

ANATOMY OF ENDOCRINE SYSTEM

Parathyroid gland and Adrenal gland

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PARATHYROID GLAND

I. Gross Anatomy The parathyroid gland is difficult to see at the gross level. It is very close to and usually embedded within the capsule of the thyroid gland.

II. Histology

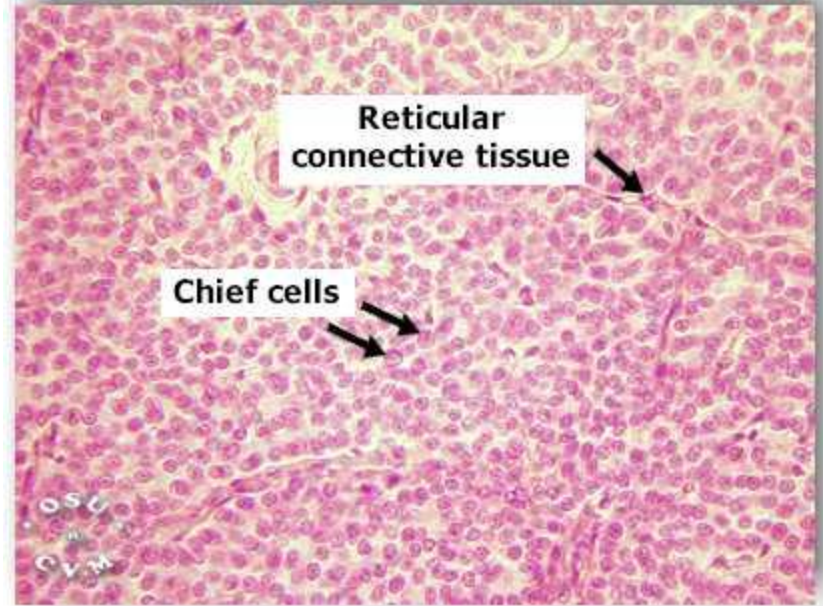
There are three types of cells in the parathyroid gland: **adipocytes**, **chief cells** and **oxyphil cells**.

A reticular connective tissue framework surrounds and supports these cells.

The main secretory cell is the **chief cell**. These cells secrete parathyroid hormone. Unfortunately these cells have no distinguishing features.

Another cell type present is the oxyphilic cell which occur in the human, ox and horse. These are large cells that contain numerous mitochondria. Their function is unknown.





Function

The parathyroid gland secretes parathyroid hormone which is essential for regulating the levels of calcium and phosphate in the blood. Parathyroid hormone acts on the following target organs.

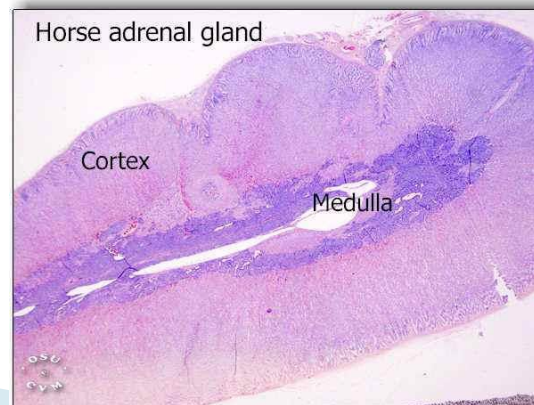
Bone: increases blood calcium by inhibiting osteoblast deposition of calcium and stimulating osteoclast removal of calcium.

Kidney: increases blood calcium by increasing calcium ion reabsorption by kidney tubular cells; inhibits reabsorption of phosphate ion from the glomerular filtrate

Small intestine: increases the absorption of calcium from the small intestine

ADRENAL GLAND

I. Gross Anatomy The adrenal glands are located at the cranial end of the kidneys. They are flat organs embedded in fat. Each gland has an outer cortex that appears yellow in fresh tissue and an inner medulla that appears gray in fresh tissue.



The adrenal gland is surrounded on the surface by a connective tissue capsule. This capsule has projections into the cortex and through the cortex down into the medulla in some species.

- In most species 4 cortical zones can be identified. From the zone nearest the capsule these are: **Zona glomerulosa**

- In ruminants this zone consists of cells in clusters.

- In carnivores, horses and pigs this zone consists of columnar cells in arches and is sometimes called a zona arcuata.

- **Zona intermedia:** This zone is relatively thin and contains mostly undifferentiated cells.

