

Histology of endocrine system

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Endocrine system

It includes:

1. Glands, e.g. pituitary, suprarenal, thyroid, parathyroid glands and pineal body
2. Masses of cells, e.g. endocrine part of pancreas, testis, ovary, thymus
3. Cells scattered all over the body, e.g. APUD cells.
 - They have no ducts but fenestrated capillaries or blood sinusoids to carry the hormones directly to the blood.



Thyroid Gland

Large endocrine gland in the front the neck formed 2 lobes connected by an isthmus.

I. STROMA:

A. Capsule: 2 capsules

Outer false capsule of pretracheal fascia.

Inner true capsule: C.T. cells & fibers, firmly adherent to the gland.

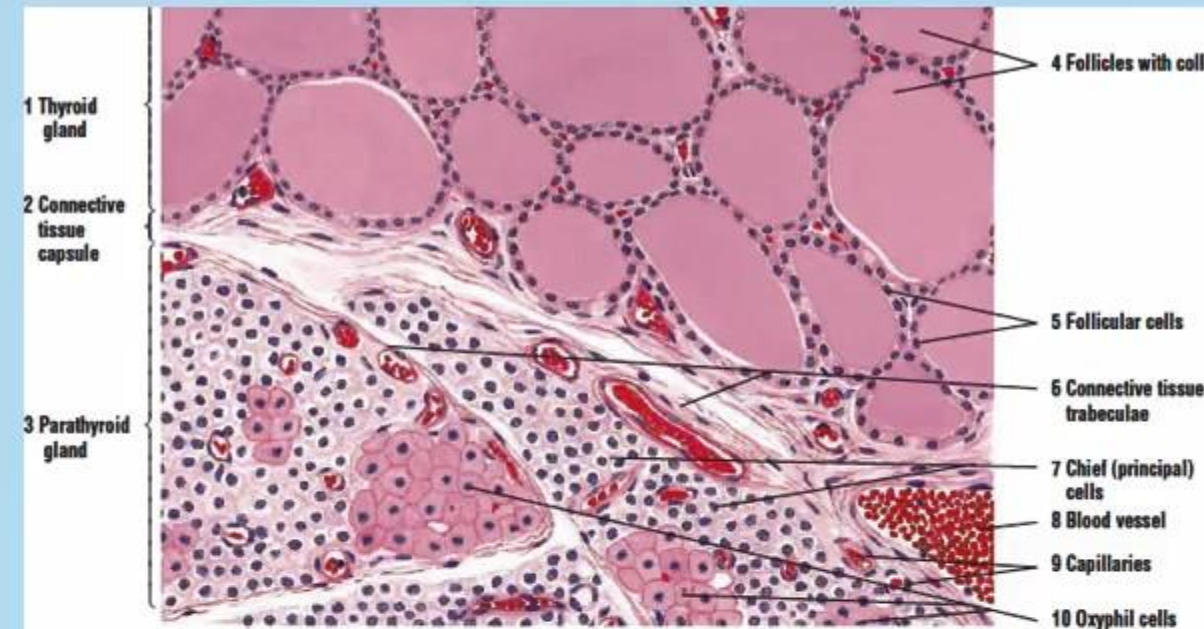
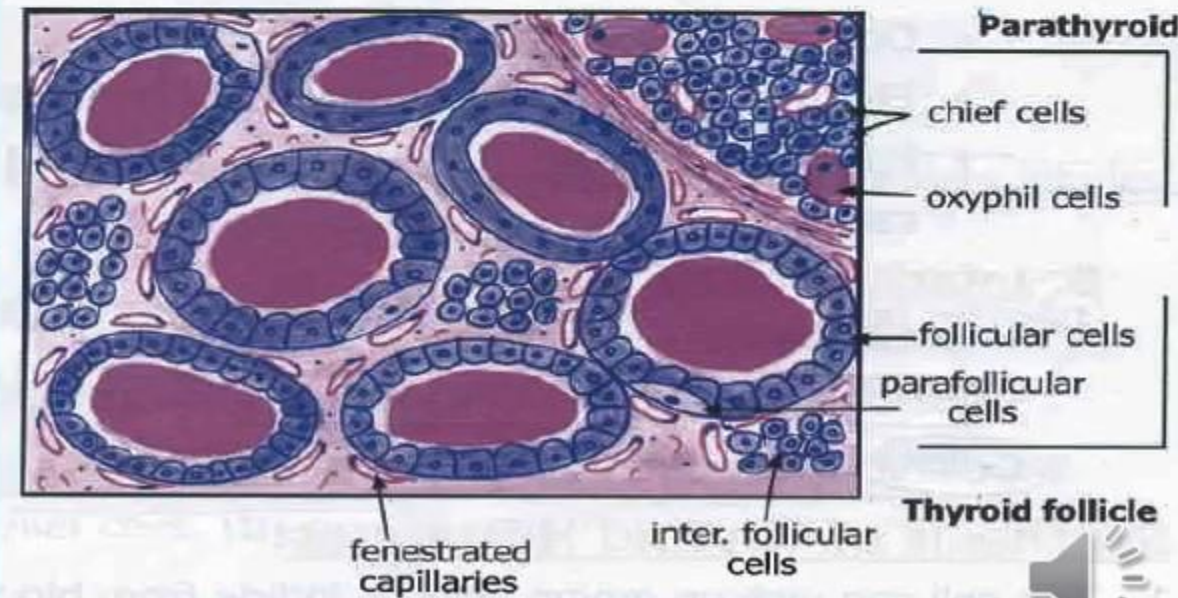


