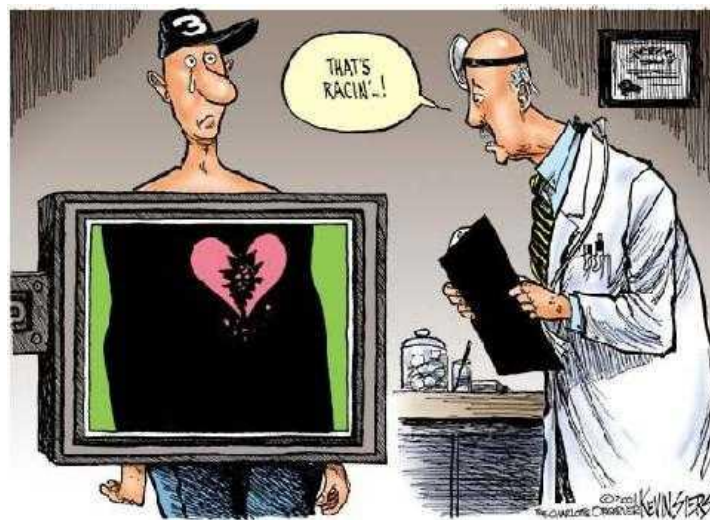




Regulation

of Blood pressure



Created By :

Suhibe Al. Masry

Muhammad al WATBAN

Notes :

Amna Baljoun

Abdullah Al Faris

Sultan Al Salem

Ismail Raslan

Somaia Al Amri

Tahani Al Harbi

Eman Al Rashidi

Shahad Al Ruwashid

Hayfaa Al Radhi

Salman Al Sfaiyan

Abdulssalam Al Qahtani

Figures :

Press :

Muhammad Al WATBAN

Ahmed Al Duraihem

To contact with the team :

ThePhyllteam@yahoo.de



First Version

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Regulation of blood pressure

How could Automatic nervous system ANS (sympathetic – parasympathetic) effect the Diameter ?

Sympathetic

- It's affecting all the body
- If it stimulated , it cause vasoconstriction
- If it inhibited , it cause vasodilatation

Parasympathetic

- In the abdomen and the thoracic cavity only
- If stimulated , it case vasodilatation

Best artery regulation in the kidney , it gives :

① Myogenic :

It's in the media layer of the vessel

When there is high blood flow , the vessels will stretch and the smooth muscle cells will cause depolarization and that will make it contract

• Is it a continues pressure?

✱ No, when pressure high it well

② Metabolic

- When there is a vessel contraction , there will be increase in metabolic end product and that will cause vasodilatation :
- Oxygen decreases will cause vasodilatation
- Adenosine (ATP) gives powerful vasodilatation
- small amount of K^+ causes vasodilatation
- Acidosis
- CO_2

Reactive Hyperemia : Unknown cause

When you release a cuff, the blood flow will increase 10 time than normal

Local Hormones effecting Diameter

Vasodilator

- Endothelial derived relaxing factor (EDRF) – nitric oxide (powerful)
- Prostacycline
- Leukotrine
- Histamine
- Bradykinine
- Serotonins (5HT)

