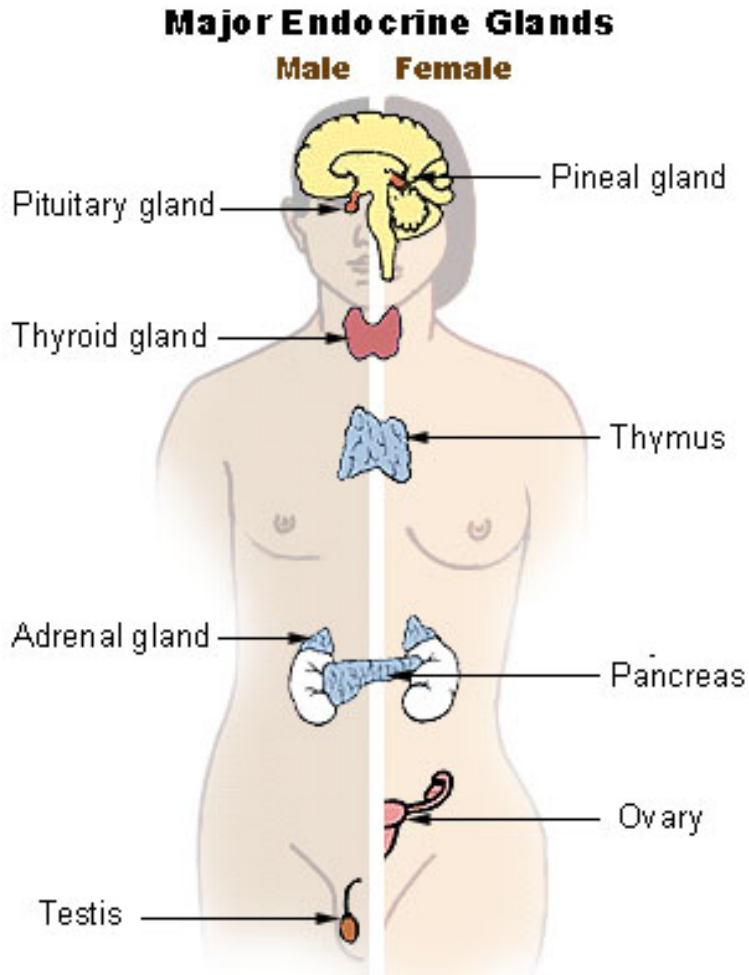
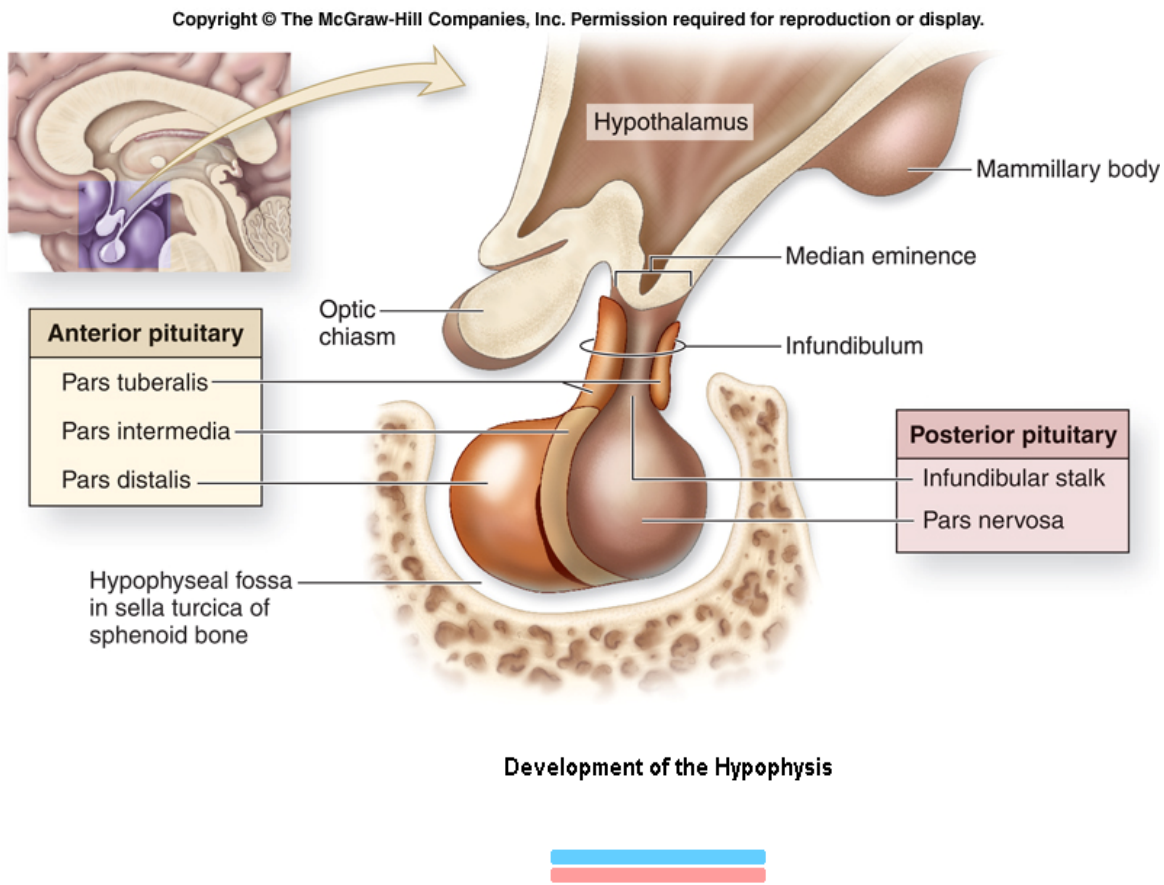
Endocrine System

