

**M U N I**  
**M E D**

# **Autonomic nervous system**

# Autonomic nervous system

## AUTONOMIC PATHWAYS

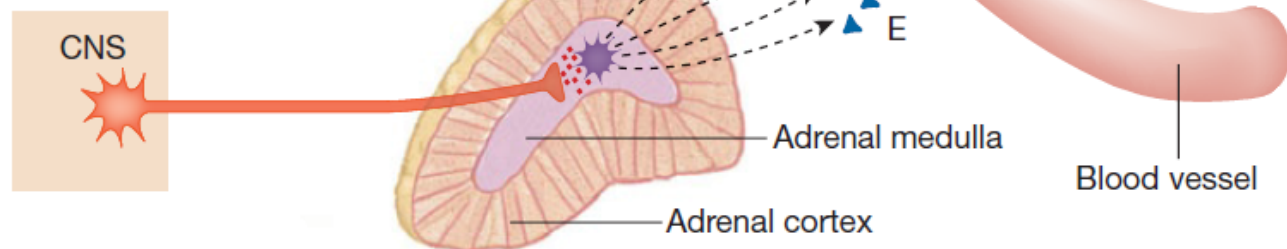
### (a) Parasympathetic Pathway



### (b) Sympathetic Pathway



### (c) Adrenal Sympathetic Pathway



# Autonomic nervous system

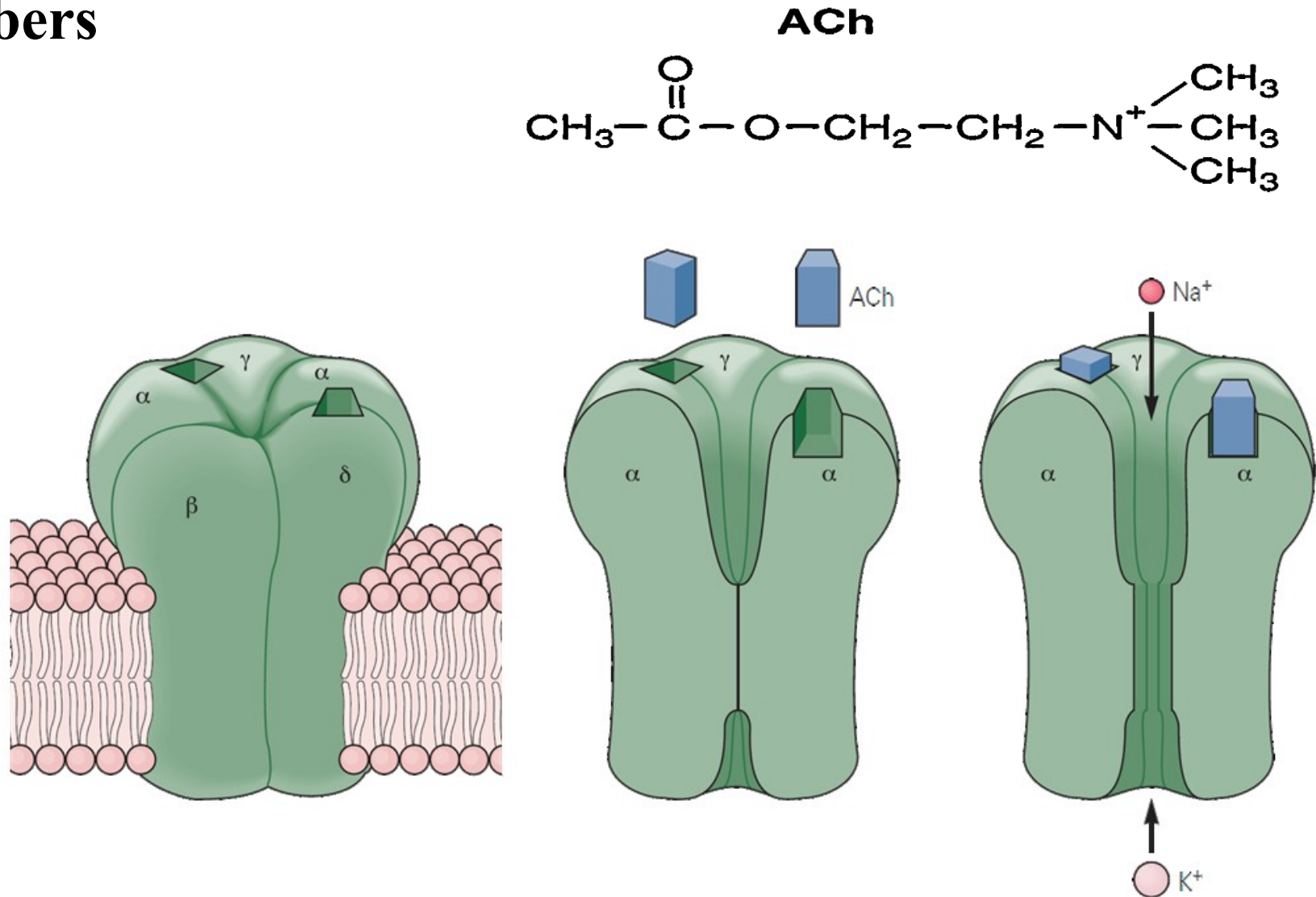
## Preganglionic fibers

SNS, PNS