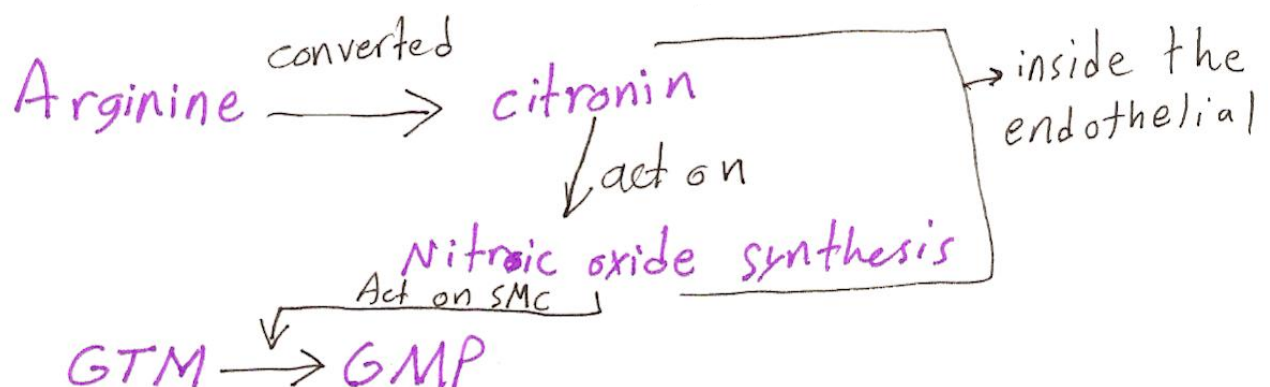
Vasoconstriction

- Endothelin (powerful)
- Prostagland F (PDF)
- Thromboxane A₂

Endothelial release 2 types of hormones :

1. Suprarenal
2. Local hormone :
 - Endocrine : the hormone releases circulated the blood
 - Paracrine : the hormone release and work locally (in the same area)

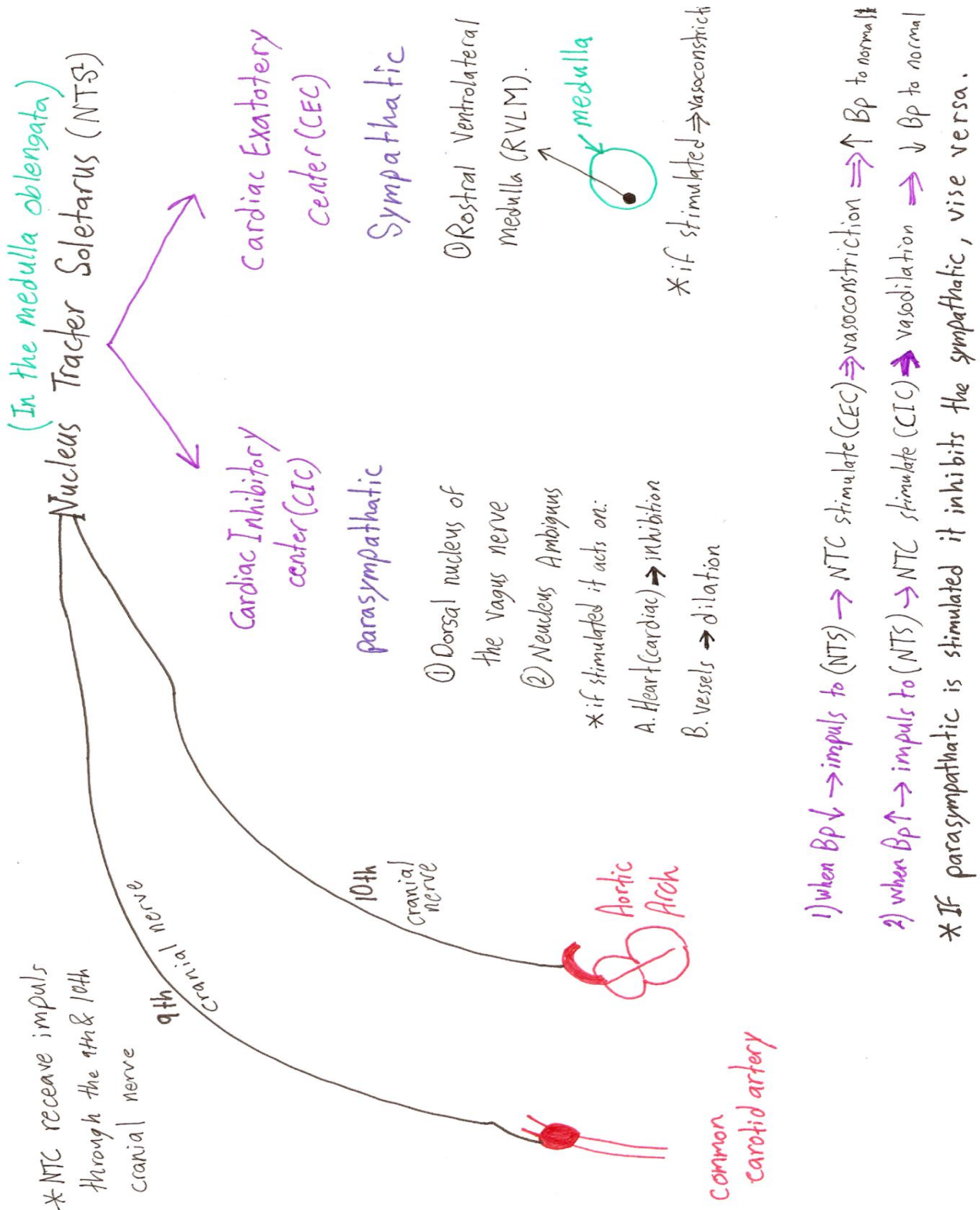
Where Nitric acid comes from ?