FIGURE 17.8 ■ Thyroid and parathyroid glands: canine (sectional view). Stain: hematoxylin and eosin. Low magnification.



Thyroid and parathyroid glands.

B. Trabeculae: C.T. cell & fibers, thin, divide the gland into lobes & lobules, carry blood vessels,

C. Reticular C.T.: reticular cells & fibers in the background, stained with silver.

II. PARENCHYMA

A. Thyroid Follicles:

- The structural & functional units of the gland.*
- Rounded or oval in shape, surrounded by fenestrated blood capillaries*
- Lined with cubical epithelium, resting on thin basement membrane & surrounding a lumen filled with acidophilic colloid material (iodinated glycoprotein).*

Lined with 2 types of cells:



1. Follicular cells (98%) (endodermal):

LM: Cuboidal cells with basophilic cytoplasm & central rounded nuclei. In hyperthyroidism, the cells become Columnar & in hypothyroidism, the cells become flat squamous cells.

EM: The apex of cells show short microvilli & adjacent cells joined by tight junction.

Have mitochondria, rER, supranuclear Golgi apparatus, ribosomes, apical secretory vesicles & lysosomes.

Function: secrete thyroid hormones (T3 & T4) under control of TSH.

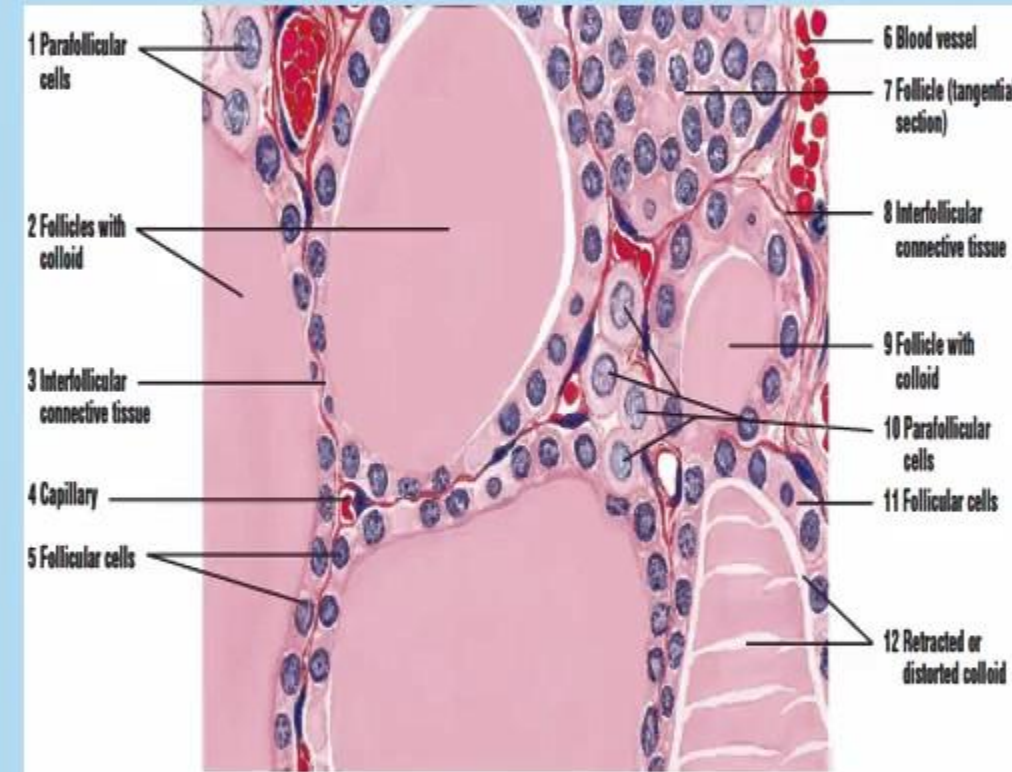


FIGURE 17.7 ■ Thyroid gland follicles, follicular cells, and parafollicular cells (sectional view). Stain: hematoxylin and eosin. High magnification.



2. Parafollicular (C-cells).(2%):

- *Larger cells with paler cytoplasm, so called clear cells (stained with Ag)*
- *Present between the basement membrane and follicular cells*
- *Do not reach the lumen of the follicle.*
- *EM: have mitochondria, rER, Golgi apparatus & basal secretory granules.*
- *Function: secrete thyrocalcitonin (belong to APUD cells) decrease blood calcium.*

B. Interfollicular Tissue

In-between thyroid follicles.

Reticular CT interfollicular cells(tangential cut follicles), occasional C-cells & fenestrated blood capillaries.



Synthesis of Thyroid Hormones:

1. The cell can pick up amino acids & iodide from blood.
 2. Synthesis of protein in rER.
 3. Addition of carbohydrate in Golgi Apparatus ———→ glycoprotein which is packed into secretory vesicles which travel to the apex.
- 3 Glycoprotein
4. Exocytosis of glycoprotein in the secretory vesicles into the lumen.
 5. Iodide (picked from blood) is Oxidized by peroxidase into iodine which is liberated into lumen.
 6. Extracellular iodination of glycoprotein ———→ iodinated thyrogloblin stored as colloid.
 7. Pinocytosis of colloid ———→ pinocytic vesicles.
 8. Pinocytic vesicles fuse with lysosomes & the hydrolytic enzymes hydrolyze colloid into T3 & T4 which are released into blood