*Nicotinic recep*

N<sub>N</sub> type and N<sub>M</sub> type

Excitatory receptors



# Autonomic nervous system

## Postganglionic fibers

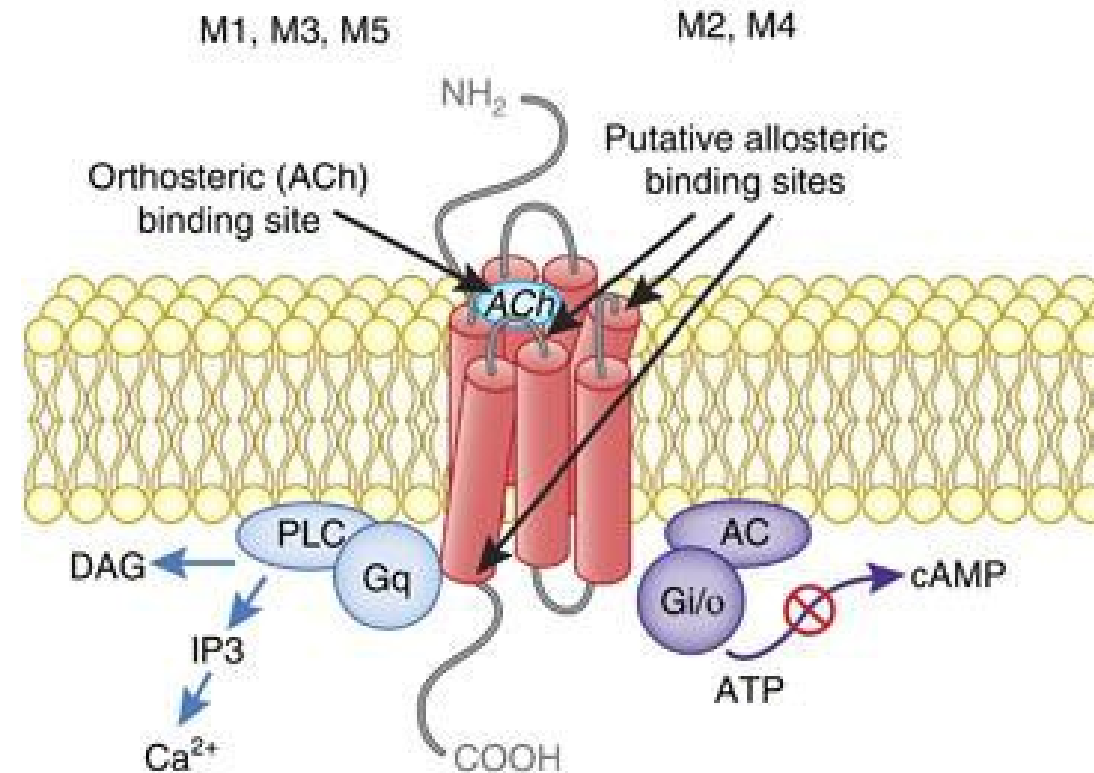
- PNS

- *Muscarinic receptor*

  - G-protein coupled

  - Excitatory receptors ( $M_1$ ,  $M_3$ ,  $M_5$ )

  - Inhibitory receptors ( $M_2$ ,  $M_4$ )



