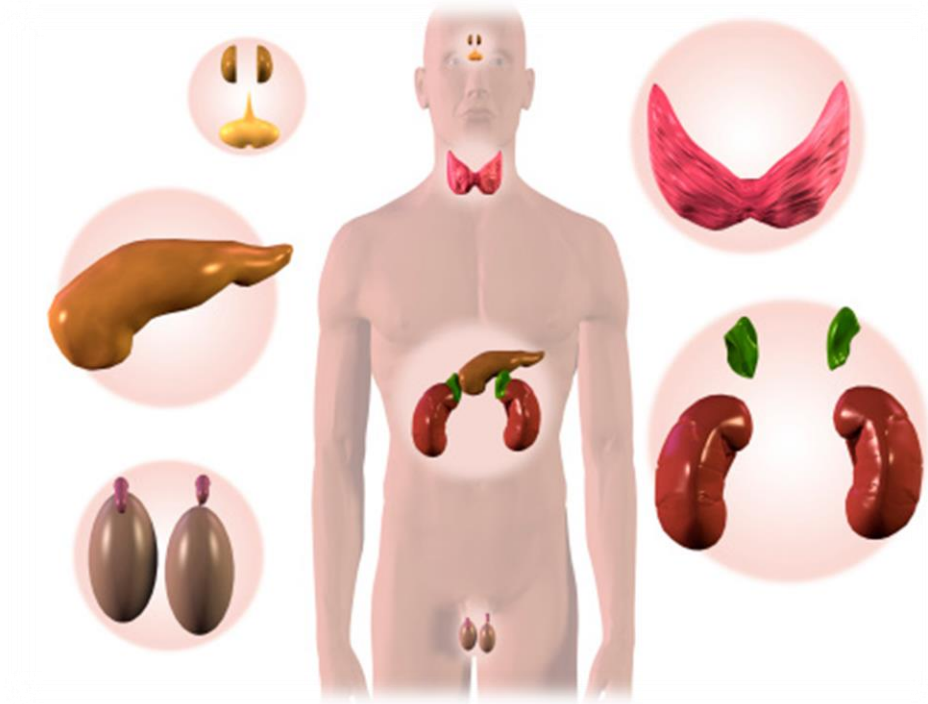




# ENDOCRINE SYSTEM



**LECTURE: ADRENAL GLAND**

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**REVIEWED BY: ALWALEED S ALOTAIBI**

[If there is any mistake or suggestions please feel free to contact us:](#)

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Both - Black  
Male Notes - BLUE  
Female Notes - GREEN  
Explanation and additional notes - ORANGE  
Very Important note - Red