- The endocrine system consists of endocrine glands (pituitary gland, pineal gland, thyroid gland, parathyroid gland, islets of Langerhans. adrenal glands, and the sex glands (testis and ovary).
- The endocrine glands are ductless glands consists of clusters, cords or follicles of secretory epitheloid cells separated by fenestrated blood capillaries, and supported by little stromal (CT) elements represented by a network of reticular fibers and reticular cells.
- Their secretory products are called hormones.
- Each hormone has a target organs or target cells which recognize hormones by receptors.
- The hormones reach to target organs or target cells via blood or lymph.



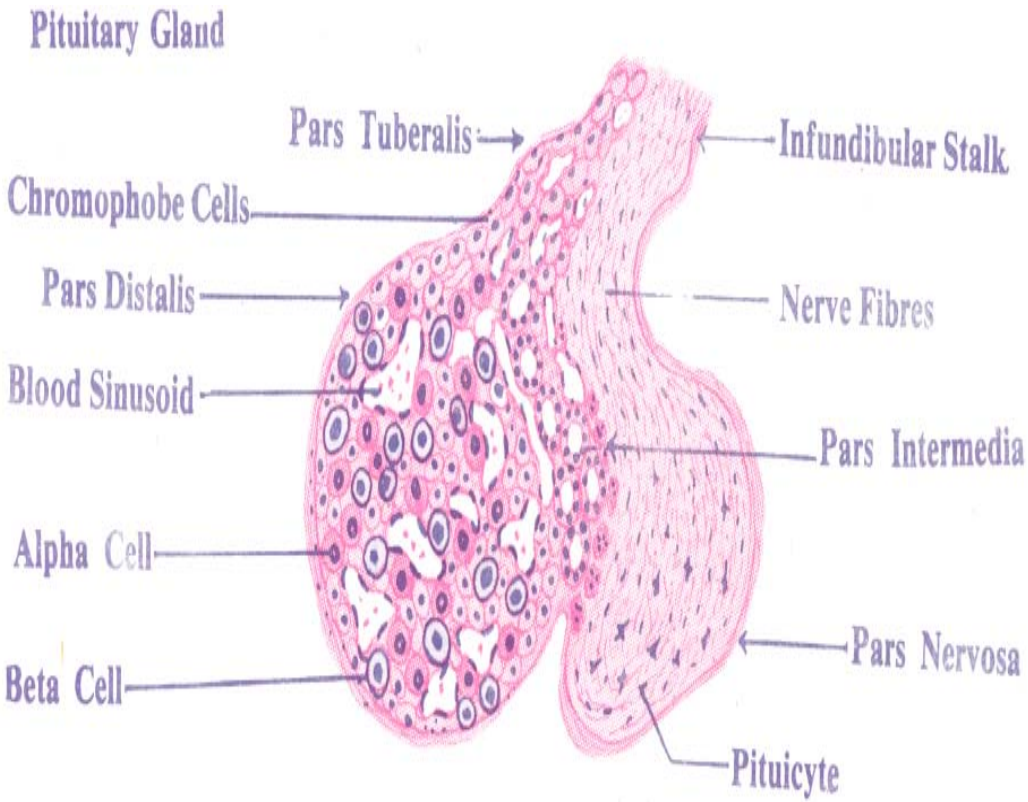
Pituitary gland

- **The pituitary gland is divided anatomically into two lobes with cleft in between: anterior lobe (adenohypophysis) and posterior lobe neurohypophysis).**
- **The anterior lobe is formed of pars distalis, pars tuberalis, and pars intermedia.**