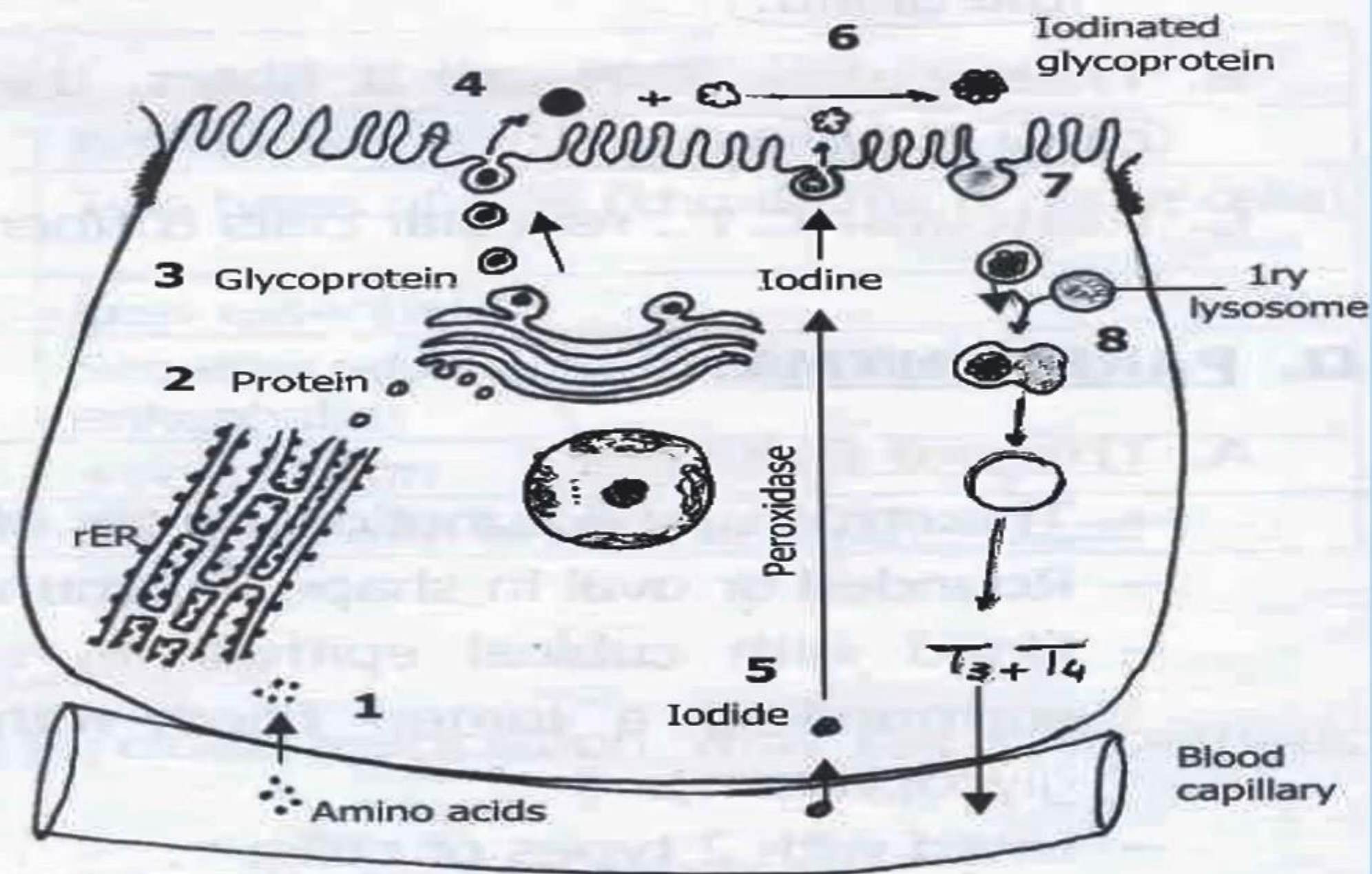


Diagram showing synthesis, storage & release of thyroid hormones.



Parathyroid Glands

Four small endocrine glands at the back of the thyroid gland.

I. STROMA:

A. Capsule: C.T. cells & fibers, thin.

B. Trabeculae: C.T. cells & fibers, thin, divide the gland into incomplete lobules, carry blood vessels.

C. Reticular C.T.: reticular cells & fibers, in the background, stained with Ag.

II. PARENCHYMA:

Cells arranged in anastomosing cords separated by fenestrated capillaries.

- Two types of cells: (a) chief cells, (b) oxyphil cells.

