

Adrenal glands (histology)

The adrenal glands are among the paired endocrine glands. It lies on the upper pole of the kidneys and in their fatty capsule. Their weight is approx. 8 g. On the surface there is a case made of dense collagen the ligament from which the septa depart. Attached to this ligament are reticular fibers providing support for the parenchyma cells. The adrenal glands are composed of cortex and medulla. Cortex and pith have different structure and function. The blood supply comes via three arteries: superior, medial and inferior suprarenal arteries. It further branches and forms a subcapsular plexus, from which the arteries of the capsule and the arteries of the cortex are formed, which anastomose throughout the cortex and flow into the veins of the medulla. Such an arrangement has a functional significance, since glucocorticoids flowing from the cortex to the medulla act enzymatically to convert noradrenaline into adrenaline. Medullary arteries also depart from the subcapsular plexus, which stretch in beams to the medulla, where they break up into a network of capillaries and sinusoids. Blood collects in the veins of the medulla and drains via the central vein to the suprarenal vein;

Adrenal cortex

The adrenal cortex makes up 80% of the mass. The cells are in the trabeculae that surround the blood sinusoids. They have a centrally located spherical nucleus, in cytoplasm there is a highly developed smooth endoplasmic reticulum, tubular mitochondria and fat droplets. This structure resembles steroid-producing cells. They do not store their products, as they are fat-soluble and freely pass through the membrane. The adrenal cortex consists of three layers: zona glomerulosa (15%), zona fasciculata (50%), zona reticularis (7%).

The zona glomerulosa is made up of cylindrical or pyramidal cells forming spherical groups or coiled beams. The cells produce mineralocorticoids, mainly aldosterone.

Polyhedral cells forming parallel beams one to two cells thick that contain large numbers of fat droplets and produce glucocorticoids and androgens, form the zona fasciculata. The last layer, the zona reticularis, is made up of cells that have an irregular nucleus and a large amount of lipofuscin in the cytoplasm and produce glucocorticoids and androgens. Regulation of adrenal cortex hormone secretion is provided by adrenocorticotrophic hormone (ACTH) from the adenohypophysis.

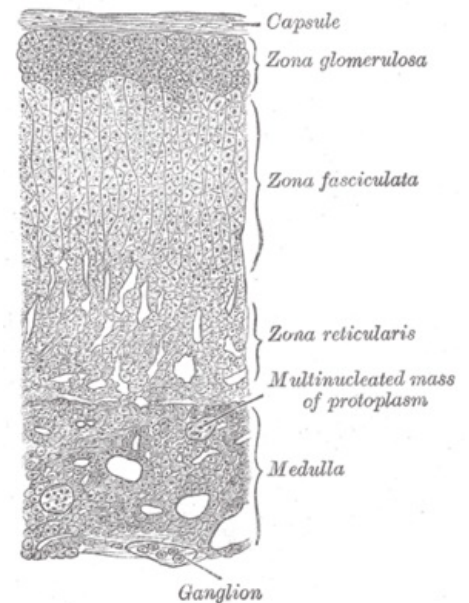


Schéma buněčného uspořádání v nadledvině

Functions of cortex hormones

Mineralocorticoids

 For more information see *Mineralocorticoids*.

They maintain the ionic balance of the organism. They are mainly used in the distal tubules of the kidneys, in the mucous membrane of the stomach and in the salivary and sweat glands. Aldosterone acts on the renal tubules and increases sodium reabsorption. Excessive concentration of aldosterone can cause hypertension.

Glucocorticoids

 For more information see *Glucocorticoids*.

They have a complex effect on the body's metabolism. They affect the metabolism of carbohydrates, proteins and lipids. Thanks to their immunosuppressive effect, they suppress the immune response, and also stimulate gluconeogenesis and glycogen synthesis in the liver. They have a catabolic effect on other tissues outside the liver (especially on proteins). Due to their influence, the number of eosinophilic granulocytes and circulating immunocompetent lymphocytes decreases.

Androgens

They are similar to sex hormones. Their production is low, and therefore they do not play a significant role in the body. The most famous is called dehydroepiandrosterone, which has mild masculinizing and anabolic effects. Pathologically, excess synthesis of this hormone can manifest itself in women as a virilizing effect, or cause premature puberty (pubertas precox).

Adrenal medulla

The medulla consists of polyhedral cells arranged in beams or groups. These cells resemble cells secreting biogenic amines. The origin of medullary parenchyma cells is found in the neural crest. Modified sympathetic postganglionic neurons are found in the medulla, which are reduced (lacking axons and dendrites). These neurons are connected to preganglionic sympathetic cholinergic fibers, so the release of catecholamines is controlled by the release of acetylcholine from these fibers. Cells have a large nucleus, small granular endoplasmic reticulum, Golgi complex, mitochondria, microtubules, microfilaments and electron-dense granules containing catecholamines (adrenaline, noradrenaline). Cell labeling is chromaffin due to their affinity for chromium salts.

Function of catecholamines in the medulla

An emotional response (fear) triggers the production of large amounts of catecholamines, which cause vasoconstriction, hypertension, and increased heart rate. We can classify them as a component of the defensive reaction.

Links

Related articles

- Adrenal glands
- Adrenal gland (preparation)
- Adrenal glands (images)
- Glucocorticoids
- Catecholamines
- Kidney

References

- KONRÁDOVÁ, Václava – UHLÍK, Jiří – VAJNER, Luděk. *Funkční histologie*. 1. edition. H & H, 2000. ISBN 80-86022-80-3.
- PAULSEN, Douglas. *Histologie a buněčná biologie : opakování a příprava ke zkouškám*. 1. edition. H & H, 2004. ISBN 80-7319-024-9.
- JUNQUIERA, L. Carlos – CARNEIRO, José – KELLEY, Robert O. *Základy histologie*. 1. edition. H & H, 1997. 502 pp. ISBN 80-85787-37-7.
- ČIHÁK, Radomír – GRIM, Miloš. *Anatomie*. 2. upr. a dopl edition. Grada, 2002. 488 pp. ISBN 80-247-0143-X.