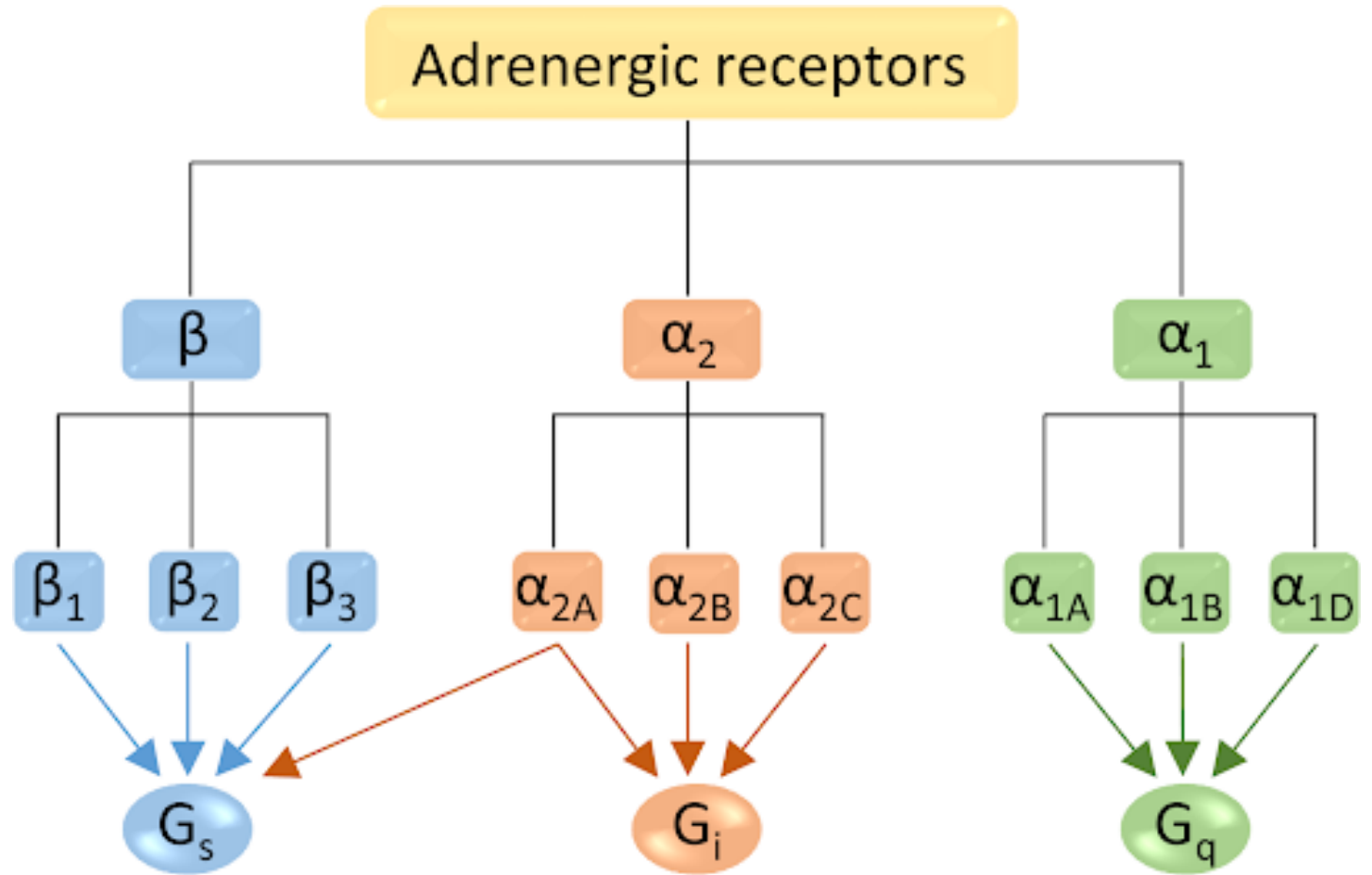
# Autonomic nervous system

□ Postganglionic fibers

□ SNS

□ *Adrenergic receptor*

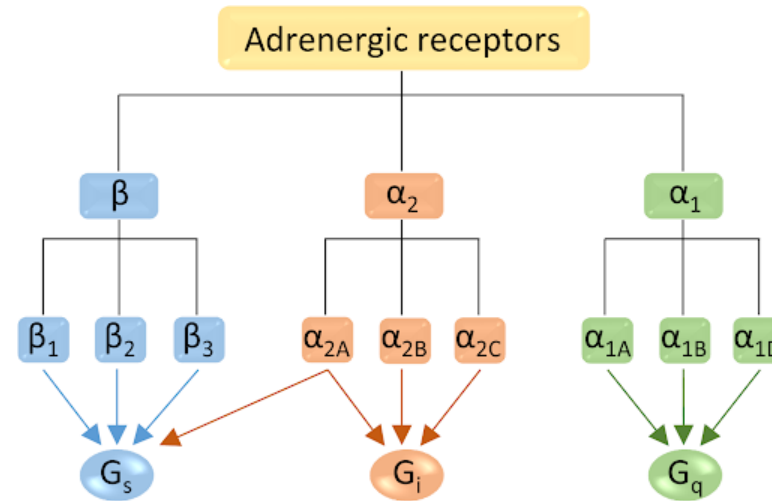
□ G-protein coupled



