

# Central (systemic) regulation

## Neuronal regulatory mechanisms

### Vasoconstrictor fibers (VC)

↳ **Sympathetic (VC)** → They discharge continuously leading to VC → called sympathetic VC tone.

↳ **parasympathetic VC fibers** . no VC parasympathetic directly.  
↳ coronary vasoconstriction . after bradycardia . (indirectly)

### Vasodilator fibers (VD)

↳ **Sympathetic (VD)** :- all sympathetic innervation to blood vessels is VC, except:

- 1) **Coronary vessels** :- THR → ↓ O<sub>2</sub> tension → accumulation of metabolites → VD
- 2) **Skeletal muscles** :- VD → cholinergic → Ach, they start operate even before the start of the exercise.  
↳ activated by sudden strong emotions → ↓ VD "marked" → ↓ BP → syncope.
- 3) **Splanchnic areas** : Stimulate β receptor to VD
- 4) **Sympathetic to sweat gland** : VD → It controlled by heat loss center.

↳ **Parasympathetic VD fibers** : the only parasympathetic which are definitely VD → genital organ (sacral out-flow)

↳ VD to salivary gland by facial and glossopharyngeal nerve by increasing metabolic activity.

↳ **Antidromic vasodilator impulses** :- when pain receptors are stimulated by pain → produces dilatation of adjacent blood vessels . (reflex) -  
↳ don't involve CNS

\* impulse of pain travel toward CNS, until they reach a branch, they travel along it (antidromically), when they reach arterioles, they release **Substance P** → VD → so inflammation area become red.

## Hormonal regulatory mechanisms

### Circulating VC substances :-

① Catecholamine → noradrenaline → α → VC  
↳ Adrenaline → β<sub>2</sub> → VD <sup>the goal</sup>

② **Renin-angiotensin-system** "↑BP, ↑aldosterone"  
↳ strong arteriolar VC so ↑ peripheral resistance.  
↳ Aldosterone release → from suprarenal gland  
↳ ↑ ADH (vasopressin) → from pituitary gland  
↳ Stimulate NA release from postganglionic sympathetic fibers.  
↳ ↑ thirst sensation  
↳ Salt and water retention  
↳ Some angiotensin II → angiotensin III

③ **ADH** → (vasopressin / Antidiuretic hormone) → goal → ↑ blood volume  
↳ act on V<sub>1</sub> receptor in vascular SM → ↑ BP  
↳ act on V<sub>2</sub> receptor in nephron → ↑ permeability to water, urea, some solute → ↑ BP  
↓ urine volume  
↑ BP / ↑ BF

### Circulation VD substances

① Kinins → plasma Kinins (bradykinin) } ← Kininogen.  
↳ tissue Kinin (Kallidin)

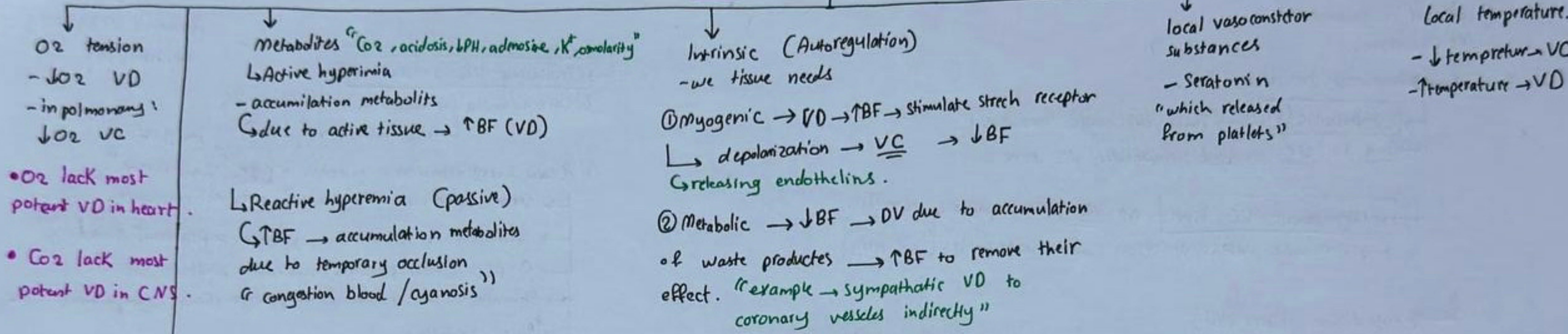
Action :- ① Positive chemotaxis  
② ↑ permeability  
③ ↑ pain receptor  
④ VD in active salivary gland.  
⑤ Contraction of smooth muscle in respiratory system.