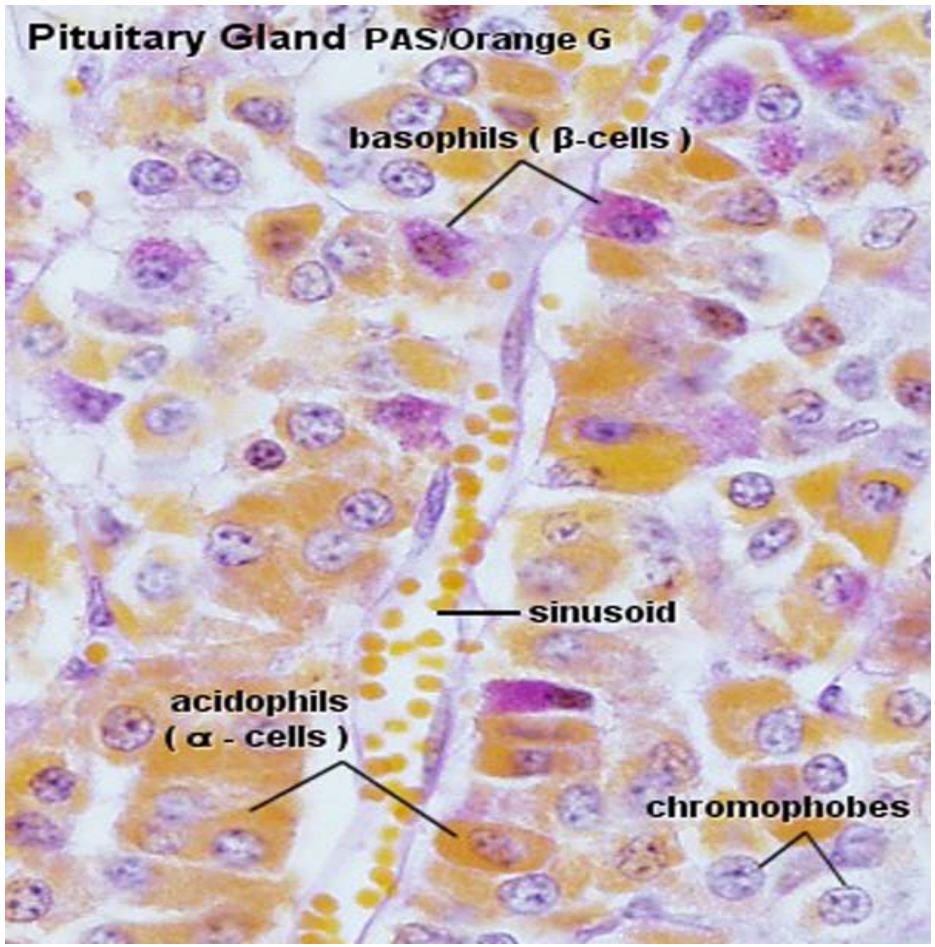
Pituitary gland

- The pars distalis is formed of clusters and cords of cells separated by blood sinusoid.
- The cells are of two types: chromophobes (dislike colour) and chromophils (like colour).
- The chromophobes constitute 50% of the cell mass, they are small, pale and may be resting or stem cells for other cells.
- The chromophils conistitute 50% and consisted of two types: acidophil (Alpha), and basophil (Beta cell).
- The acidophils (40%) are of two types: somatotrophs (secrete growth hormone), and mammatrophs (secrete prolactin).
- The basophils (10%) are of 3 types: Thyrotrophs secrete thyroid stimulating hormone (TSH) and act on the thyroid gland.