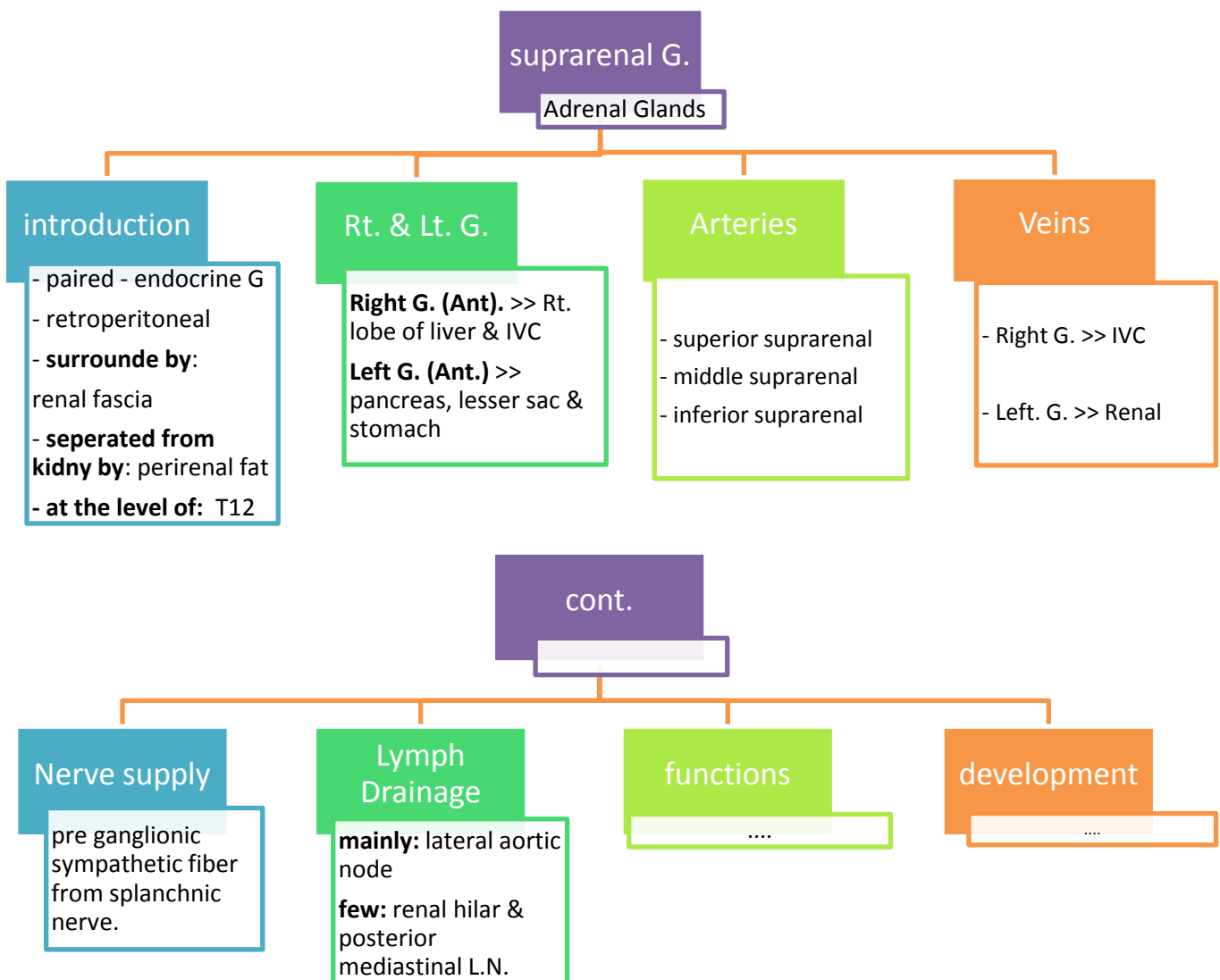


# Objectives:

**At the end of the lecture, the students should be able to describe the:**

- **Location, shape** and **relations** of the right and left adrenal glands.
- **Blood supply, lymphatic drainage** and **nerve supply** of right and left adrenal glands
- **Parts** of adrenal glands and **function** of each part.
- **Development** of adrenal gland and **common anomalies**.