② **Atrial Natriuretic Peptide** :- From atria  
↳ secreted when (goal ↓BP) → ① NaCl intake increased  
② Blood volume increased  
③ Immersion in water up to neck ↑ VR  
④ ↑ central venous pressure  
⑤ ↑ intra ventricular pressure.

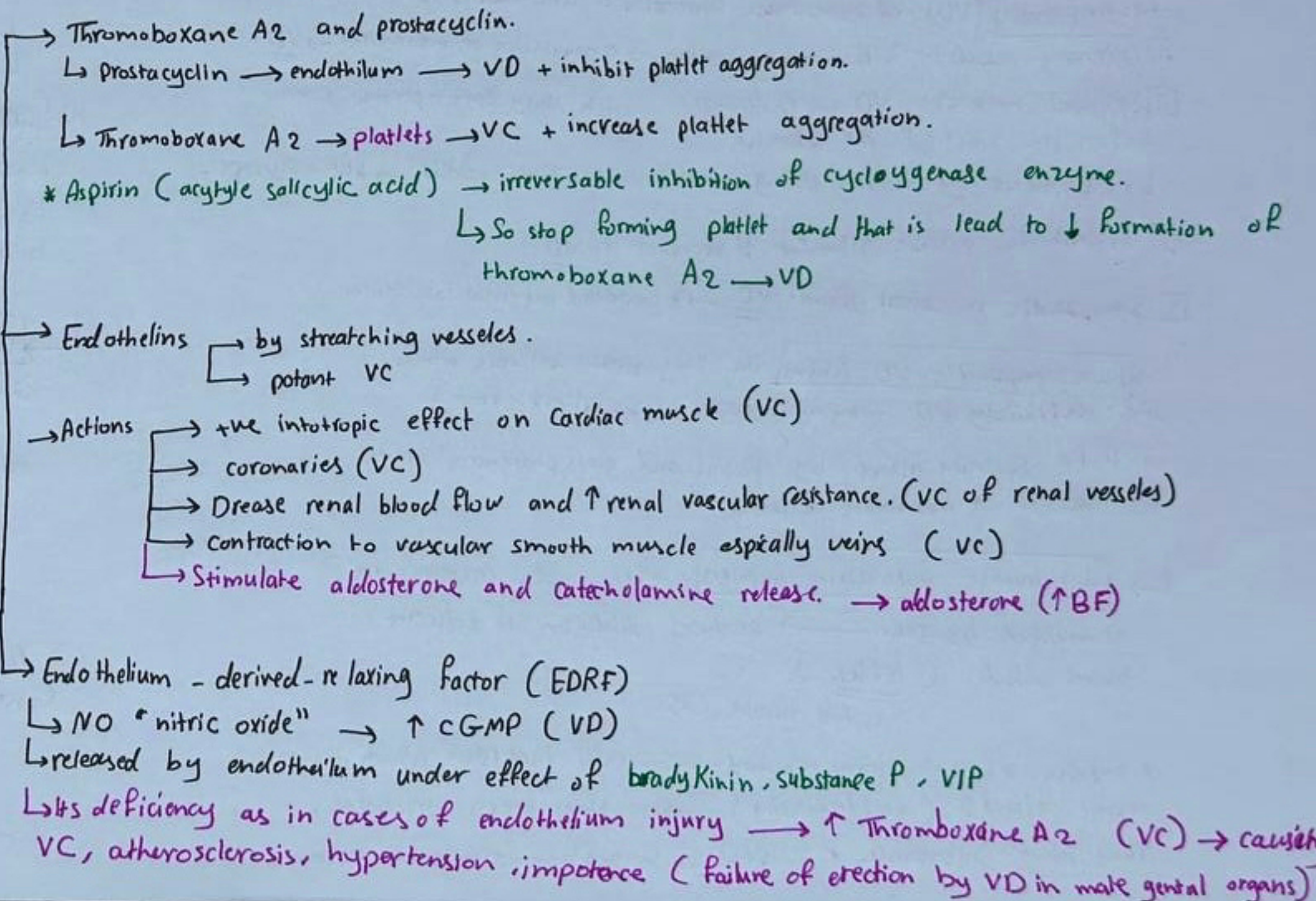
↳ Action → natriuresis  
↳ VD  
↳ ↓ aldosterone, ↓ renin, ↓ ADH

\*regulation of diameter of arterioles \*

local regulation mechanisms



Substances released by the endothelium



- \* Characters of arteriole
- ↑ S.M layer
  - great resistance
  - sensitive to chemicals like hormone, gases
  - has sympathetic and parasympathetic fibers
  - its endothelium synthesize chemical mediator
  - only site at which arterioles can be seen in retina.

- \* Function of arterioles
- peripheral resistance
  - control Blood flow by changing their diameter.