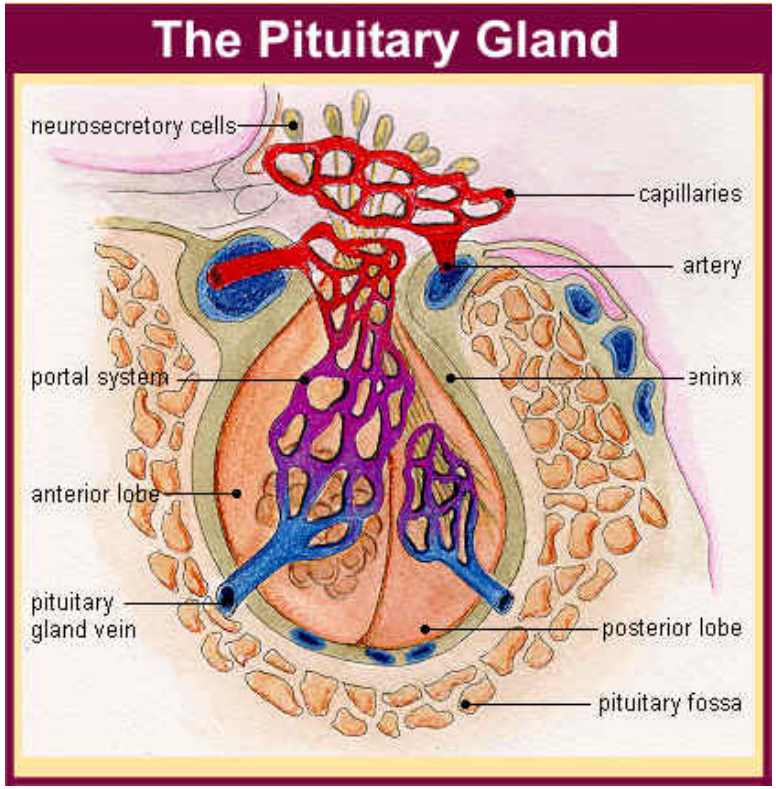
Pituitary gland

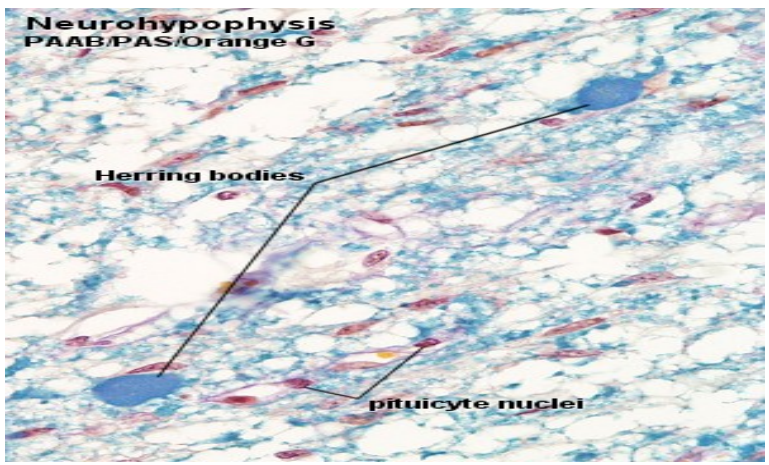
- Corticotrophs secrete adrenocorticotrophic hormone (ACTH), acting on adrenal cortex, and melanocyte stimulating hormone (MSH) which act on melanocytes of the skin.
- Gonodotrophs secrete follicle stimulating hormone (FSH), luetinising hormone (LH) and interstitial cell stimulating hormone (ICSH). These hormones act on gonads.



Pituitary gland

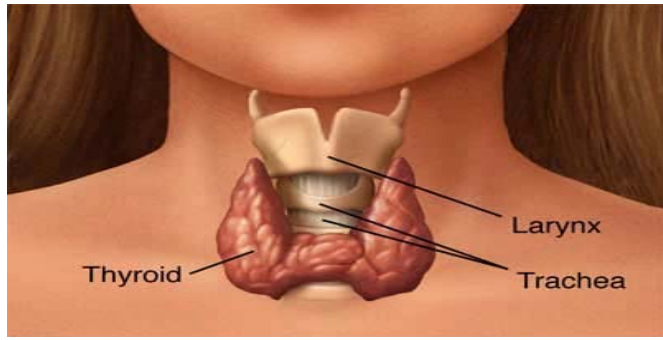
- The posterior lobe includes pars nervosa and infundibulum.
- The infundubulum is formed of nerve fibers which connect the posterior lobe to the hypothalamus.
- The pars nervosa consists of unmyelinated nerve fibers (axons of neurosecretory neurons present in the hypothalamus), and Herring's bodies (accumulation of neurosecretion secreted by the nerve cells of the hypothalamus.
- Pituicytes which are branched neuroglia cells.
- The hormones of the pars nervosa are secreted by neurosecretory neurons of the hypothalamus.
- Vasopressin (ADH) is secreted by the supraoptic nuclei of the hypothalamus.
- Oxytocin is secreted by paraventricular nuclei of the hypothalamus.
- These hormones reach the pituitary through hypothalamo-hypophyseal tract in the neural stalk.