GMP : an inhibitor of smooth muscle cells causes : relaxation

- Arginine is the source of Nitric Acid
- Nitric Acid works through GMP
- While Arginine is converted to citronin , NO released

Central Control of Blood Pressure



mlw

Pulse pressure depends on :

- Blood volume
- Compliance

Total Peripheral Resistance Depends on :

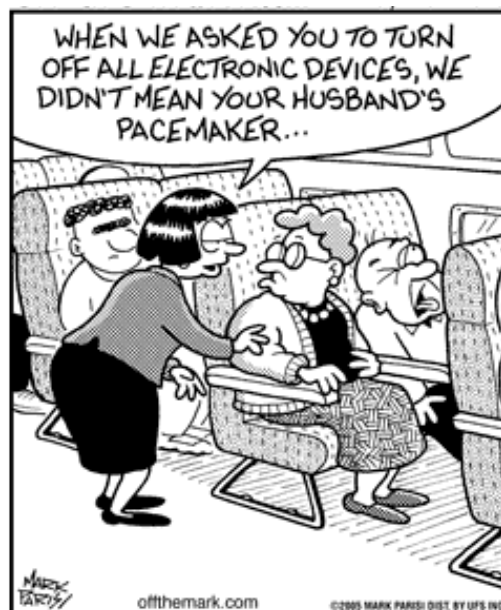
- Elasticity
- Viscosity
- Diameter

Arterioles has the maximum pressure because :

- Smooth Muscle cells
- Supplied by Sympathetic
- Arranged in series

Capillaries has less pressure than arterioles because :

- They arranged in parallel



Regulation of blood pressure

How does the body react when Blood Pressure increases or decrease ?

- Short term
- Intermediate term
- Long term

Short term :

When there is an increase in blood pressure , parasympathetic will be stimulated and will decrease the blood pressure.

When the blood pressure drop (decrease) , sympathetic will be stimulated and will increase blood pressure.

Sympathetic and para are stimulated by two ways :

❶ **Baroreceptor reflex** : another name (buffer nerves) they are in the common carotid artery wall and under the aortic Arch wall.

When the blood pressure drops or increases that will effect the Baroreceptor reflex and it will send signals to the nucleus tractus solitarius NTS

❷ **Chemoreceptor** : its situated , below the aortic arch and carotid artery , the same place of Baroreceptor but chemoreceptor are outside the wall as carotid body and aortic arch body . these body chemoreceptor are :

Vascular , Solid body and Sensory in the changes of the blood chemistry :

When there is loss in blood volume , blood pressure drops , cause :

- | | | |
|---------------------------------------|---|---|
| ❶ Hypoxia (loss in Oxygen) | } | this will reach the chemoreceptor , it act on SNC,
cause vasoconstriction , Blood pressure increase to
normal |
| ❷ Hypocapnia | | |
| ❸ H ⁺ increases , acidosis | | |

Baroreceptor :

- Work best in → 100 mm Hg
- Won't work in → below 60 mm Hg or more than 180 mm Hg
- It will work between : 60 – 180 mm Hg

Chemoreceptor :

Regulation of blood pressure

- work best in \rightarrow 40 – 60 mm Hg

Chemoreceptor also acts on the respiratory center and stimulate it that will cause hyperventilation \rightarrow CO_2 will go out and O_2 will go in. this will cause $\uparrow \text{PH}$ because of $\uparrow \text{CO}_2$ cause acidosis

Note:

*Baroreceptor: it works depending on pressure that's why it's called Baroreceptor.

