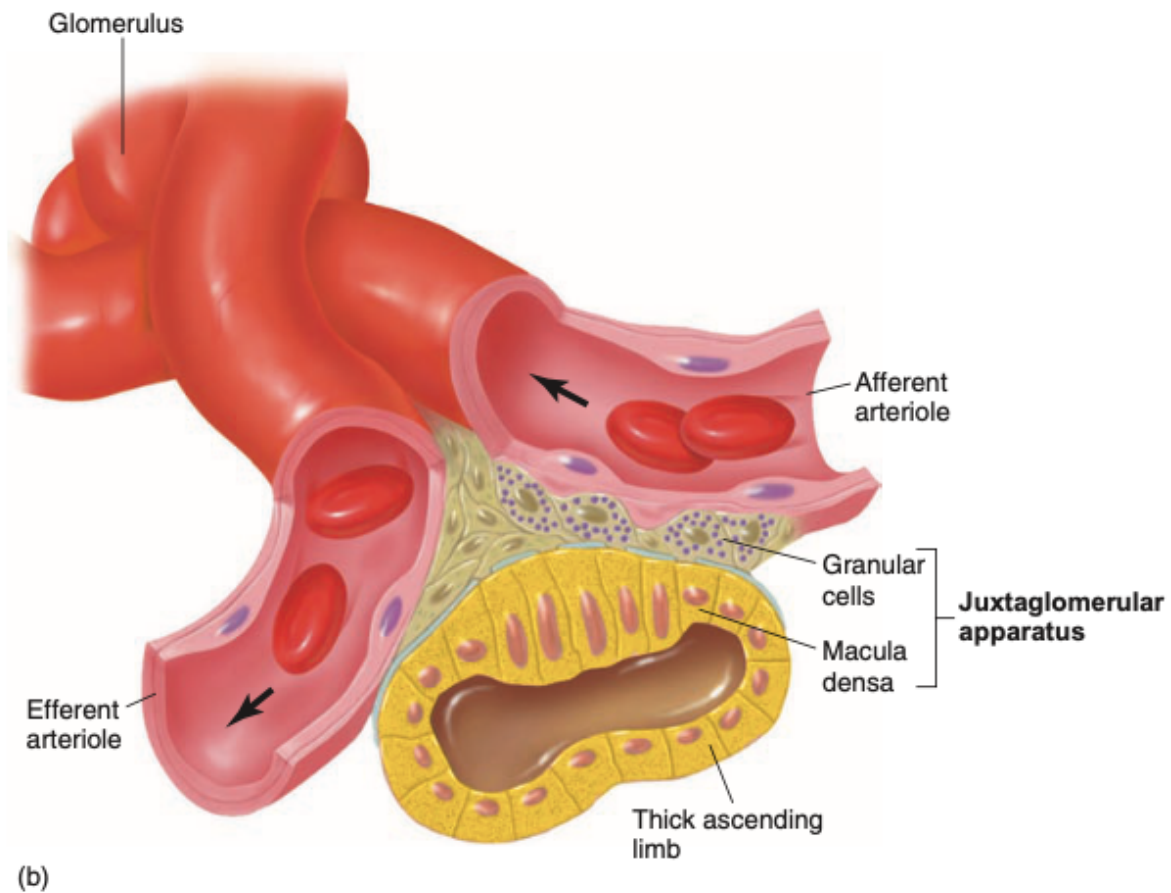
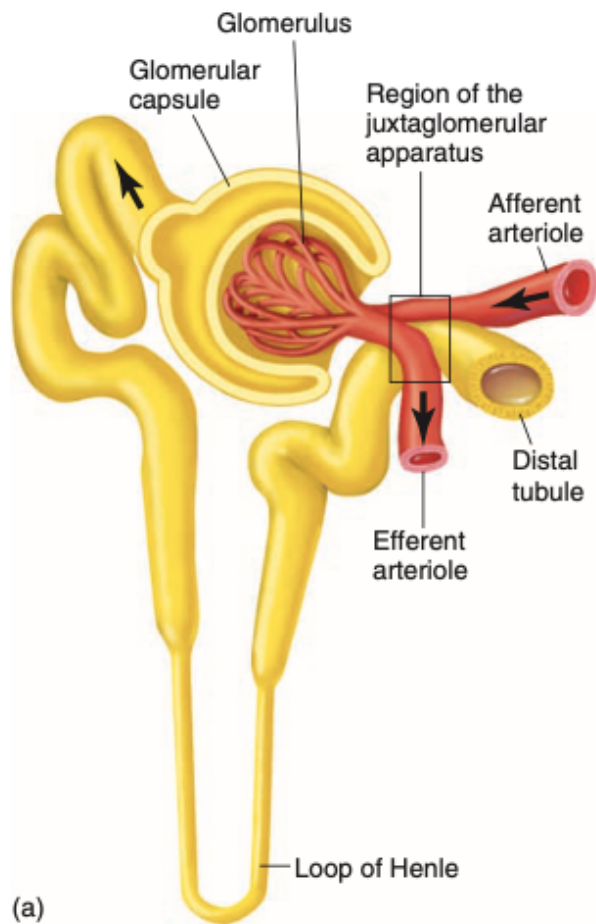