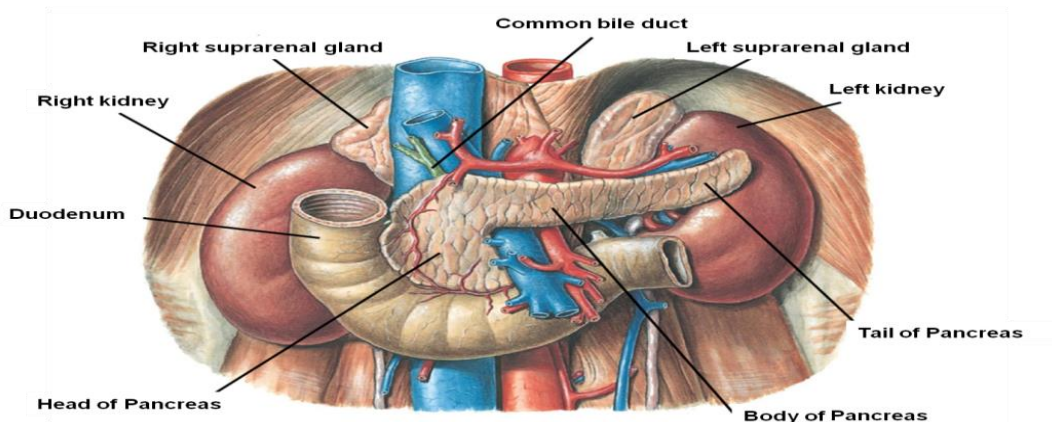
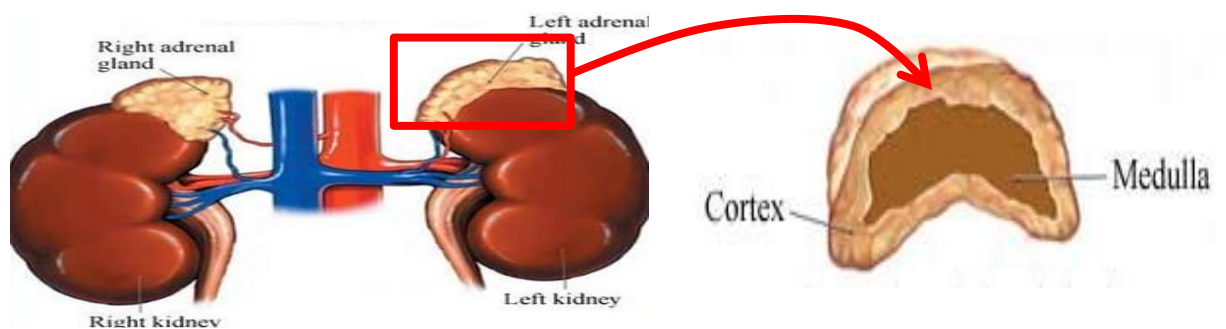
# Mind Map:





# Suprarenal Glands (Adrenal)

- **Paired**, Endocrine glands.
- **Yellowish** in color, **retroperitoneal** organs that lie on the upper poles of the kidneys, at the level of the **last thoracic vertebra (T12)**.
- They are surrounded by renal fascia but are separated from the kidneys by the perirenal fat.
- Each gland has an outer **cortex** and an inner **medulla**.



Right Gland	Left Gland
Is <b>pyramid shaped</b> and caps the <b>upper pole of the right kidney</b>	is <b>crescent in shape</b> and <u>extends along the medial border of the left kidney</u> from the upper pole to the <b>hilum</b>
<b>Anterior:</b> <ul style="list-style-type: none"> <li>- <b>right</b> lobe of the <b>liver</b></li> <li>- Inferior vena cava (<b>IVC</b>).</li> </ul>	<b>Anterior:</b> <ul style="list-style-type: none"> <li>- <b>Pancreas</b></li> <li>- <b>lesser sac</b></li> <li>- <b>stomach</b></li> </ul>
<b>Posterior:</b> <ul style="list-style-type: none"> <li>- <b>Diaphragm</b>.</li> </ul>	<b>Posterior:</b> <ul style="list-style-type: none"> <li>- <b>Diaphragm</b>.</li> </ul>



## ARTRIE

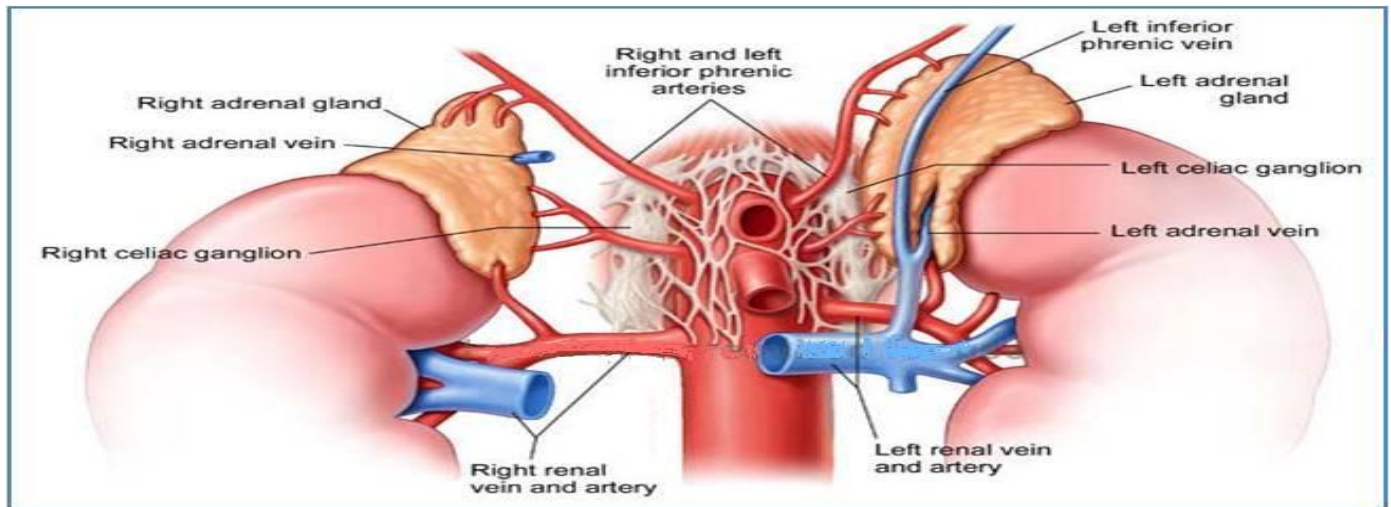
Each gland receives three arteries:

- **Superior suprarenal a.** a branch of **inferior phrenic artery**.
- **Middle suprarenal a.** a branch from **abdominal aorta**.
- **Inferior suprarenal a.** a branch of **renal artery**.

## VEINS

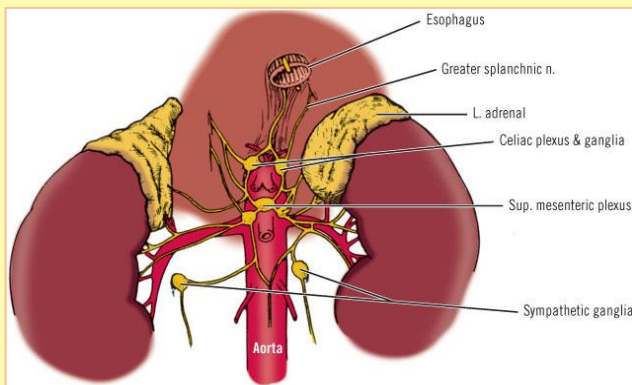
A single vein emerges from the hilum of each gland and drains into the:

- **Inferior vena cava** on the right &
- **Renal vein** on the left.



## NERVES

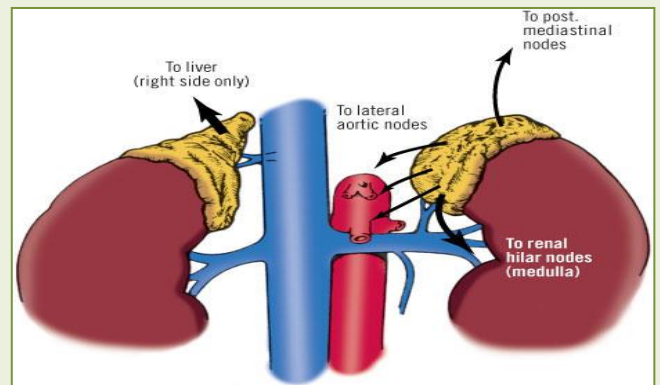
- **Preganglionic sympathetic fibers** derived from the splanchnic nerves.
- Most of the nerves **end in the medulla** of the gland.



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## Lymph Drainage

- The lymph drains **mainly** into the **lateral aortic nodes**.
- A **few** lymphatics may drain into **renal hilar** and **posterior mediastinal** lymph nodes
- **On the right**, may drain into **hepatic nodes**.