# Autonomic nervous system

## *Adrenergic receptor*

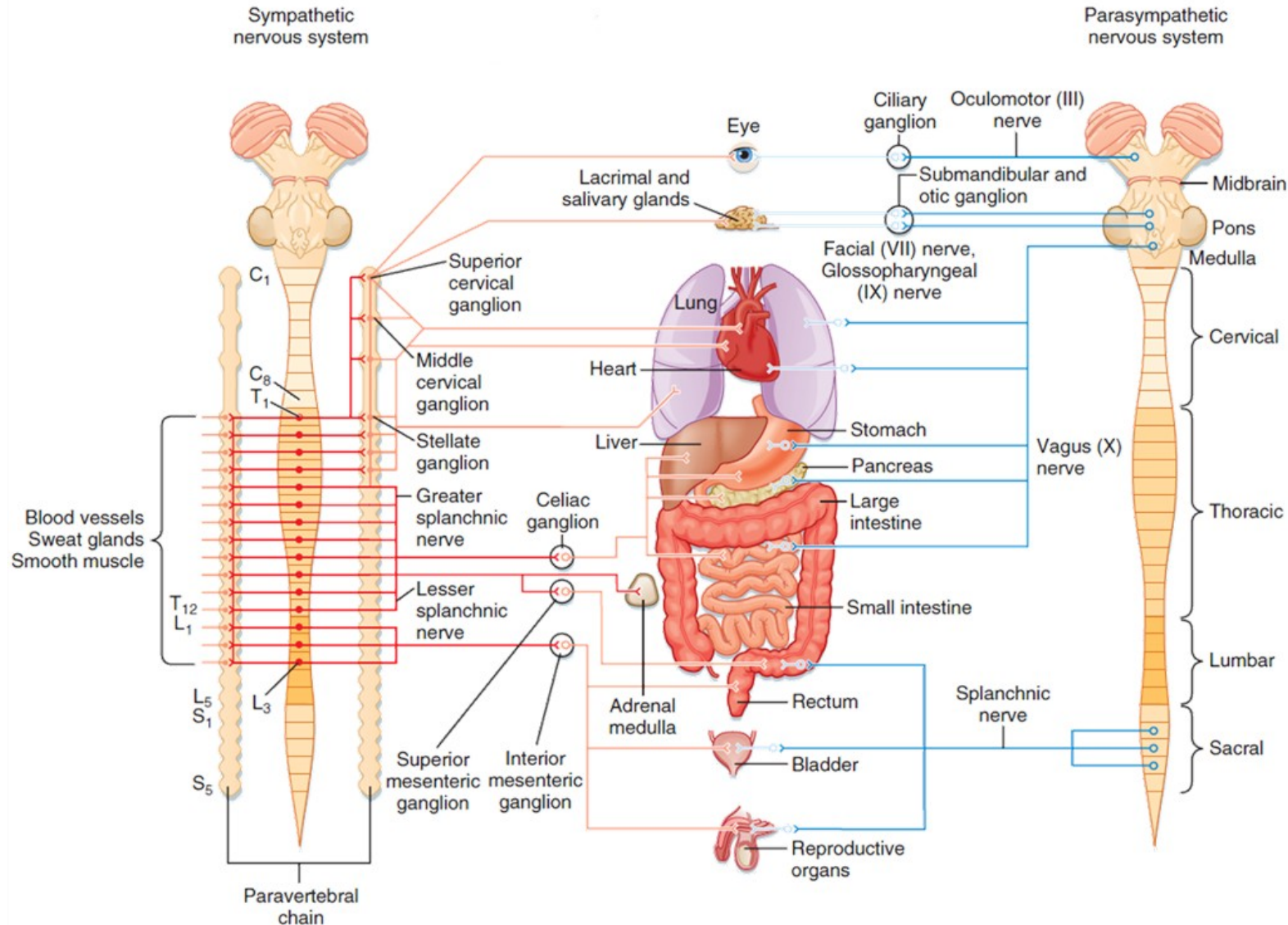
- G-protein coupled
- Type  $\alpha$  – Excitatory receptors
- Type  $\beta$  – Inhibitory receptors