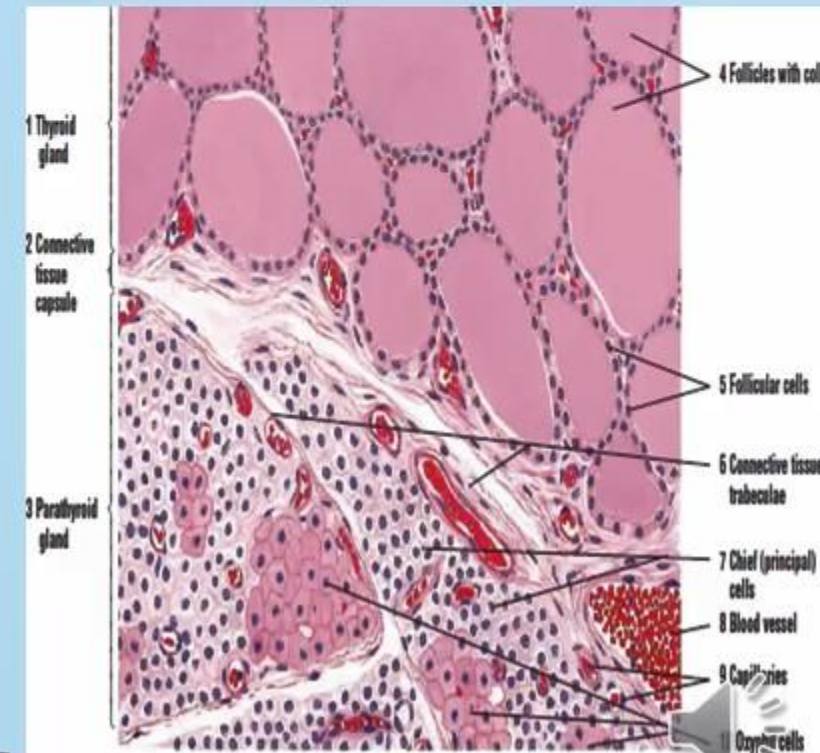


FIGURE 17.8 ■ Thyroid and parathyroid glands: canine (sectional view). Stain: hematoxylin and eosin. Low magnification.

Chief cell	Oxyphil cell
More numerous & small	Less numerous but larger number increase with age
Polygonal cell with central rounded nuclei	Oval or rounded cell with eccentric nuclei
Have basophilic cytoplasm and vesicular nucleus	Deeply acidophilic cytoplasm and dark nucleus
Fine secretory granules	Acidophilic granules
E.M: rich in mitochondria , rER , Golgi apparatus & secretory granules	E.M: mitochondria
FUNCTION:secrete parathyroid hormone (parathormone) increase blood calcium	Function not yet known



Pineal Body(Epiphysis Cerebri)

Cone-shaped neuroendocrine gland derived from neuroectoderm.

Attached to third ventricle by pineal stalk.

Covered with pia mater from which septa containing blood vessels & unmyelinated nerve fibers arise to divide the gland into incomplete lobules.

Formed of:

1. Pinealocytes

- Large branched cells with long tortuous processes which end by dilatations on blood capillaries in the vascular septa.*
- Have large pale nucleus with clear nucleolus.*



- *Have basophilic cytoplasm rich in mitochondria, Golgi apparatus, rER & secretory granules.*
- *Innervated by unmyelinated nerve fibers, some form synapse with the pinealocytes. Synaptic vesicles containing noradrenalin are seen in these nerve endings.*

Function: *secrete:*

1. Serotonin (at day time).

2. Melatonin (at night):

- *Regulates gonadal function preventing precocious puberty.*
- *Regulates sleep rhythm.*
- *Antioxidant (protection of body cells).*



2. Astrocytes:(neuroglial supporting cells between pinealocytes with darker nuclei & long processes and many intermediate filaments.