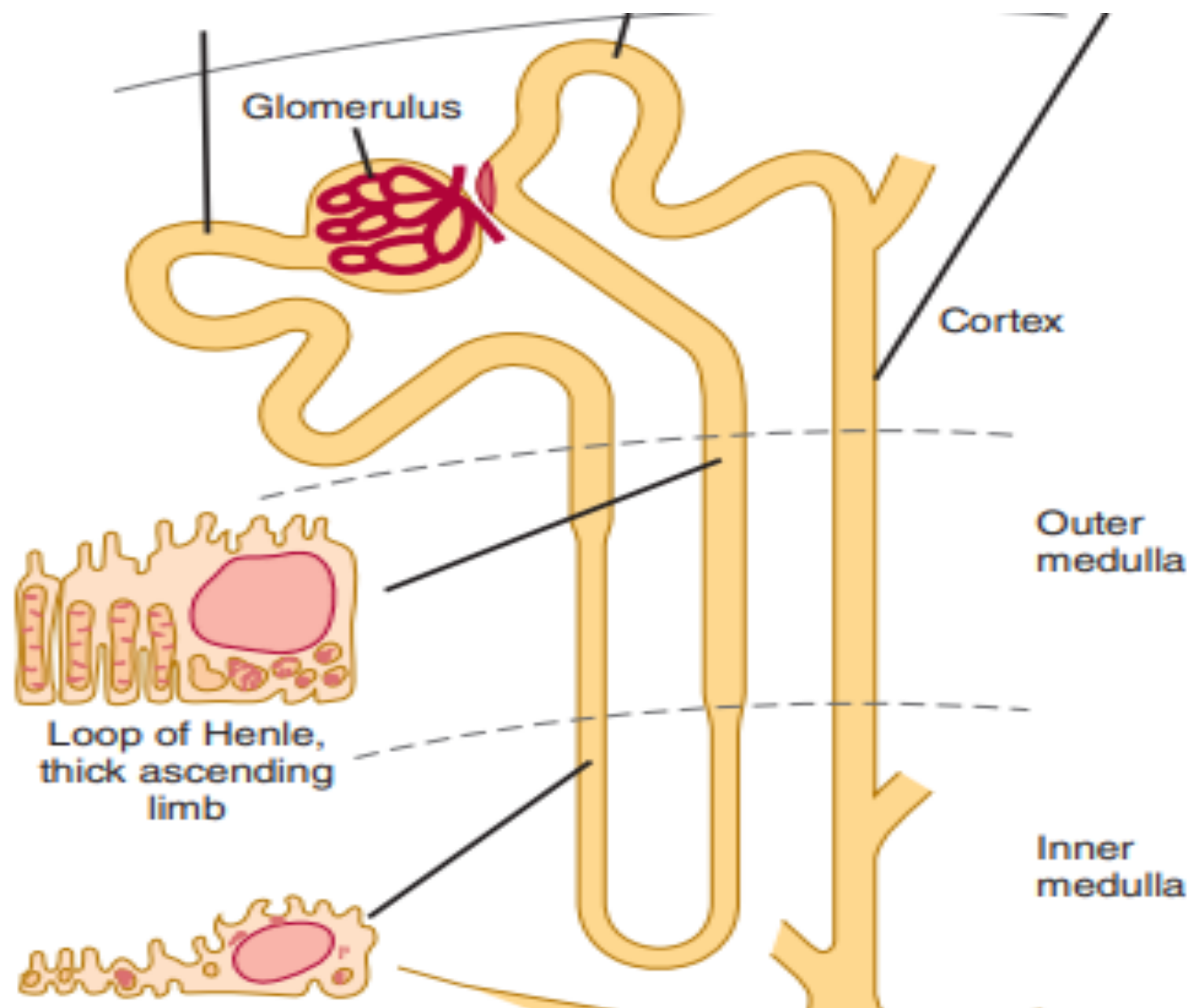
JGA & RAAS

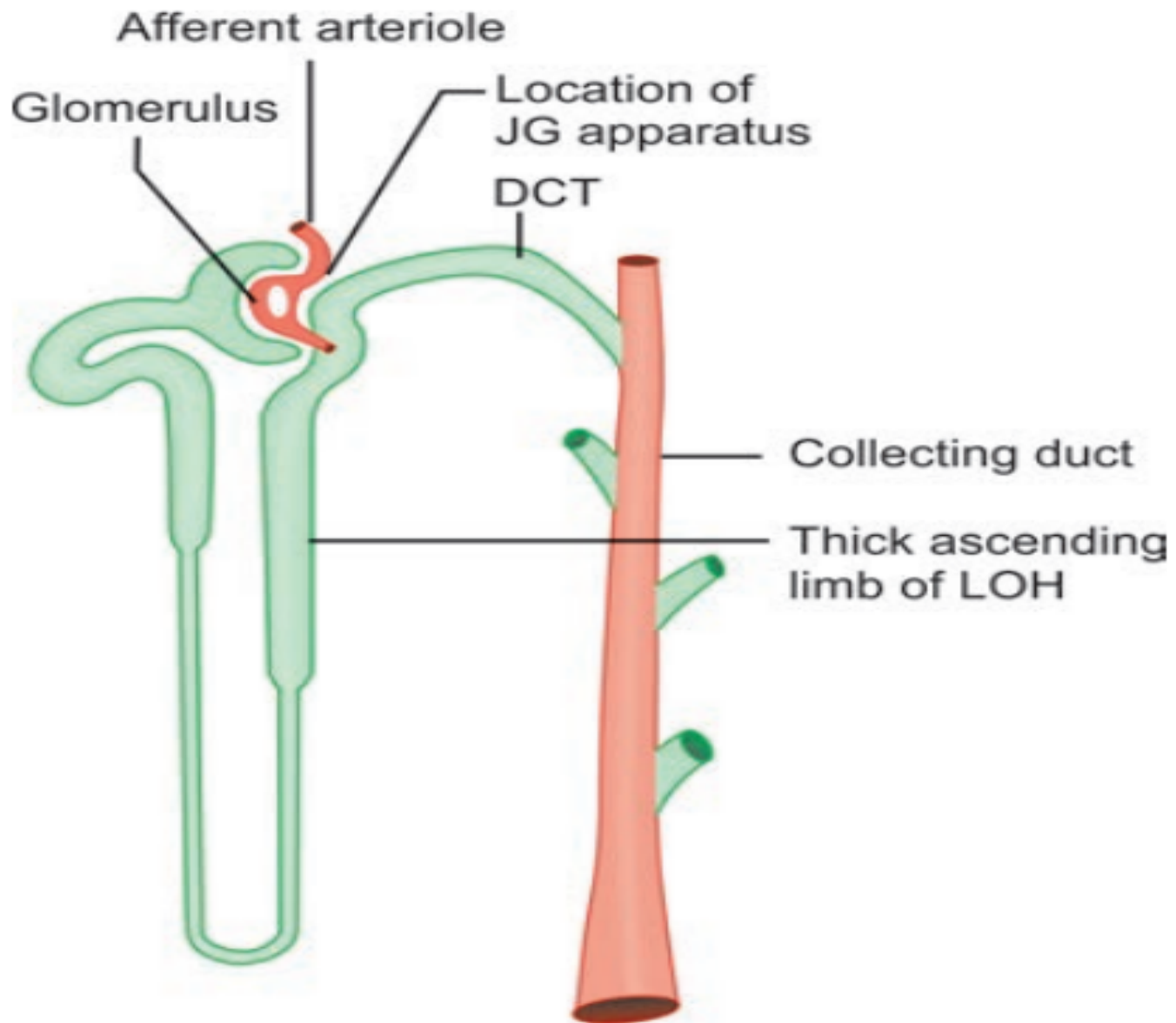




JUXTAGLOMERULAR APPARATUS(JGA)