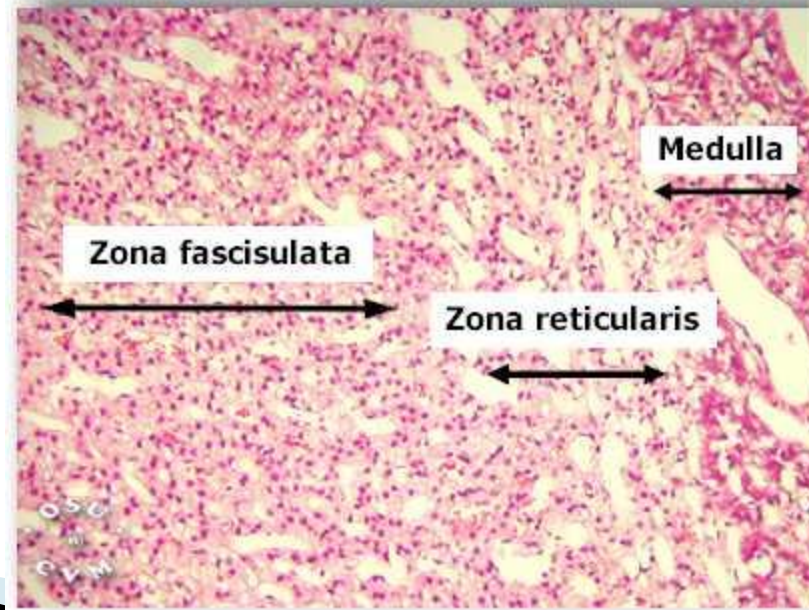
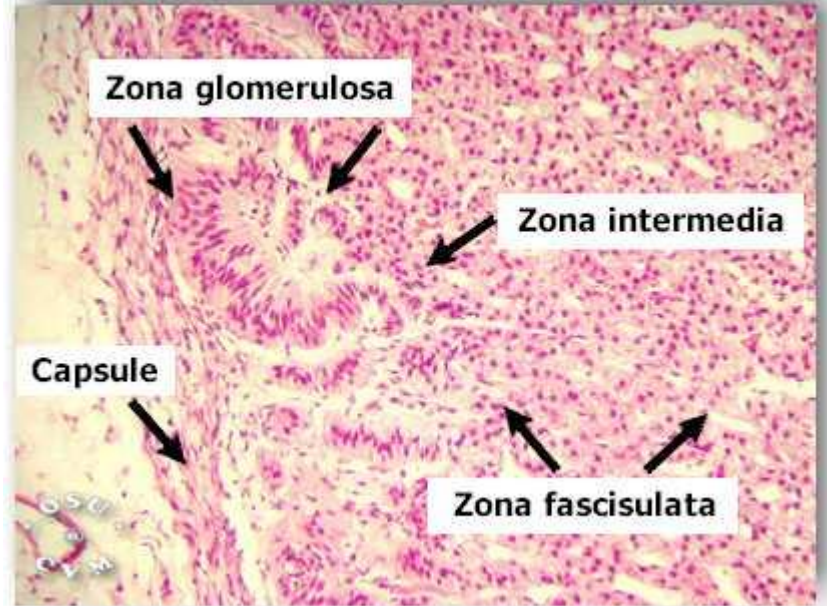
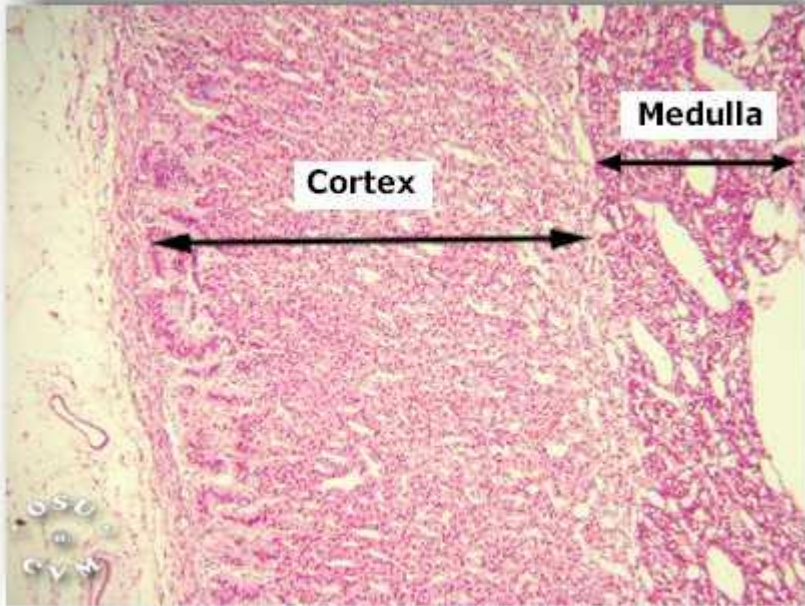
- **Zona fasciculata** This is the largest zone containing large, round, foamy-appearing cells arranged in cords that radiate from the zona glomerulosa down toward the medulla.

- Sinusoidal capillaries are located between cords of cells that are one cell thick.

- Cells in the zona fasciculata have a foamy appearance due to the presence of many lipid droplets prior to processing for microscopy. These lipid droplets represent the precursors for steroid hormones.

- **Zona reticularis**

- Cells of the zona reticularis are arranged in a network of cords no longer arranged in parallel as in the zona fasciculata.



Function of the Adrenal Cortex

Zona glomerulosa cells secrete mineralocorticoids (principal one is aldosterone). These steroid hormones act on the kidney to:

- Increase Na^+ reabsorption

- Increase K^+ secretion

Zona fasciculata and reticularis cells secrete glucocorticoids (e.g., cortisol, cortisone, corticosterone) which control glucose metabolism.

Adrenal Medulla:—Cells in the medulla are arranged in groups or cords, clustered around capillaries and venules.

The cells have secretory granules which contain either epinephrine or norepinephrine.

When fixed in potassium bichromate, the medullary cells become brown. Therefore, they are called *chromaffin cells*. The color is the result of a reaction between chromate and epinephrine or norepinephrine. With the typical H&E stain, the cells appear as shown in the adjacent figure as somewhat stellate-shaped cells containing a rather prominent, round nucleus.

Chromaffin cells are derived from neural crest cells. They are innervated by preganglionic sympathetic fibers. They release hormone by exocytosis when stimulated by those fibers.

