Physiology 435 team

#13 Adrenal Gland(Adrenal Medullary Hormones)

Objectives:

- Summarize the actions of adrenal androgens.
- Describe the causes and major manifestations of
- hyperadrenocorticism and Hypoadrenocorticism
- Describe circumstances in which catecholamines are released from the adrenal gland.
- List the major actions of catecholamines.

Important
Males notes
Females notes
Extra

Resources: 435 male's & female's slides.
Editing file: click Here

Revised by
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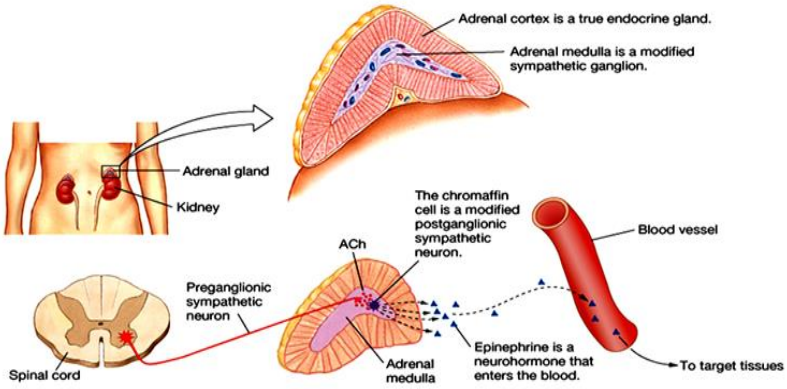
Adrenal medulla and its secretions

Adrenal medulla :

- The adrenal medulla is the inner part or core of each adrenal gland.
- It is considered as part of sympathetic nervous system.

Adrenal Medullary Hormones:



- Adrenal medulla secretes catecholamines(epinephrine & norepinephrine) and small amount of dopamine.
- They are released from chromaffin cells[1] in the adrenal medulla.
- Secretion of these hormones causes: Blood to be diverted to the brain, heart, and skeletal muscle.
- Its secretions are derived from tyrosine :

  -Tyrosine→Dopamine→Norepinephrine →Epinephrine.

  -(Phenylethanolamine N-methyltransferase (PNMT) is an enzyme found in the adrenal medulla[2] that converts norepinephrine (noradrenaline) to epinephrine (adrenaline)).

- **Epinephrine Vs norepinephrine:**

Adrenaline (epinephrine):	80% of adrenal medullary secretion	Epinephrine is the more potent stimulator of the heart and metabolic activities	comes **solely** (not involving anyone or anything else)from chromaffin cells of the adrenal medulla .
Noradrenaline (norepinephrine):	20 % of adrenal medullary secretion.	Norepinephrine is more influential on peripheral vasoconstriction and blood pressure	comes from BOTH from chromaffin cells of the adrenal medulla and postganglionic sympathetic nerves. -This is because postganglionic sympathetic nerves cannot synthesize EP from its precursor NE, because they lack the enzyme (PNMT) needed for conversion of NE into EP.

[1] it's Modified postganglionic sympathetic neurons in the adrenal medulla arise from embryogenic neural crest , that's why it's neural cell.

[2] موموجوده بمكان ثاني غير الادرينال ميديولا

The actions of Adrenal Medullary Hormones

Enhance the effects of the sympathetic nervous system

Prepare the body for stressful events ("fight or flight" response.)

The overall effect is to ensure that all requirements for increased muscle activity are available.
What are these?