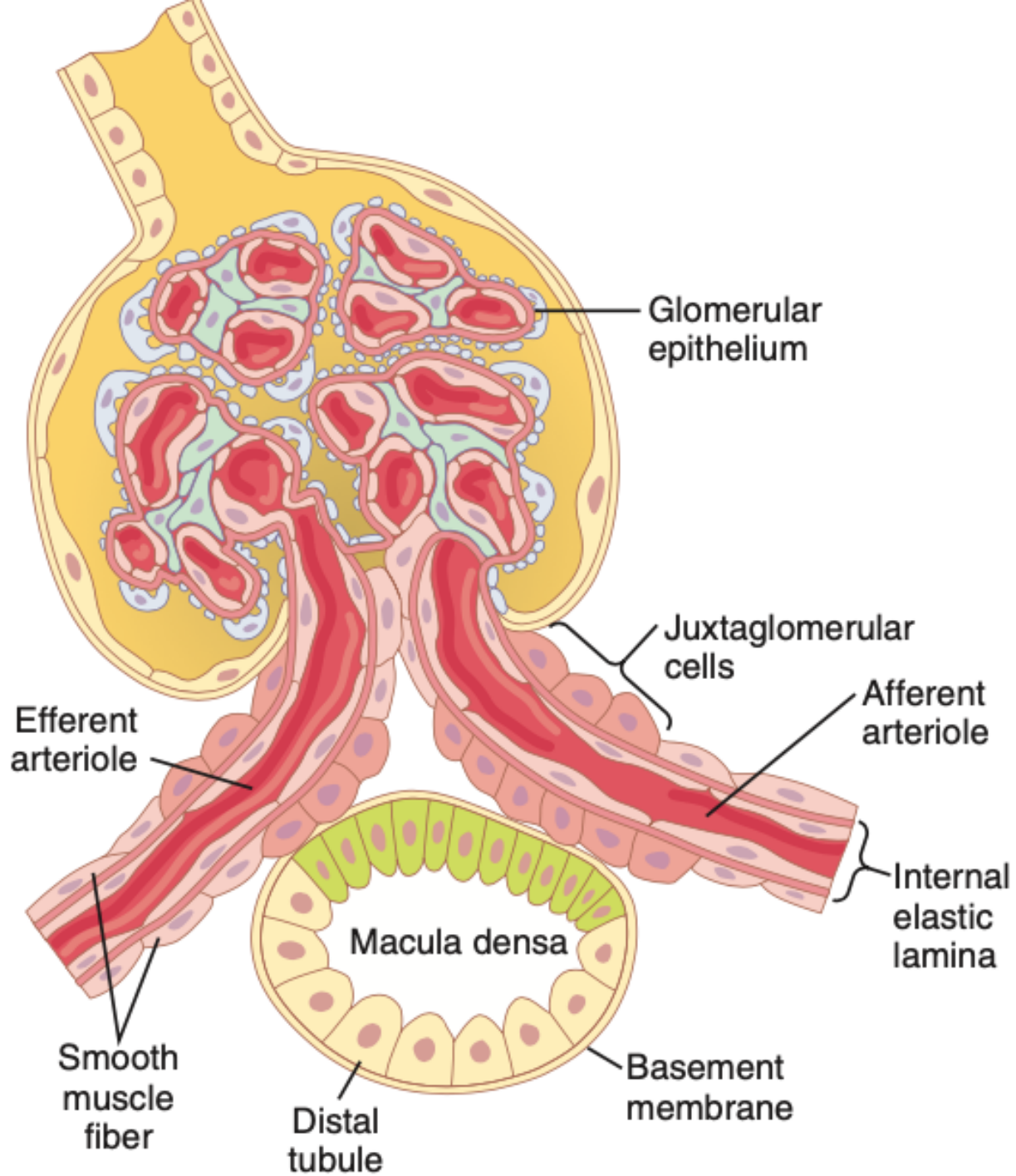
- Thick ascending LOH when comes in contact with the glomerulus of same corpuscle, structural modifications occur in the tubule & afferent and efferent arterioles.