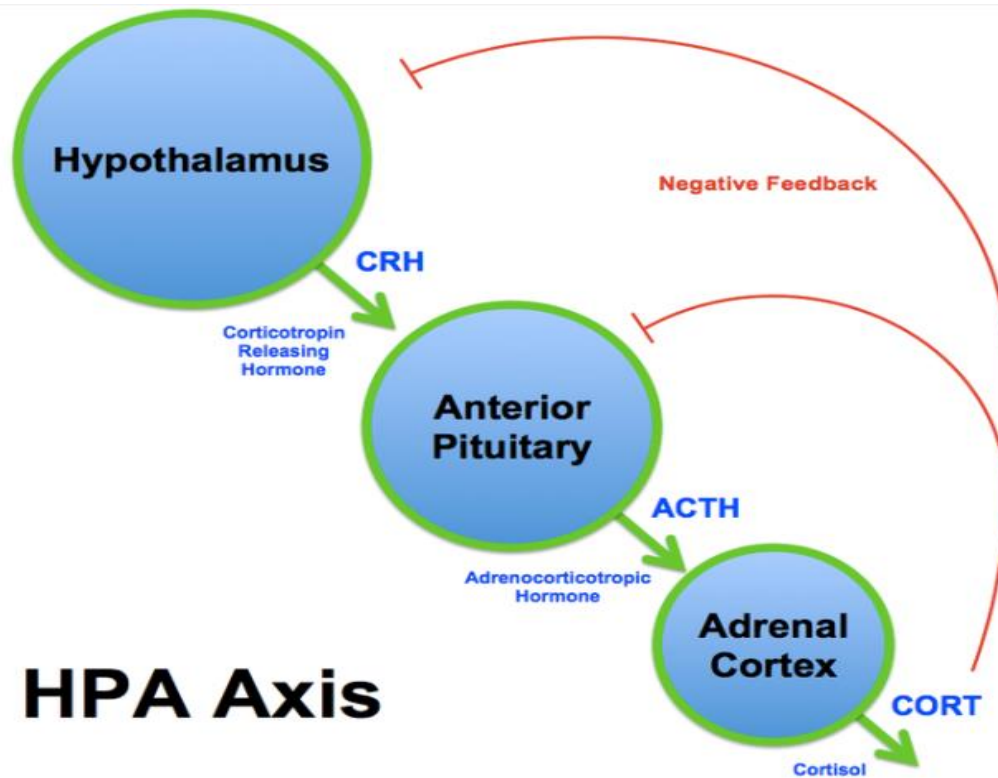


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# Functions

- The **suprarenal (adrenal) gland** is a component of the **hypothalamic-pituitary-suprarenal axis** that is responsible for coordinating stress response and **metabolism**.



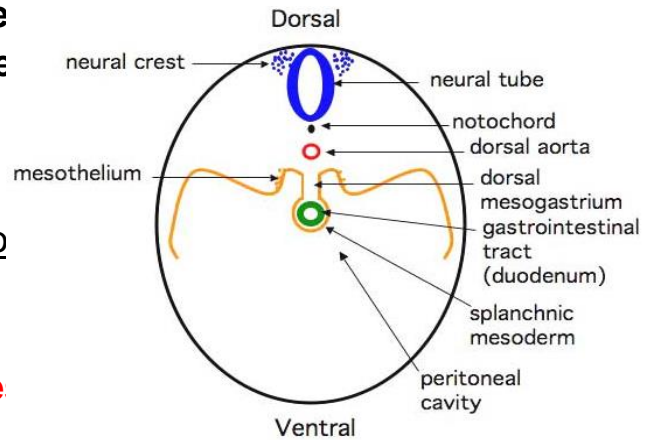
The cortex	The medulla
<p>The <u>cortex</u> of the suprarenal glands secretes hormones that include:</p> <ul style="list-style-type: none"><li>- <b>Mineralocorticoids</b>, which control fluid and electrolyte balance</li><li>- <b>Glucocorticoids</b>, which control the metabolism of carbohydrates, fats, and proteins</li><li>- Small amounts of <b>sex hormones</b>, which probably play a role in the prepubertal development of the sex organs.</li></ul>	<p>The <u>medulla</u> of the suprarenal glands secretes the <b>catecholamines</b>:</p> <ul style="list-style-type: none"><li>- epinephrine</li><li>- norepinephrine</li></ul>