Typical Responses to stimulation of the adrenal medulla

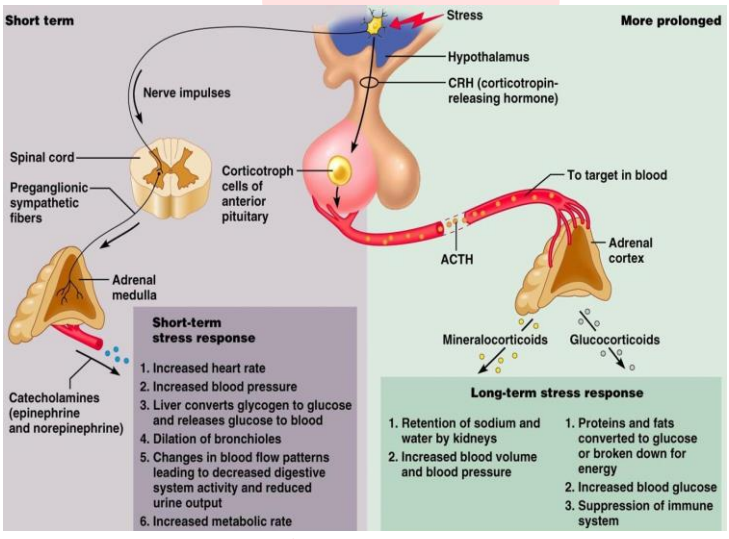
Target	Responses	غير مطالبين بها Receptor
Cardiovascular system		
Heart	↑ Frequency and rate of contraction	
	↑ Conduction	β
	↑ Blood flow (dilation of coronary arterioles)	β
Arterioles		
Skin	Constriction	α
Mucosae	Constriction	α
Skeletal muscle	Constriction	α
	Dilation	β
Metabolism		
Fat	↑ Lipolysis	β
	↑ Blood FFA and glycerol	β
Liver	↑ Glycogenolysis and gluconeogenesis	β
	↑ Blood sugar	β
Muscle	↑ Glycogenolysis	β
	↑ Lactate and pyruvate release	β
Bronchial muscle	Relaxation	β
Stomach and intestines	↓ Motility	β
	↑ Sphincter contraction	α
Urinary bladder	↑ Sphincter contraction	α
Skin	↑ Sweating	α
Eyes	Contraction of radial muscle of the iris	α

الهدف من هذا الجدول هو معرفة تأثير الكتيكول امين على الجسم بشكل عام , لا يهم معرفة كل ريسيبتورز وش يسوي

(هذا للاستزادة فقط اما معرفة كل ريسبتورز وش يسوي غير مطالبين فيه)
عشان تسهل عليكم كل ريسيبورز وش يسوي , اعرفو اماكنها بعدها تخيلو تأثير السميثاتك عليها :
B1 receptors r located in the heart >increasing the contractility and blood flow .
B2 receptors r located in the smooth ms causing relaxation of bronchial, stomach & intestinal smooth ms.
Also they r located in blood vessel of skeletal ms causing vasodilatation.
Also they r located in liver >increase glucose metabolism.
B3 r located in adipose tissue causing lipolysis.
A1 receptors r located In smooth muscle cells of blood vessels,sweat gland, the sphincters of gastrointestinal system & urinary balder>causing contraction of the smooth ms .

(Glycogenolysis & gluconeogenesis in liver) And (Glycogenolysis in skeletal muscles)> can lead to hyperglycemia> rises blood glucose level.
Mobilization of free fatty acids
Increase O2 consumption
Increase Metabolic Rate
Cause vasoconstriction of blood vessel except the blood vessels of skeletal ms.
Increase heart rate + blood pressure
Short term stress response[3]

Stress and the Adrenal Gland



يمكن تجي سؤال

-Short term stress will stimulate adrenal medulla to release catecholamine.
-long term stress will stimulate adrenal cortex to release corticosteroid & mineralocorticoid.
لان زيما عارفين النيرفس سيستم اسرع بكثيييير من الاندوكرين سيستم , زي ماجاكم بالميد^^

Which has more affinity towards the receptors(alpha and beta) ? ركزت عليه الدكتوره