JUXTAGLOMERULAR APPARATUS

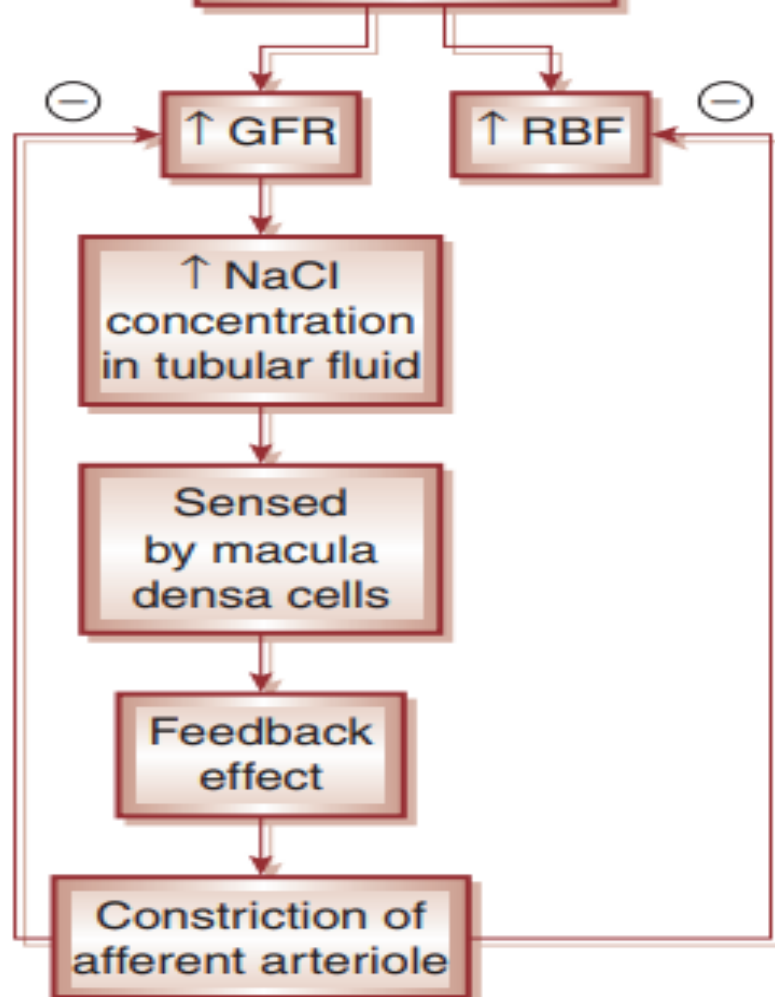
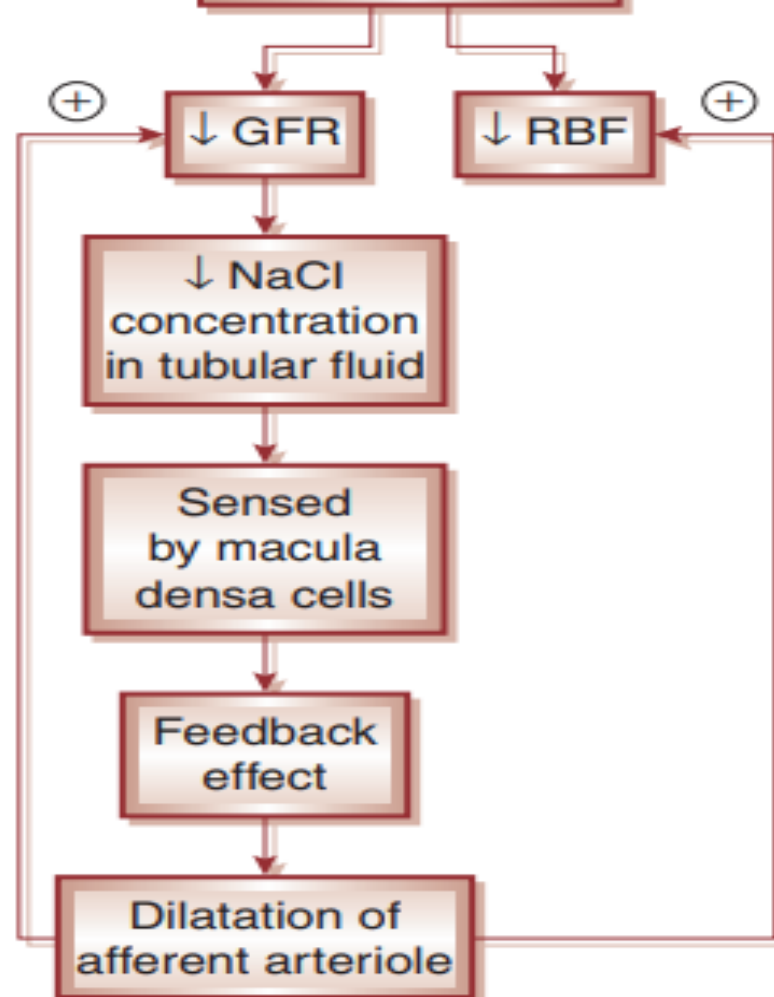
- Combination of specialized tubular & vascular cells & the cells between them.
- JGA is composed of:
 1. Macula densa cells
 2. Juxtaglomerular (JG) cells
 3. Lacis cells



MACULA DENSА CELLS

- Modified epithelial cells of thick ascending LOH (start of DCT) when it comes in contact with afferent & efferent arterioles supplying its glomerulus of origin.

- Acts as sensor : monitors ionic composition & rate of flow of tubular fluid in the tubular lumen.