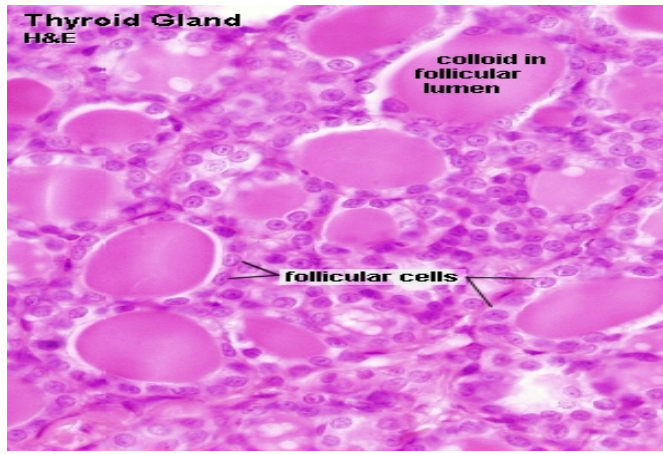


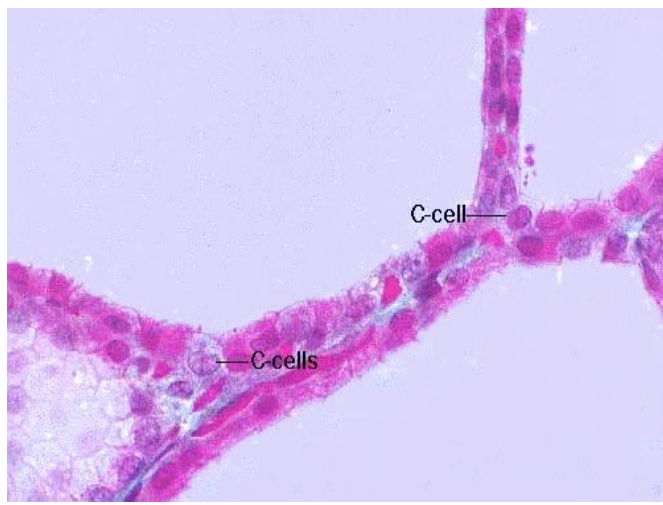


Thyroid gland

- The thyroid gland is formed of two lobes joined together by the isthmus in front of the trachea.
- The gland is formed of stroma and parenchyma.
- The stroma is formed of CT capsule, incomplete septa and fine reticular net.
- The parenchyma is in the form of follicles separated by blood capillaries.
- The wall of the follicles consists of two types of cells: follicular cells, and parafollicular (C) cells.
- The follicles contain in their lumen the stored secretion called colloid.
- The follicular cells constitute the majority of the cells. They are cuboidal with basophilic cytoplasm, and secrete thyroid hormone, T3 and T4 (thyroxin).
- The parafollicular or C cells are few in number and larger than follicular cells. They are cuboidal with pale cytoplasm. They are present in the wall of thyroid follicles resting on its basement membrane. They secrete calcitonin.