Receptor Type	Primary Mechanism of Action	Examples of Tissue Distribution	Examples of Action
$\alpha_1$	$\uparrow$ IP3 and $\text{Ca}^{++}$ , DAG	Sympathetic postsynaptic nerve terminals	Increase vascular smooth muscle contraction
$\alpha_2$	$\downarrow$ cAMP	Sympathetic presynaptic nerve terminals, beta cell of pancreatic islets	Inhibit norepinephrine release, inhibit insulin release
$\beta_1$	$\uparrow$ cAMP	Heart	Increase cardiac output
$\beta_2$	$\uparrow$ cAMP	Liver; smooth muscle of vasculature, bronchioles, and uterus	Increase hepatic glucose output; decrease contraction of blood vessels, bronchioles, and uterus
$\beta_3$	$\uparrow$ cAMP	Liver, adipose tissue	Increase hepatic glucose output, increase lipolysis

# Autonomic nervous system

FIGHT OR FLIGHT



REST OR DIGEST

# Brain control of ANS

## Autonomic centers—brain stem and hypothalamus

### 1. Medulla

- Vasomotor center
- Respiratory center
- Swallowing, coughing, and vomiting centers

### 2. Pons

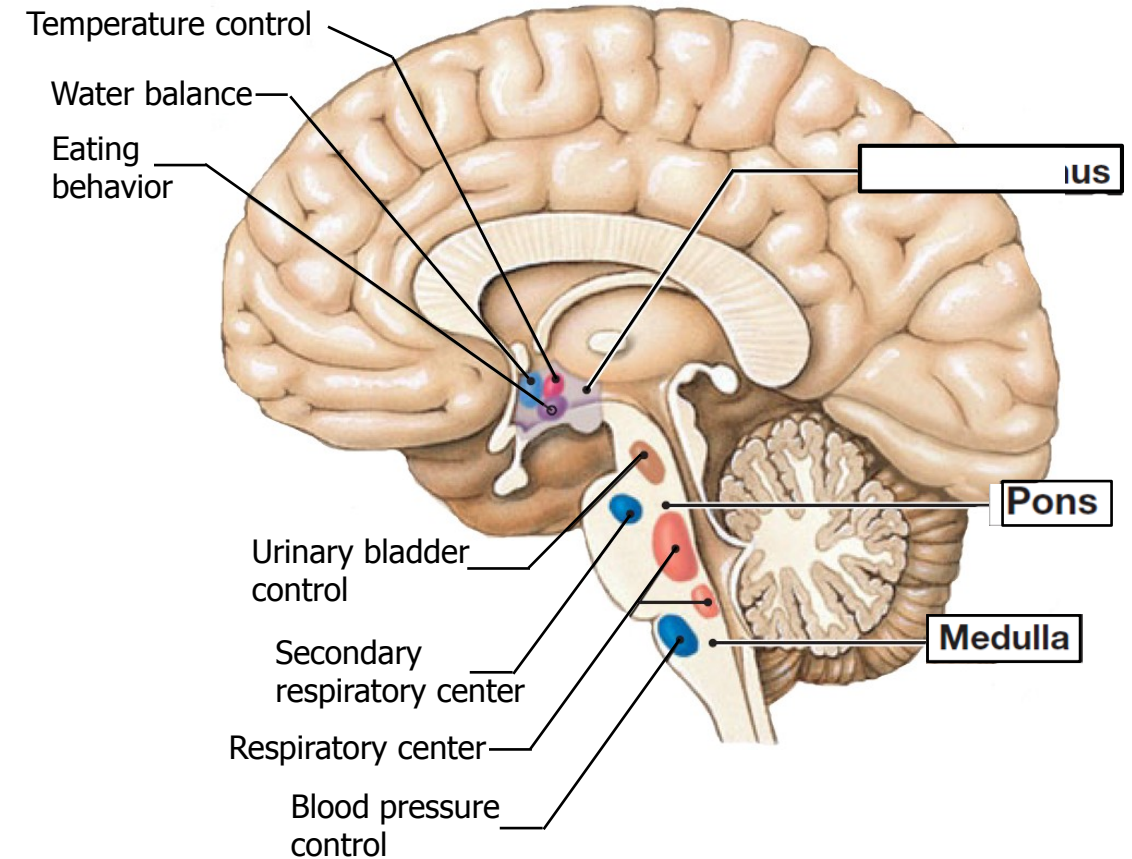
- Pneumotaxic center

### 3. Midbrain

- Micturition center

### 4. Hypothalamus

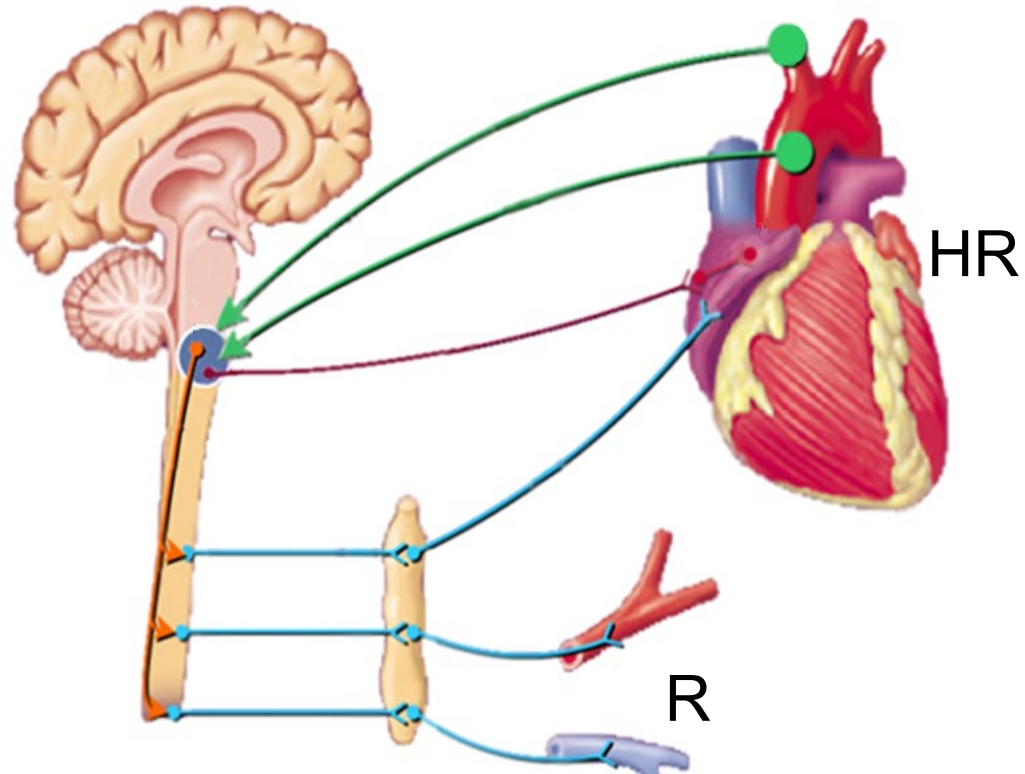
- Temperature regulation center
- Thirst and food intake regulatory centers