- provides appropriate feedback signal to glomerulus to change the filtration so as to meet the need of kidney function.
- important component of tubuloglomerular feedback mechanism.

A**Increased renal arterial pressure****B****Decreased renal arterial pressure**

JUXTAGLOMERULAR(JG) CELLS

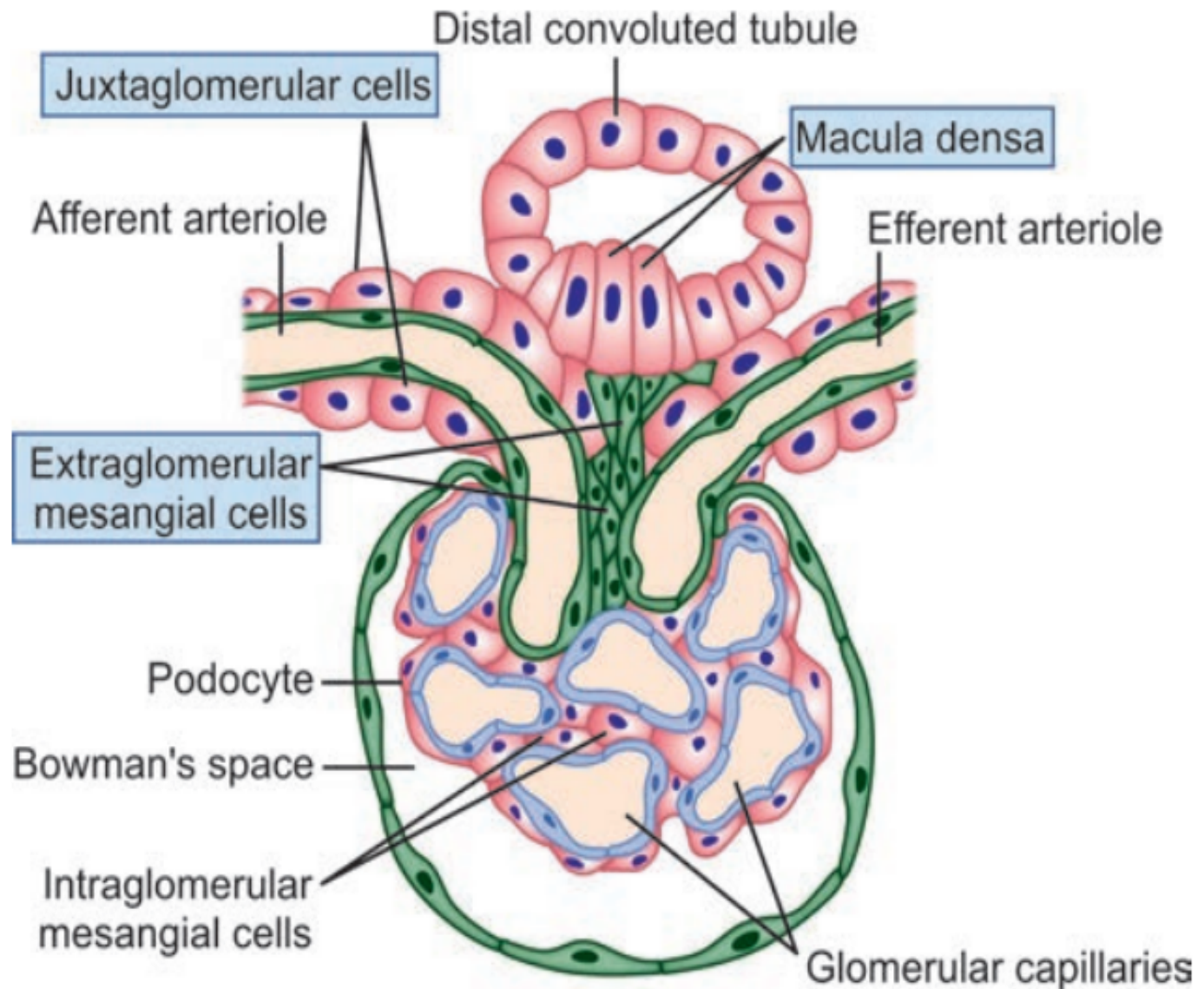
- Modified vascular smooth muscle cells present in the tunica media of the afferent arteriole that comes in contact with the terminal part of thick ascending LOH.
- Well developed Golgi apparatus, endoplasmic reticulum, abundant mitochondria & ribosomes.