*In the spinal cord in the thoracic area there is 3 horns and it releasing sympathetic fibers to supply the other parts to cause the effect .

Spinal cord contain 3 horns :

- ① Anterior : motor
- ② Posterior : sensory
- ③ Intermediate sympathetic "lateral "

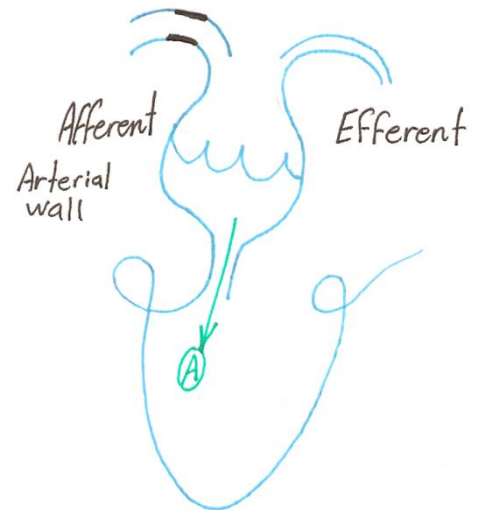


Intermediate term: "Rennin Angiotensin system"

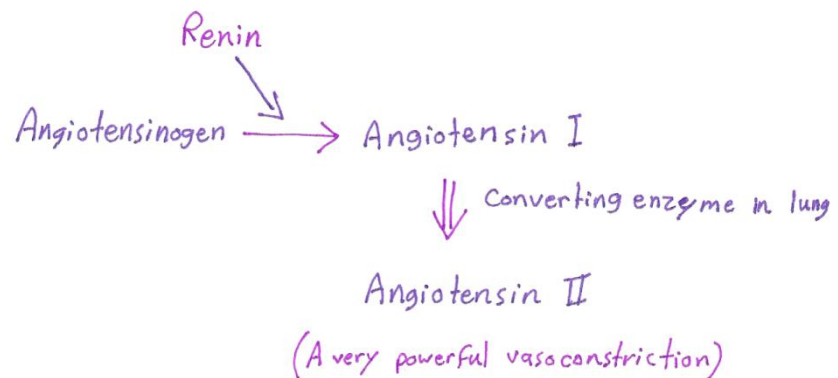
when blood pressure drops :

- Rennin is formed in the Juxta glomerular apparatus near the afferent in the kidney. Rennin formation is stimulated by:

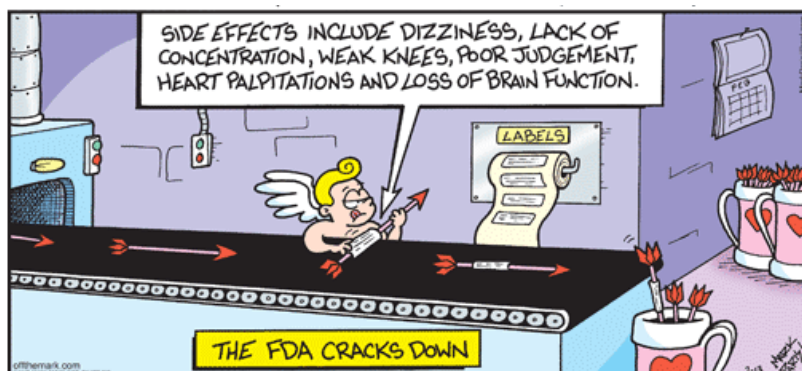
- During sympathetic stimulation
- Low blood pressure in the A.A. wall
- Less Na filtration **A** in the Glomular filtrate.