# Development of Adrenal glands

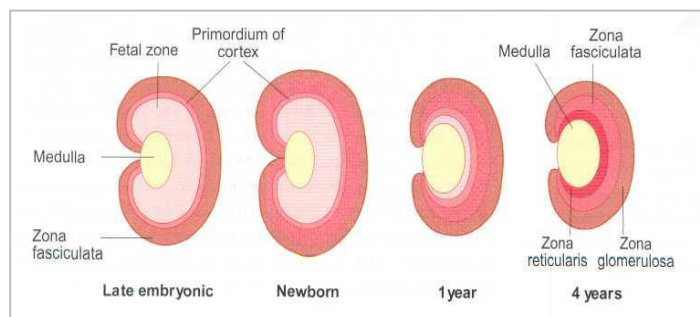
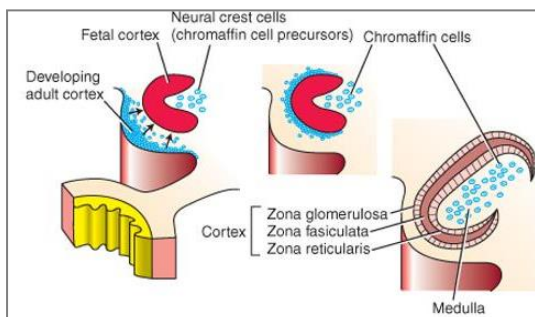
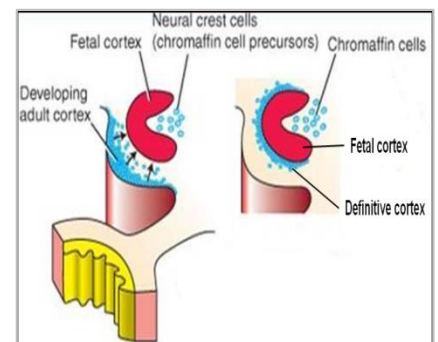
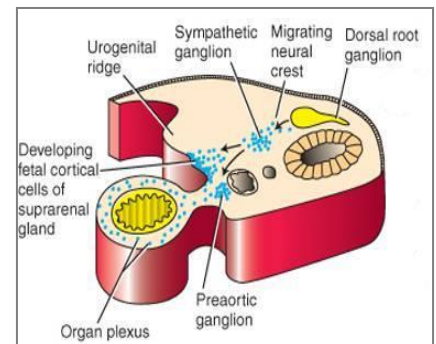
The two parts of the adrenal gland i.e. the cortex and the medulla develop from different origins.

- **Cortex** develops from the **Celomic epithelium (mesothelium)** derived from **mesoderm**
- **Medulla** develops from the **neural crest cells** derived from **ectoderm**



## The Cortex :

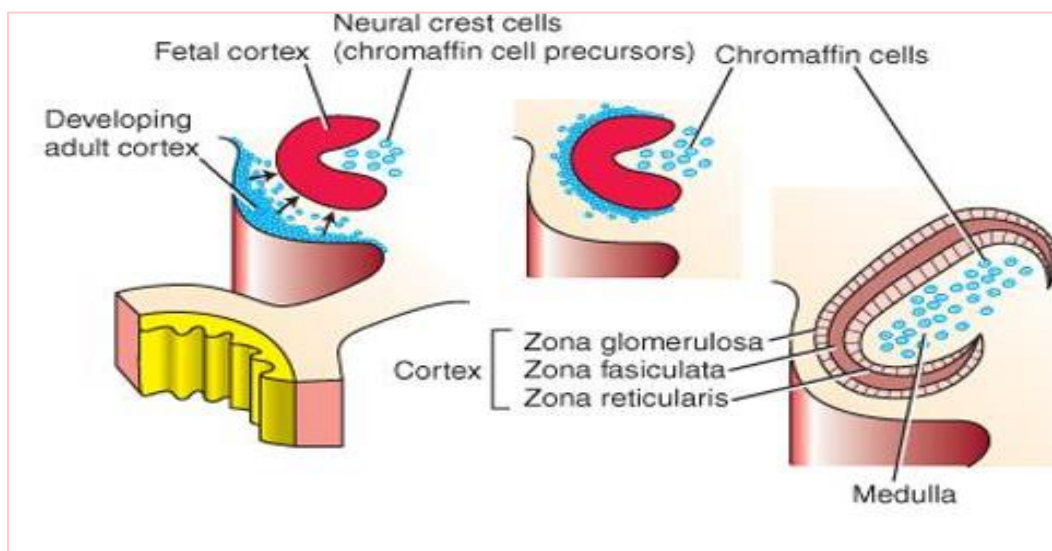
- Develops during 6th week by proliferation of the **coelomic epithelium** medial to the developing **gonadal ridge**.
- The newly formed cells get separated from the surface epithelium, enter the underlying mesoderm, and form the **fetal cortex**.
- A **second wave** of delaminating cells migrates and forms a thinner **definitive (permanent) cortex** surrounding the fetal cortex.
- Ultrastructurally, cells of both fetal and definitive cortical layers exhibit cytological characteristics of steroid-producing cells.
- Differentiation of the characteristic suprarenal cortical zones (*glomerulosa*, *fasciculata* & *reticularis*) begins during the **late fetal period**.
- **Zona glomerulosa & zonafasciculata** are present **at birth**.
- **Zona reticularis** is not recognizable until the end of 3<sup>rd</sup> year.