- Highly granular as they contain secretory granules
- JG cells function :
 - synthesize, store (in the secretory granules) & release renin.

LACIS CELLS

- Present in the triangular space formed by efferent and afferent arterioles & the macula densa.
- Mesangial cells located outside the glomerulus hence called ***Extraglomerular Mesangial cells***.

- Agranular cells
- Secrete some quantity of renin & erythropoietin
- Contractile & play a role in regulation of glomerular filtration

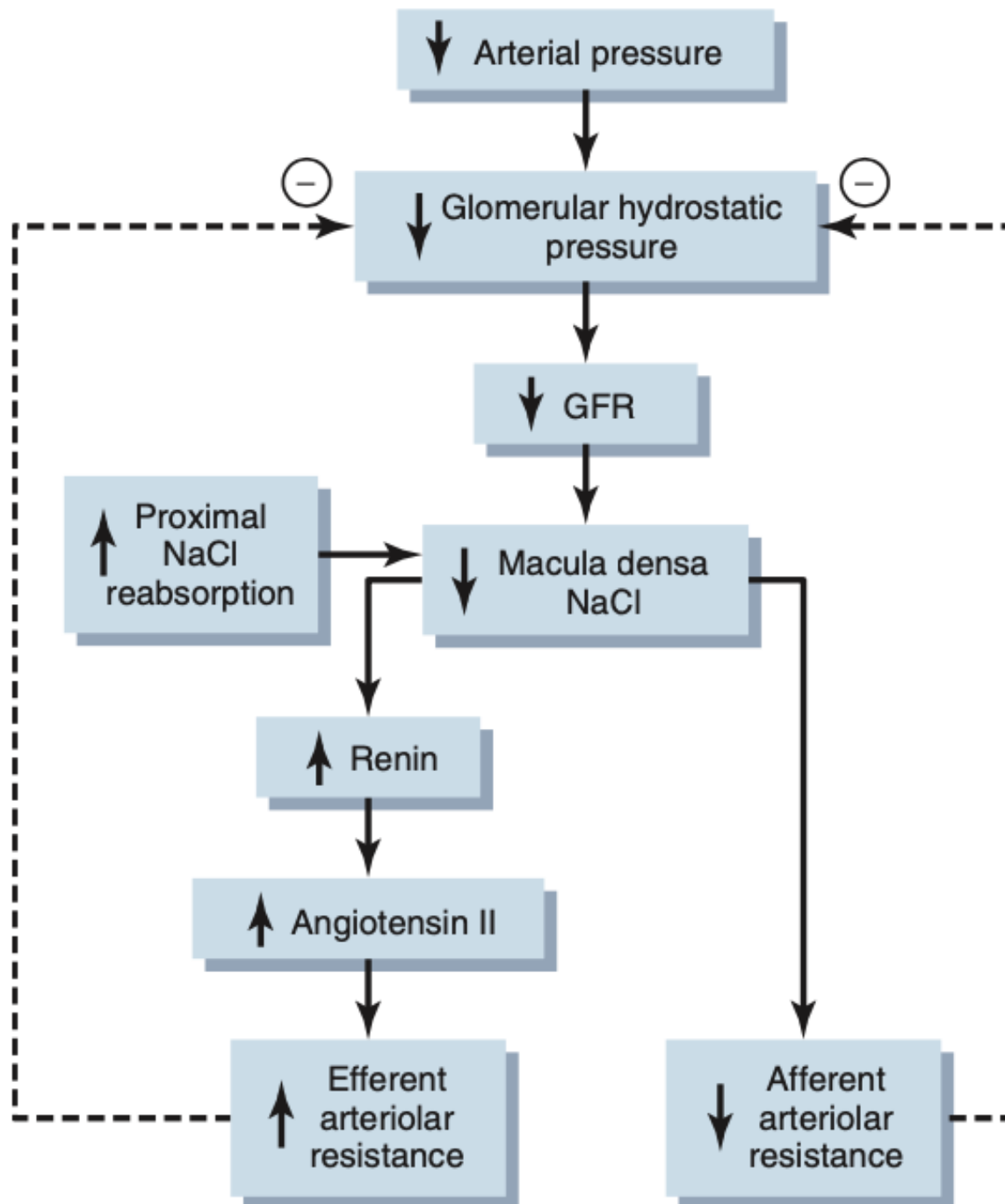


FUNCTIONS OF JGA

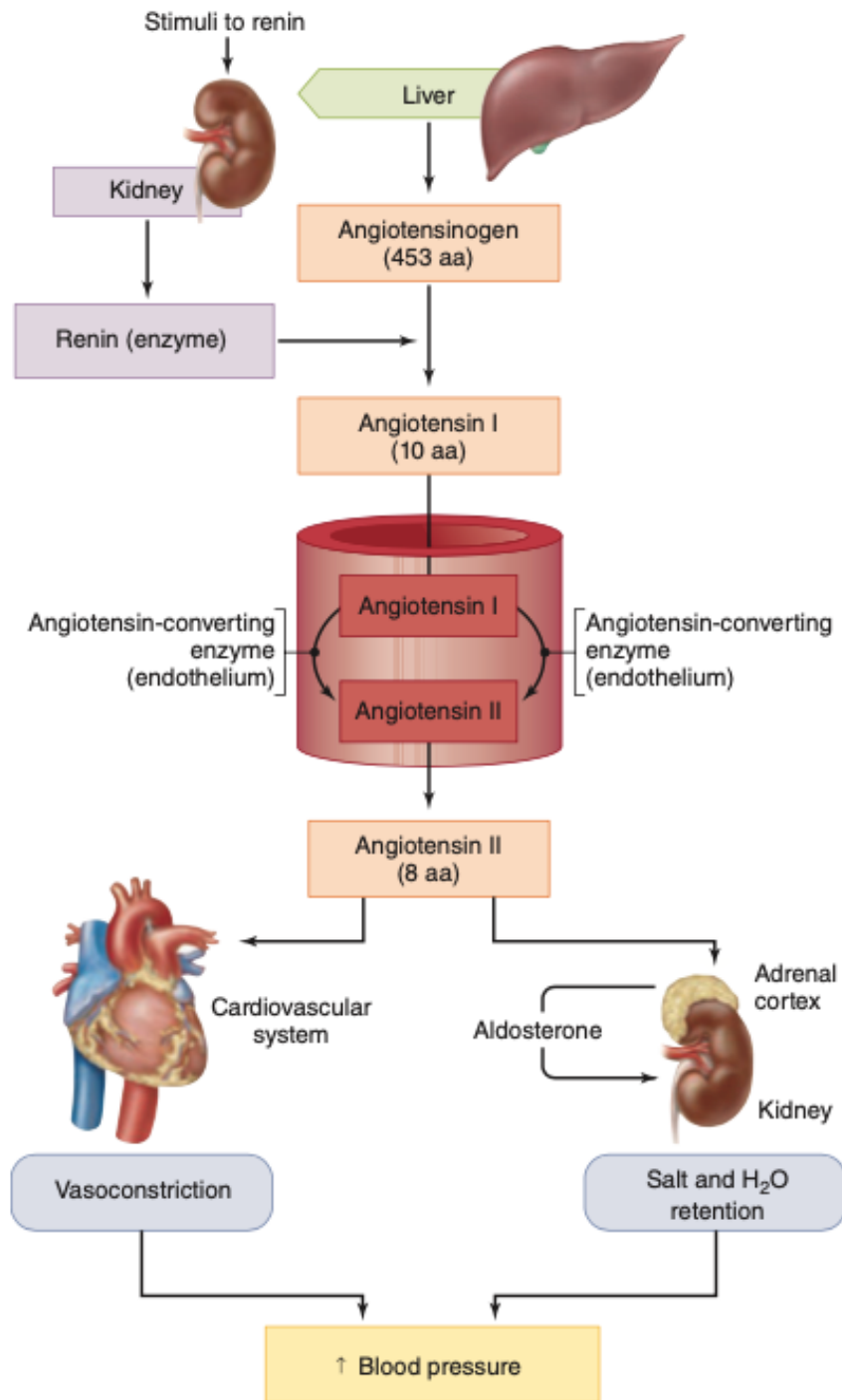
1. **JG cells** secrete renin → activate renin angiotensin system
→ regulation of blood volume & pressure.
2. **Macula densa** acts as sensor that detects the change in ionic composition & rate of flow of tubular fluid in the lumen.

- Provides appropriate feedback signal to glomerulus to change the rate of filtration which forms the physiological basis of tubuloglomerular feedback – thus, they control Glomerular filtration

3. **Lacis cells** secrete renin & erythropoietin.



RENIN ANGIOTENSIN SYSTEM



RENIN ANGIOTENSIN SYSTEM(RAS)

- Renin secreted from JG cells of kidney which activates angiotensinogen to angiotensin I which on further enzymatic action gets converted into angiotensin II, III and IV
- Primarily involved in the regulation of Blood pressure

RENIN

- Acid protease secreted from JG cells of kidney
- converts angiotensinogen into angiotensin I

	FACTORS INCREASING RENIN SECRETION	FACTORS DECREASING RENIN SECRETION
1.	Increase in sympathetic activity via renal nerves(hypovolemia, hypotension)	Increased blood pressure(stretch due to afferent arteriolar pressure)
2.	Decreased plasma Na ⁺ conc., increased K ⁺	Increased plasma Na ⁺ conc(via macula densa)
3.	Prostaglandins	ADH
4.	Increased circulating catecholamines	Angiotensin II
		ANP