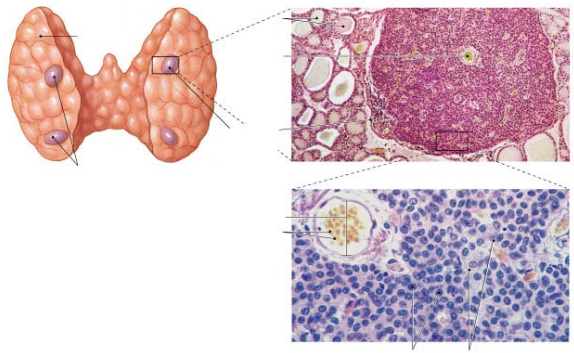


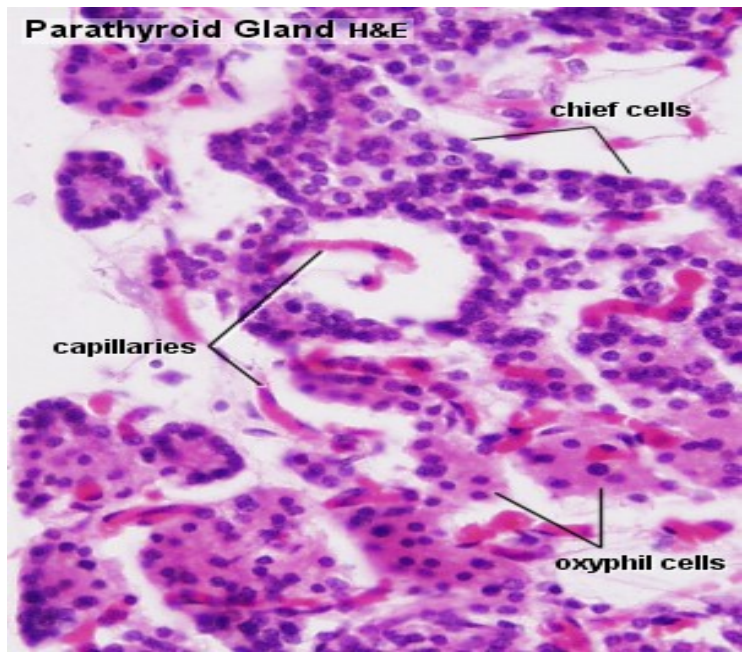




Parathyroid gland

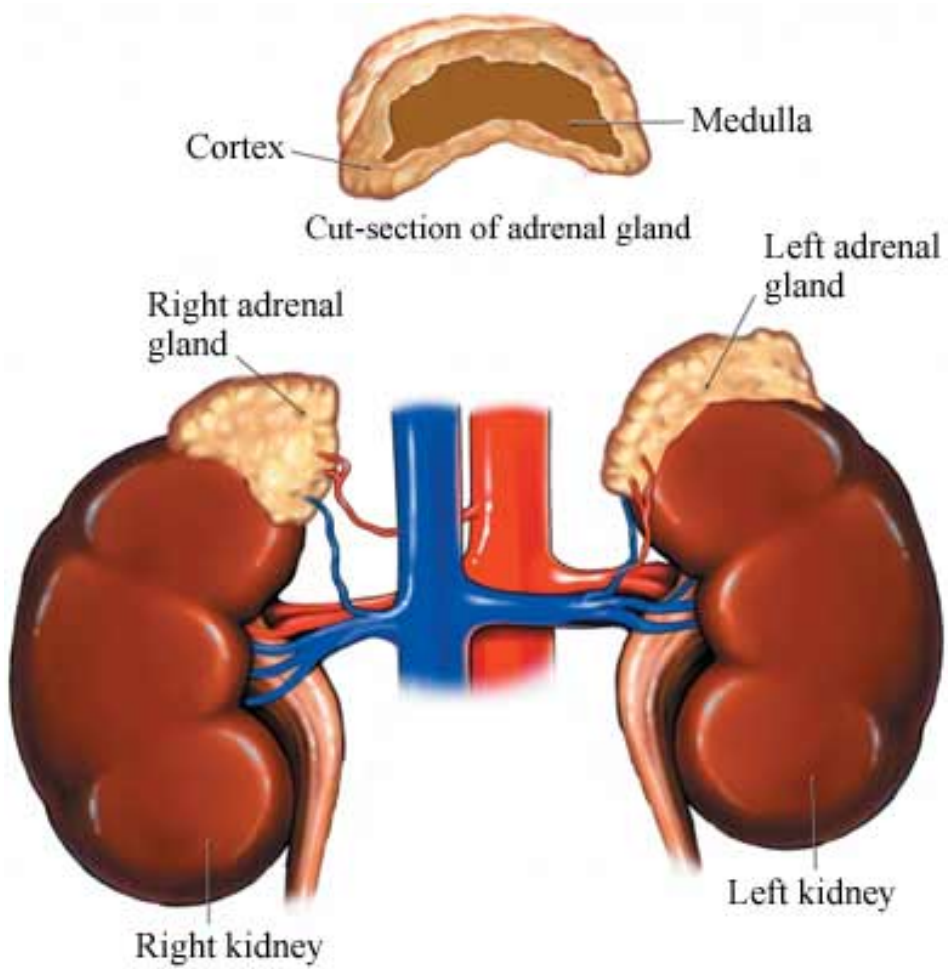
- They are 4 small glands located behind the thyroid gland.
- Each gland consists of stroma and parenchyma.
- The stroma is formed of CT capsule, incomplete septa and fine reticular fibers.
- The parenchyma is formed of clumps or cords of cells with large fenestrated capillaries in between.
- The cells are of two types: chief cells, and oxyphil cells.
- The chief cells is the main type with pale spherical nuclei and slightly acidophilic cytoplasm. It secretes parathyroid hormone.
- The Oxyphil cell is larger, less numerous with dark nucleus and more acidophilic cytoplasm. It is of unknown function.