## The Medulla :

- Formed from the **sympathochromaffin cells** of the neural crest.
- These cells invade the **cortex** on its medial side, occupy the central position and differentiate into the **secretory cells**.
- Preganglionic sympathetic nerve fibers grow into the medulla, release *epinephrine* and *norepinephrine* upon sympathetic stimulation, and influence the activity of the medullary cells.





-The suprarenal gland of the fetus is **10-20 times larger than the adult glands** relative to the body weight, and is large compared with the kidneys. This is because of the extensive size of the fetal cortex. The medulla remains relatively small until after birth.

-The suprarenal glands rapidly become smaller during **the first 2-3 weeks after birth**, due to the rapid regression of the fetal cortex.

-Its involution is largely **completed in the first year of life**.

-During the process of involution, the cortex is friable and **susceptible to trauma at birth leading to severe hemorrhage**.

#### **-Congenital adrenal hyperplasia (CAH):**

An abnormal increase in the cortical cells results in **excessive androgen production**; during **the fetal period**.

**In females**, it may lead to masculinization of external genitalia and enlargement of clitoris.

**In males**, it may remain undetected in early infancy.

**Later in childhood**, in both sexes, androgen excess may lead to rapid growth and accelerated skeletal maturation.





## Questions:

**1- Which of the following is the true location of Adrenal gland:**

- a- at level of the (11) thoracic vertebra
- b- At level of the (10) thoracic vertebra
- c- At level of the (12) thoracic vertebra

**2-Which one of the following is anterior of the right adrenal gland:**

- A-Diaphragm
- b- Pancreas
- C-stomach
- d- Inferior vena cava

**3- Which one of the following is posterior of the both adrenal glands:**

- a- Liver
- b- Duodenum
- c- Diaphragm
- D-stomach

**4-the adrenal gland supply by Middle suprarenal artery which arises from:**

- a- abdominal aorta
- b- Renal artery
- c- Inferior phrenic artery



**5- The nerve supply adrenal glands are Preganglionic sympathetic fibers derived from:**

- a- Vagus nerve
- b- Splenic nerve
- c- Splanchnic nerves

**6- In the Adrenal glands the lymph drains into:**

- a- the lateral aortic lymph nodes
- b- Celiac lymph nodes
- C-Gastric lymph nodes

**7- Which one of the following hormones secreted by Medulla of the adrenal glands:**

- a- Mineral corticoids
- b- Norepinephrine
- c- Sex hormones
- d- Glucocorticoids

**8- Mineral corticoids are concerned with the control of:**

- a- Metabolism
- b- Play a role in the prepubertal development
- c- Control of fluid and electrolyte balance



**9-Which one of the following is true about development of adrenal gland:**

- a- the cortex and the medulla develop from same origin
- b- The cortex is mesodermal in origin
- c- The medulla is mesodermal in origin

**10-In Congenital adrenal hyperplasia:**

- a- there is excessive androgen production
- b- - there is excessive catecholamine production
- c- - there is excessive Glucocorticoids production



Q	Answers
1	C
2	D
3	C
4	A
5	C
6	A
7	B
8	C
9	B
10	A

**GOOD LUCK**

**Anatomy Team Leaders:**

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**&**

**Eman AL-Bedica**