- The rennin will act on :

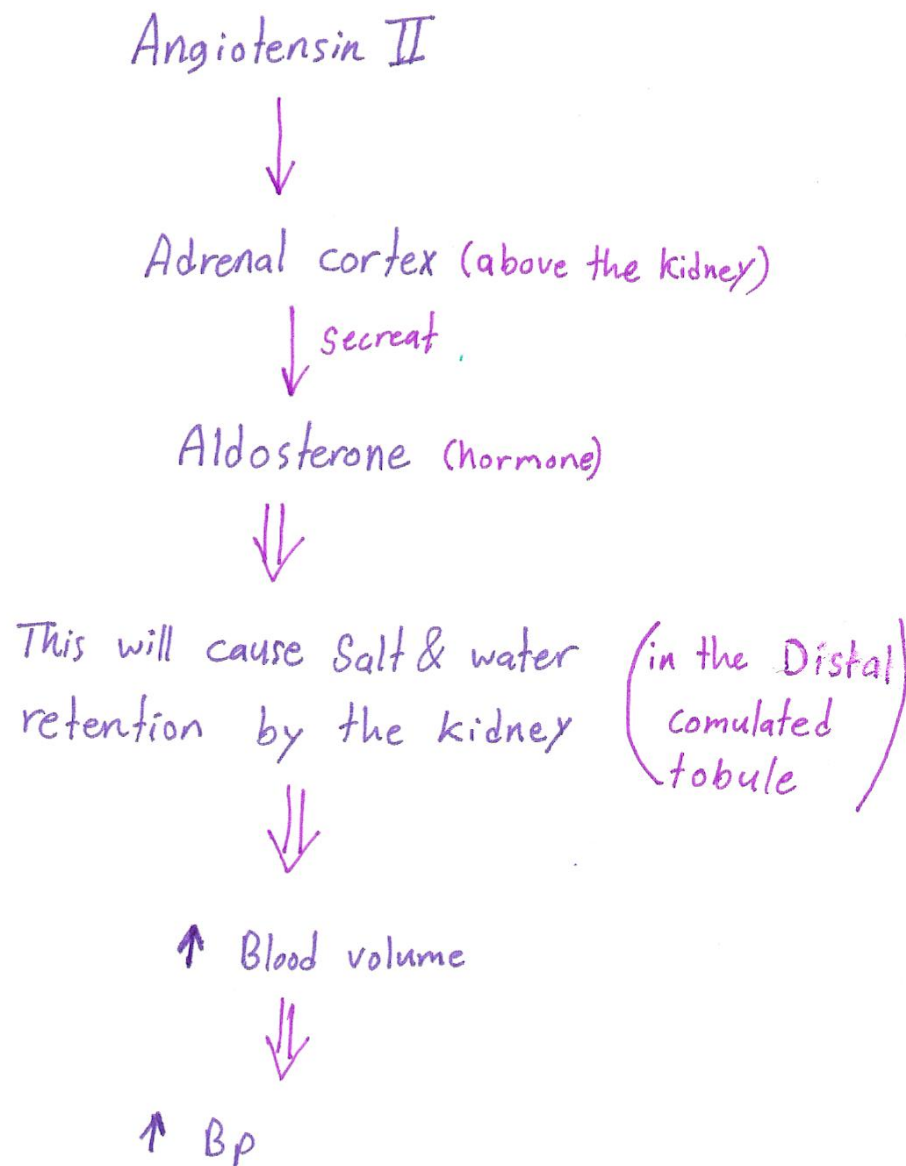


- Angiotensinogen : A plasma protein always present in the body circulation "made in the liver"



Long term

It is like the intermediate term and when the angiotensin II is formed it :

**Note :**

- Angiotensin II has two functions in intermediate and long term regulation
- Angiotensin converting Enzyme inhibitor (ACEI) that decreases BP.

That's all :)