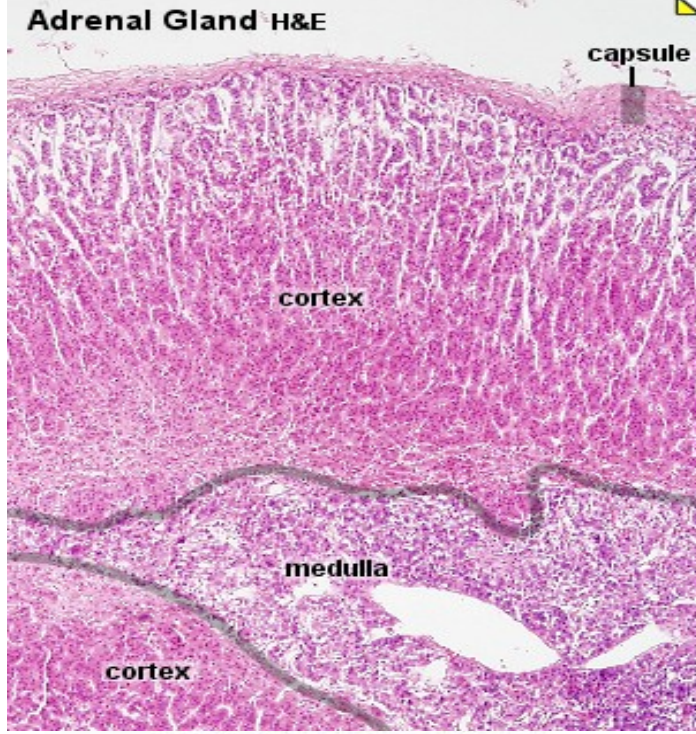
Adrenal gland

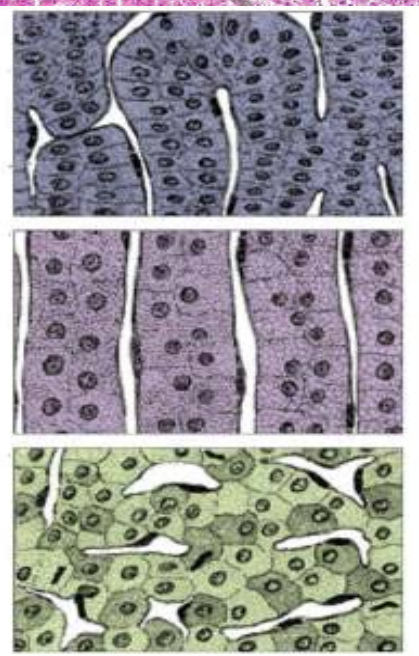
- There are two adrenal glands which are present on the upper pole of both kidneys.
- Each gland consists of stroma and parenchyma.
- The stroma is formed of thick CT capsule, thin septa and reticular network.
- The parenchyma is is divided into outer cortex and inner medulla.



Adrenal gland

- The cortex is formed of three zones: zona glomerulosa (ZG), zona fasiculata (ZF), and zona reticularis (ZR).
- The ZG is formed of columnar cells with acidophilic cytoplasm, arranged in spherical or arched clusters surrounded by blood capillaries. The cells of this zone secrete mineralocorticoids (aldosteron).
- The ZF is formed of polygonal cells arranged in the form of cords perpendicular to the surface of the gland. Blood capillaries are present inbetween these cords. They secrete glucocorticoids (cortisone) and sex hormones.
- The ZR is formed of smaller cells with acidophilic cytoplasm, arranged in the form of irregular cords forming network with blood capillaries in between. They secrete small amount of opposite sex hormone.
- The cells of the adrenal cortex are generally characterized by rich sER, lipid droplets, and mitochondria with tubular cristae.





Adrenal gland

- The adrenal medulla is formed of chromaffin cells, and ganglion nerve cells.
- The chromaffin cells are groups of polyhedral cells with central rounded nucleus, surrounded by capillaries and secrete adrenaline and noradrenaline.
- The ganglion cells are scattered between the chrommaffin cells and act as sympathetic ganglion.