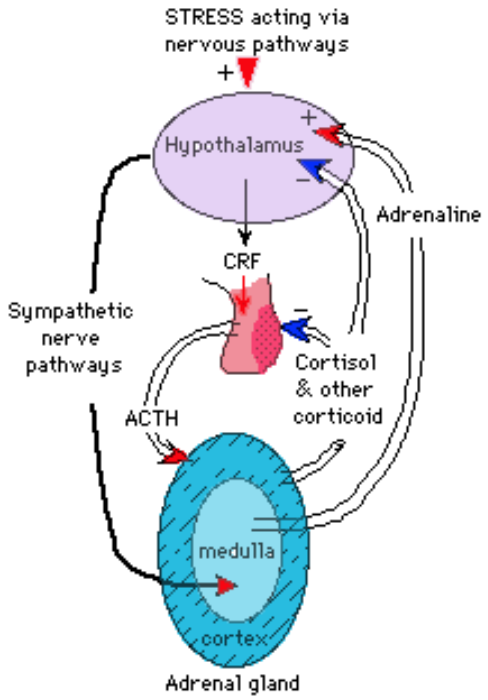
-Epinephrine has similar affinity to **α** & **β** receptors. ابي نفرن: ابي كم كلكم يالريسبيتر ^^(=سميلر افنيتي)

-Norepinephrine has greater affinity than epinephrine for the **α** receptors.

[3] stress stimulate short term and long term action :

- **long TERM**: stress stimulate the release of CRH from the hypothalamus which stimulate the release of ACTH from the anterior pituitary > goes to the **ADRENAL CORTEX** via blood releasing mineralocorticoids and glucocorticoids (each have its own action)
- **short TERM** : hypothalamus sends nerve impulses to the spinal cord > preganglionic sympathetic fibers(Ach) reaches to the **ADRENAL MEDULLA >** postganglionic sympathetic neurons (chromaffin cell) releasing catecholamine (> blood > action on the target organ

Control of Secretion of Adrenal Medullary Hormones



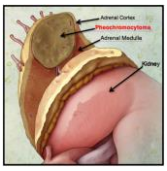
The adrenal medulla is innervated by the sympathetic nervous system.

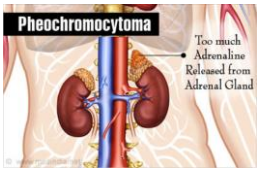
Hormones are released from medulla in response to signals.

The sympathetic nervous system is activated in response to stress. Stress can be physical (exercise), physiological (hypoglycemia, hemorrhage) or emotional

Cortisol, when secreted from cortex, causes release of these hormones from the medulla.cuz cortisol has permissive effect on catecholamine

Pheochromocytoma





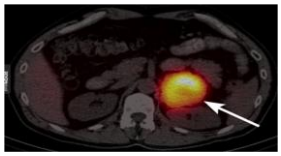
- Pheochromocytoma is a tumor of adrenal medulla :derived from **chromaffin cells** (arise from embryogenic neural crest) → Most tumors secrete epinephrine, NE, and dopamine and can cause episodic hypertension → ↑urinary vanillylmandelic acid(vanillylmandelic acid is a breakdown product of norepinephrine) and plasma catecholamines are elevated → Associated with neurofibromatosis[4].
- It can be life threatening if not recognized & not treated.
- Most often occurs in middle age.

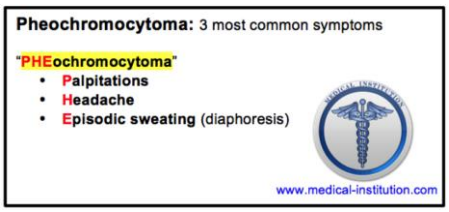
Signs and Symptoms of Pheochromocytoma:

classic triad **(palpitations ,headache & sweating)**the most imp	**resistant hypertension** (95%of cases)	anxiety	glucose intolerance	increased metabolic rate	chest pain

Diagnosis and Treatment:

- High plasma catecholamine.
- Increased metabolites [VMA[5]] in urine
- Treatment is surgical resection.





د.عبير اعطتنا مقال عشان نطلع منه اسئلة كنشاط خلال المحاضره بعدها قالت واو اعجبتني اسئلتكم يمكن اسألكم ايها بالاختبار , فشيكو على هذا الملف فيه تجميع للاسئله الي كتبناها

[4] is a group of three conditions in which tumors grow in the nervous system.
[5] vanillylmandelic acid

Physiology 435 team

Thanks to this amazing team!

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