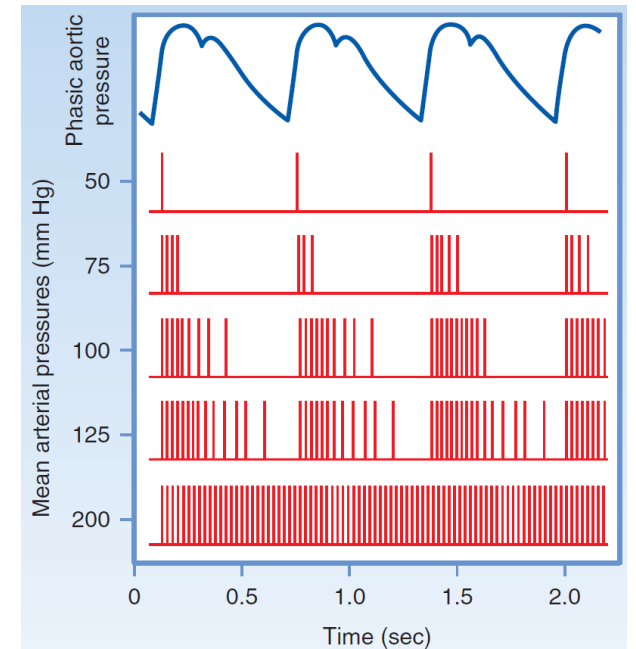


# Baroreflex I

- Aferent pathway
- Parasympathetic pathway
- Sympathetic pathway

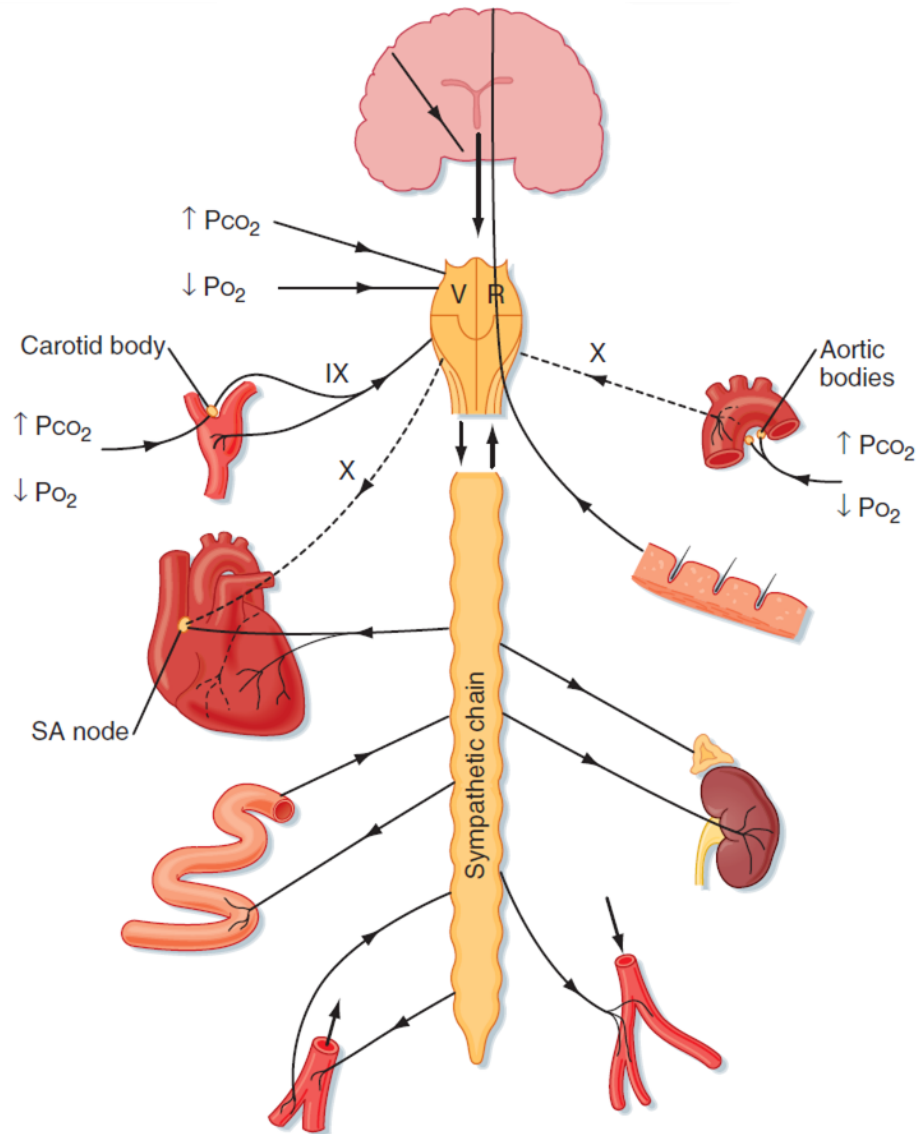


- Inotropic
  - Chronotropic
  - Dromotropic
  - Batmotropic
- } effect



$$BP = HR \times SV \times R$$

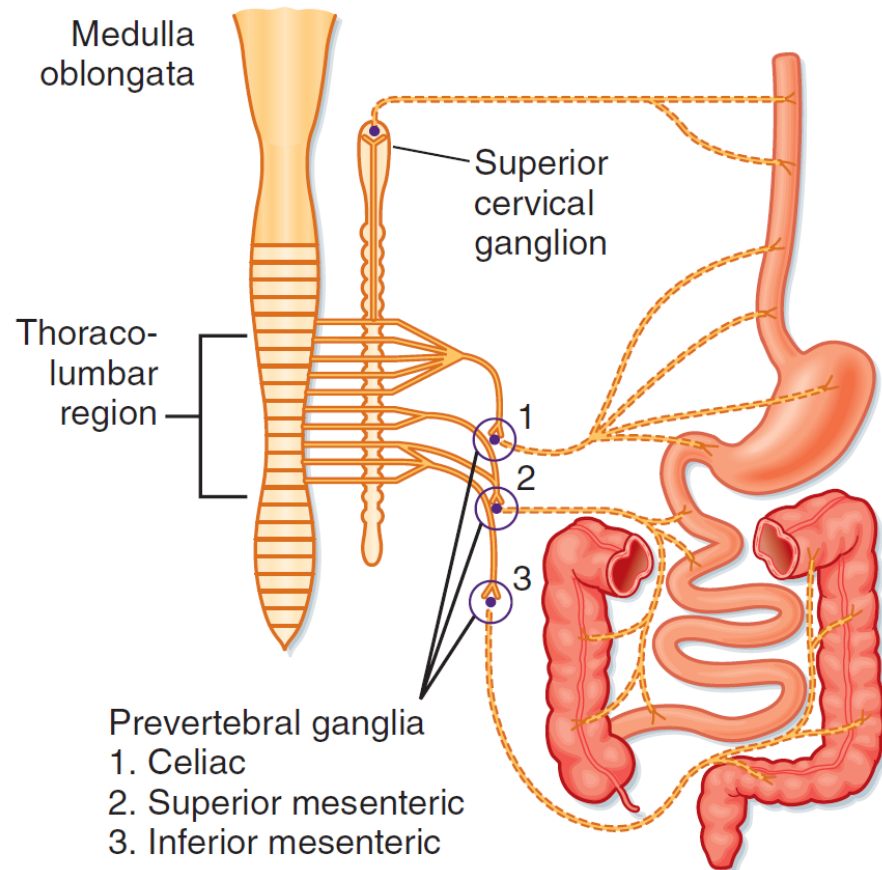