- **ANGIOTENSINOGEN**

- Glycoprotein synthesized by liver.
- Precursor for synthesis of angiotensin I

- **ANGIOTENSIN-CONVERTING ENZYME (ACE)**

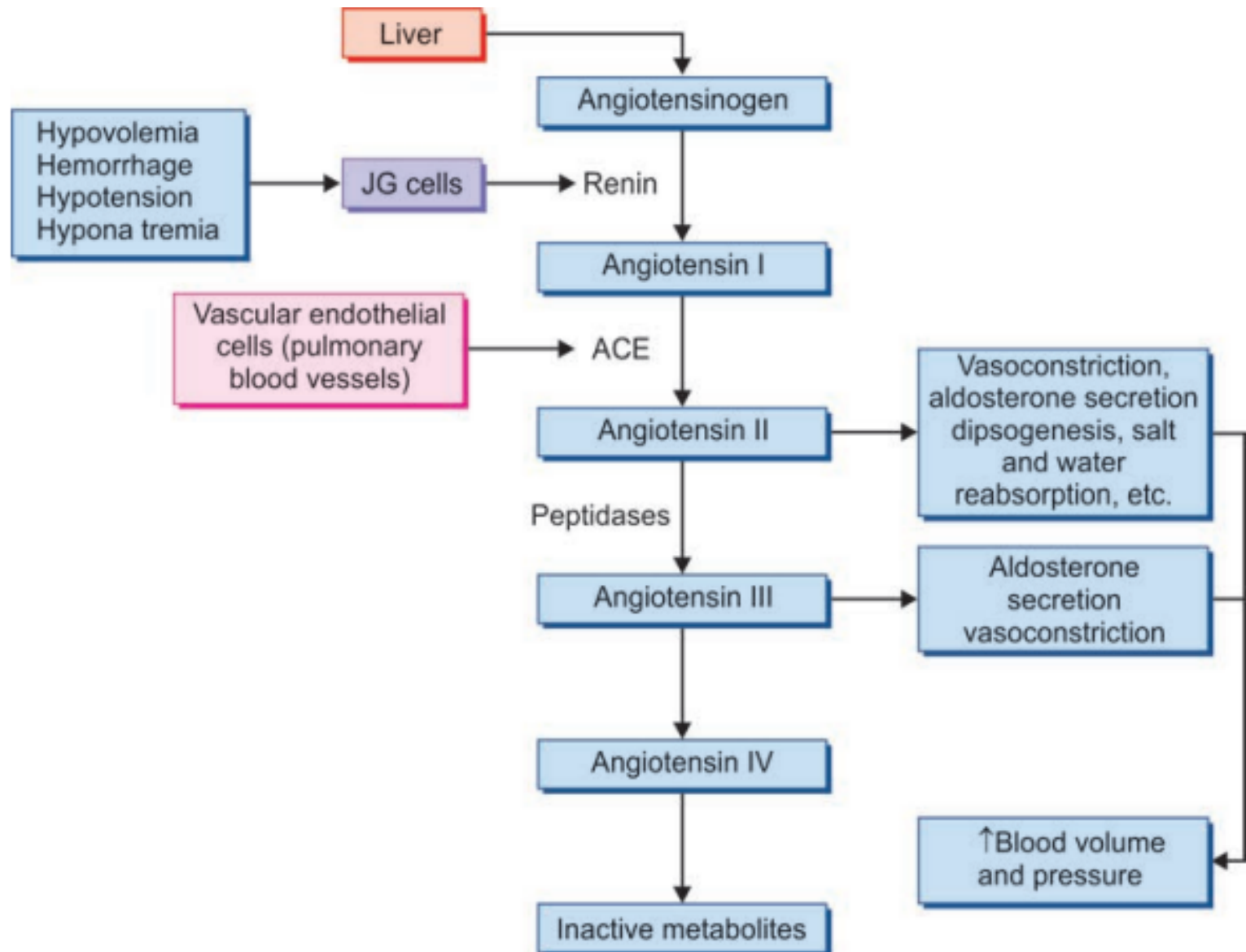
- Converts angiotensin I to II
- Synthesized & secreted by the endothelial cells of blood vessels throughout the body but major conversion of angiotensin I to II takes place in lungs

- **ANGIOTENSIN I**

- Physiologically inactive
- Precursor for angiotensin II

- **ANGIOTENSIN II**

- Most important among angiotensins
- All actions : increasing blood volume & blood pressure.

