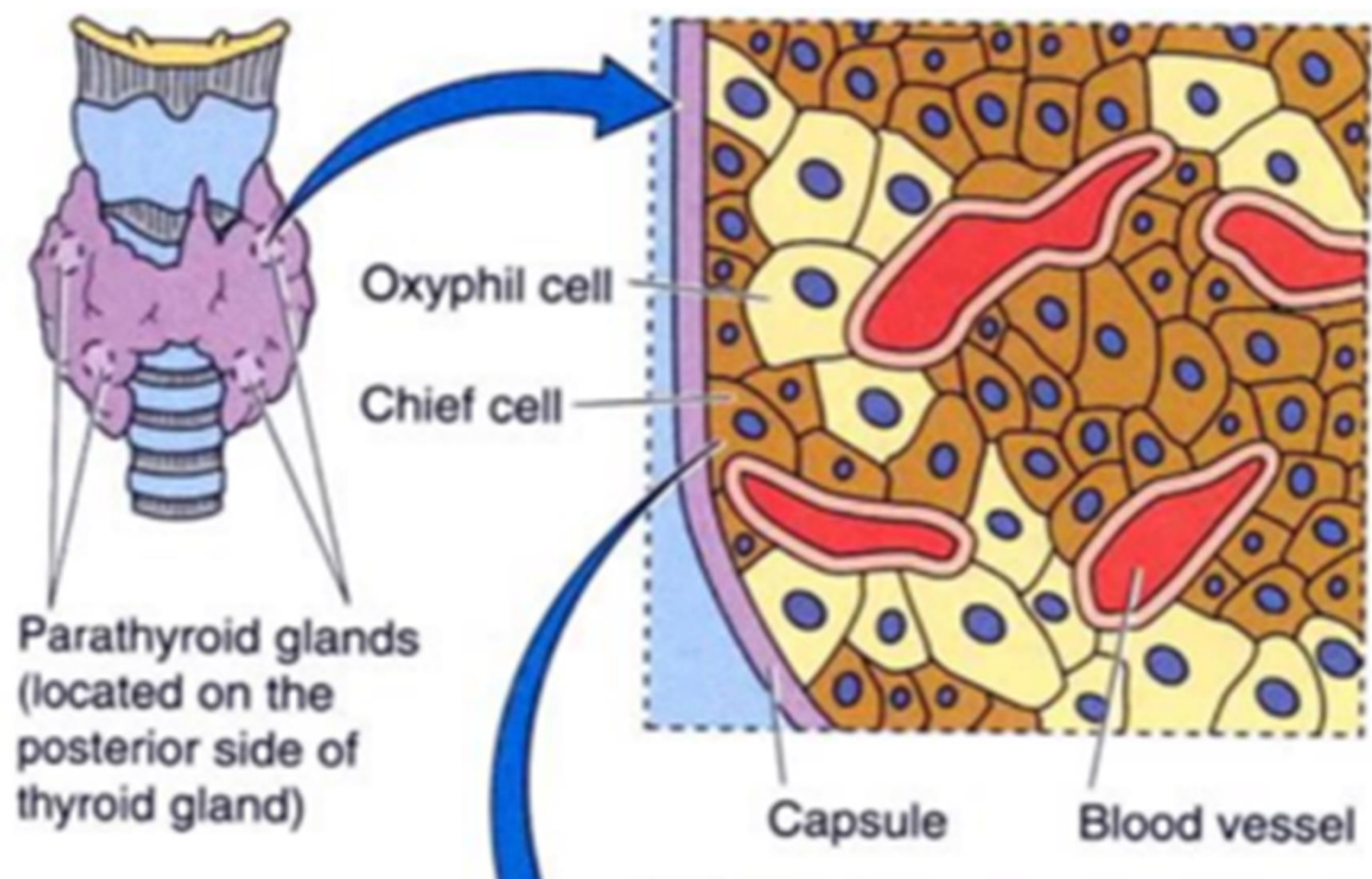
2. Parenchyma

- It consists of cords of polygonal cells surrounded by a rich network of fenestrated blood capillaries
- The cells are of two types: Chief and Oxyphil cells.



Chief cells

- Function: It secretes of parathyroid hormone
- Shape: Small polygonal cells
- Nucleus: Large nuclei
- Cytoplasm: pale due to glycogen granules and lipid droplets)
- Cytoplasm contains moderate amount of organelles (rER, Golgi complex, mitochondria and secretory granules).



Oxyphil cells

- Function: unknown
- Number: few
- Shape: large polygonal
- Nucleus: small and dense
- Cytoplasm: deep eosinophilic and contain many mitochondria

With increasing age:

- The chief cells are replaced by fat cells which may constitute more than 50% of the gland.

	Chief cell	Oxyphil cell
Size	Smaller	Larger
Number	Numerous	Few
Cytoplasm	Pale	Deep acidophilic
Nucleus	Large	Small and dense
rER	More	Less
Mitochondria	Less	Numerous
Function	PTH secretion	Unknown

Summary

Gland	Endocrine cells	Major hormones	Major functions
Thyroid glands	<ul style="list-style-type: none">• Follicular cells▪ C cells	<ul style="list-style-type: none">• Thyroid hormones▪ Calcitonin	<ul style="list-style-type: none">• Increase metabolic rate▪ Lowers blood Ca^{2+} levels by inhibiting osteoclast activity
Parathyroid glands	Chief cells	Parathyroid hormone (PTH)	Raises blood Ca^{2+} levels by stimulating osteoclast activity

Thank You