3. Fenestrated blood capillaries.

4. Brain sand (psammoma bodies, corpora aranacea): calcified concretions (calcified secretory products in concentric layers) which increase with age (landmark in X-ray to localize any mass in the brain which may displace its position).



APUD Cells (DNES)

- *Amine Precursor Uptake & Decarboxylation cells.*
- *Most of them can take up amine precursors & have amino acid decarboxylase activity.*
- *Can be stained with Ag, so called argentaffin cells.*
- *Derived from neuroectoderm, so also called diffuse neuroendocrine system (DNES).*
- *Considered as highly modified neurons.*
- *Their secretions act as hormones or neurotransmitters..*
- *EM: They have ribosomes, rER, basal secretory granules or synaptic vesicles.*



Sites:

1. Respiratory tract: between cells of respiratory epithelium & secrete serotonin, calcitonin, catecholamines & enkephalins.

2. GIT: stomach, intestine, pancreatic duct & common bile duct. They are called enteroendocrine cells and include:

- G-cell gastrin.*
- A-cells - glucagon.*
- E cells endorphin*
- D-cells Somatostatin.*
- EC-cells serotonin.*
- K-cells antgastrin (gastrin-inhibitory peptide, GIP).*
- S-cells secretin.*
- MO-cells motilin.*
- I-cells cholecystokinin-pancreozymin.*
- N-cells neurotensin.*



3. *Pancreas: islets of Langerhans.*
4. *Suprarenal medulla: chromaffin cells - catecholamines,*
5. *Thyroid gland: C-cells - calcitonin.*
6. *Pituitary gland: corticotrophs - ACTH & MSH.*
7. *Hypothalamus: neurosecretory cells.*
8. *Kidney: juxtaglomerular cells → renin.*
9. *Prostate: PEP cells (prostatic endocrine paracrine cells) serotonin.*
10. *Skin: Merkle's cells*