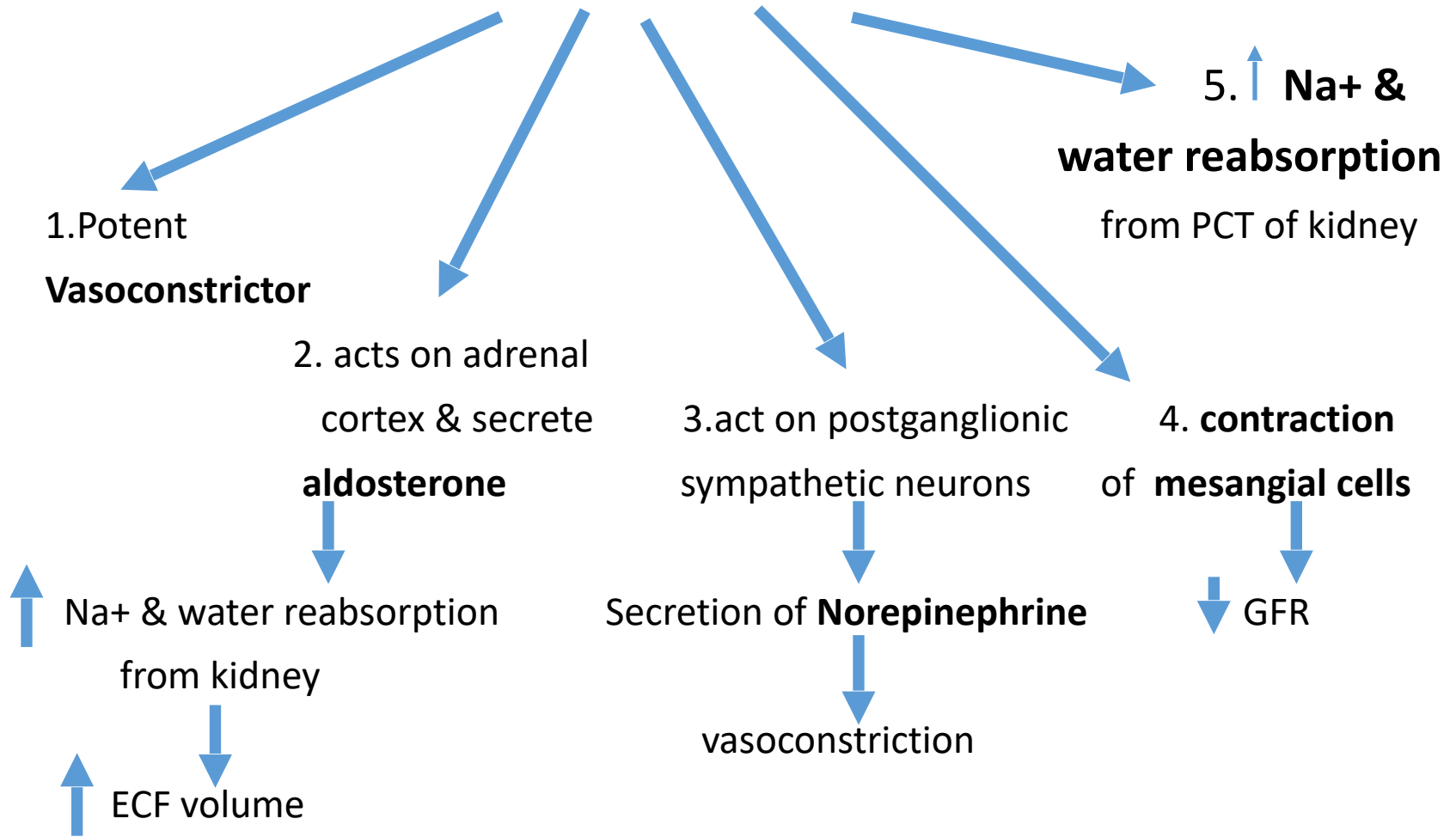


ANGIOTENSIN RECEPTORS

- 2 types: angiotensin 1 (AT1) & angiotensin 2 (AT2)
- AT1 present on arteries, adrenal cortex;
- AT2 present on fetus & neonates

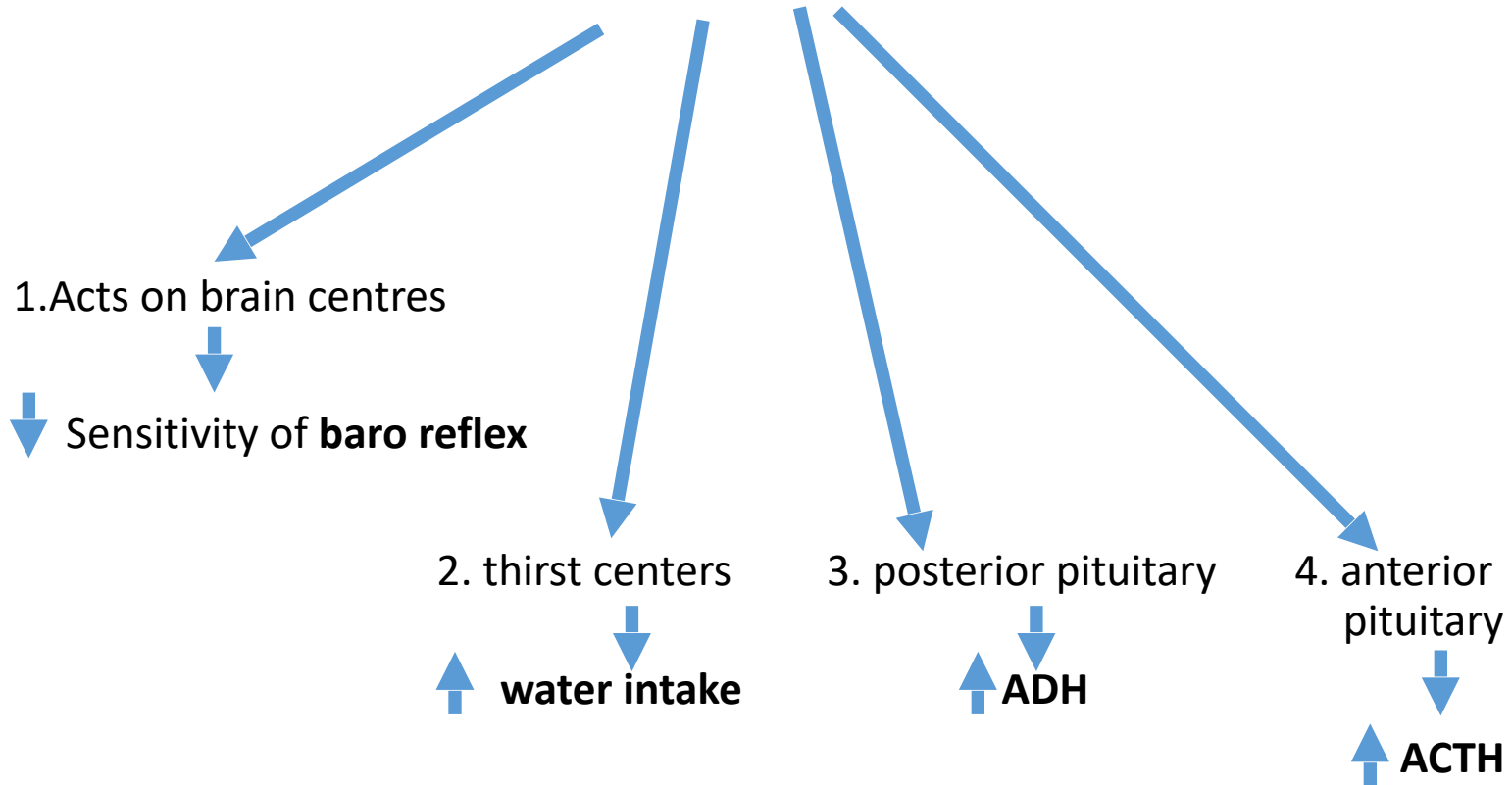
ACTIONS OF ANGIOTENSIN II

PERIPHERAL ACTIONS OF ANGIOTENSIN II (A II)



ACTIONS OF ANGIOTENSIN II

CENTRAL ACTIONS OF ANGIOTENSIN II(A II)



ANGIOTENSIN III & IV

- Angiotensin III has about 40% of the pressor activity of angiotensin II, but 100% of the aldosterone-stimulating activity
- Angiotensin IV is recently discovered angiotensin; has some biological activity in brain

APPLIED PHYSIOLOGY

- **ANTIHYPERTENSIVES** :

- ACE blockers :

- ENALAPRIL, CAPTOPRIL, RAMIPRIL.

- ARB (Angiotensin Receptor Blockers) :

- LOSARTAN, OLMESARTAN, TELMISARTAN.

IMPORTANT QUESTIONS

- Juxtaglomerular apparatus



THANK YOU!