# ANS and blood vessels



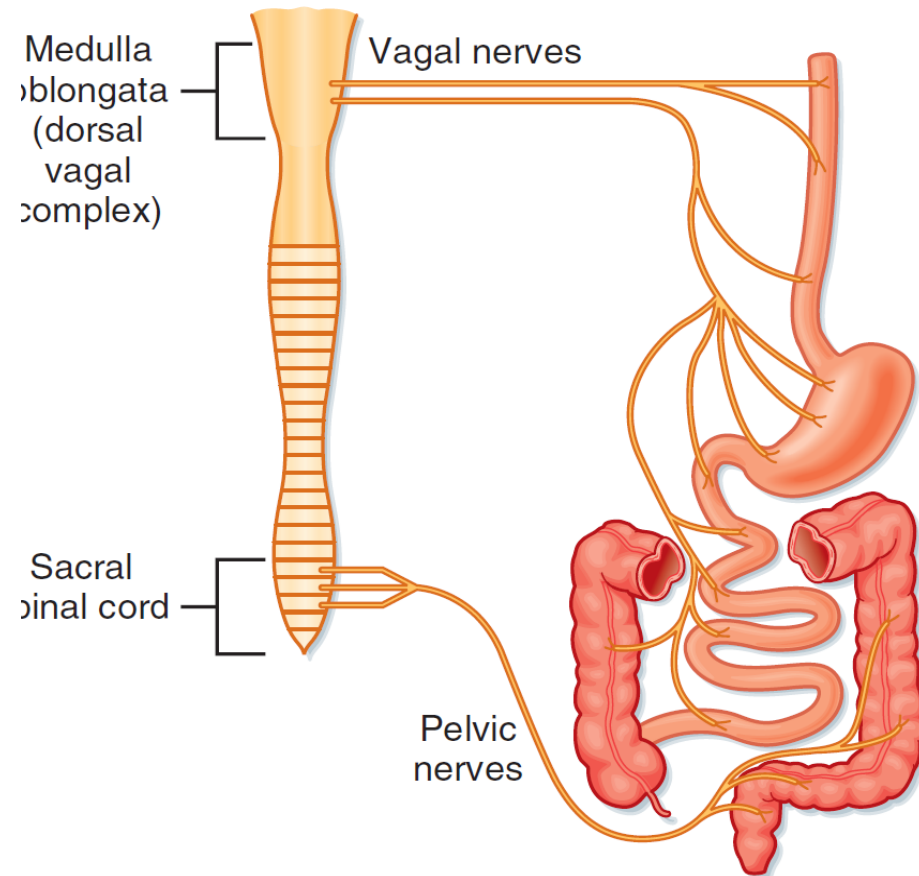
EFFECTORS	RECEPTORS	ADRENERGIC REACTION
CORONARY A.	$\alpha, \beta_2$	C, D
SKIN A.	$\alpha$	C
SKELETAL MUSCLE	$\alpha, \beta_2$	C, D
BRAIN A.	$\alpha$	C
LUNGS A.	$\alpha, \beta_2$	C, D
ABDOMENAL A.	$\alpha, \beta_2$	C, D
VEINS	$\alpha, \beta_2$	C, D

# GIT and ANS

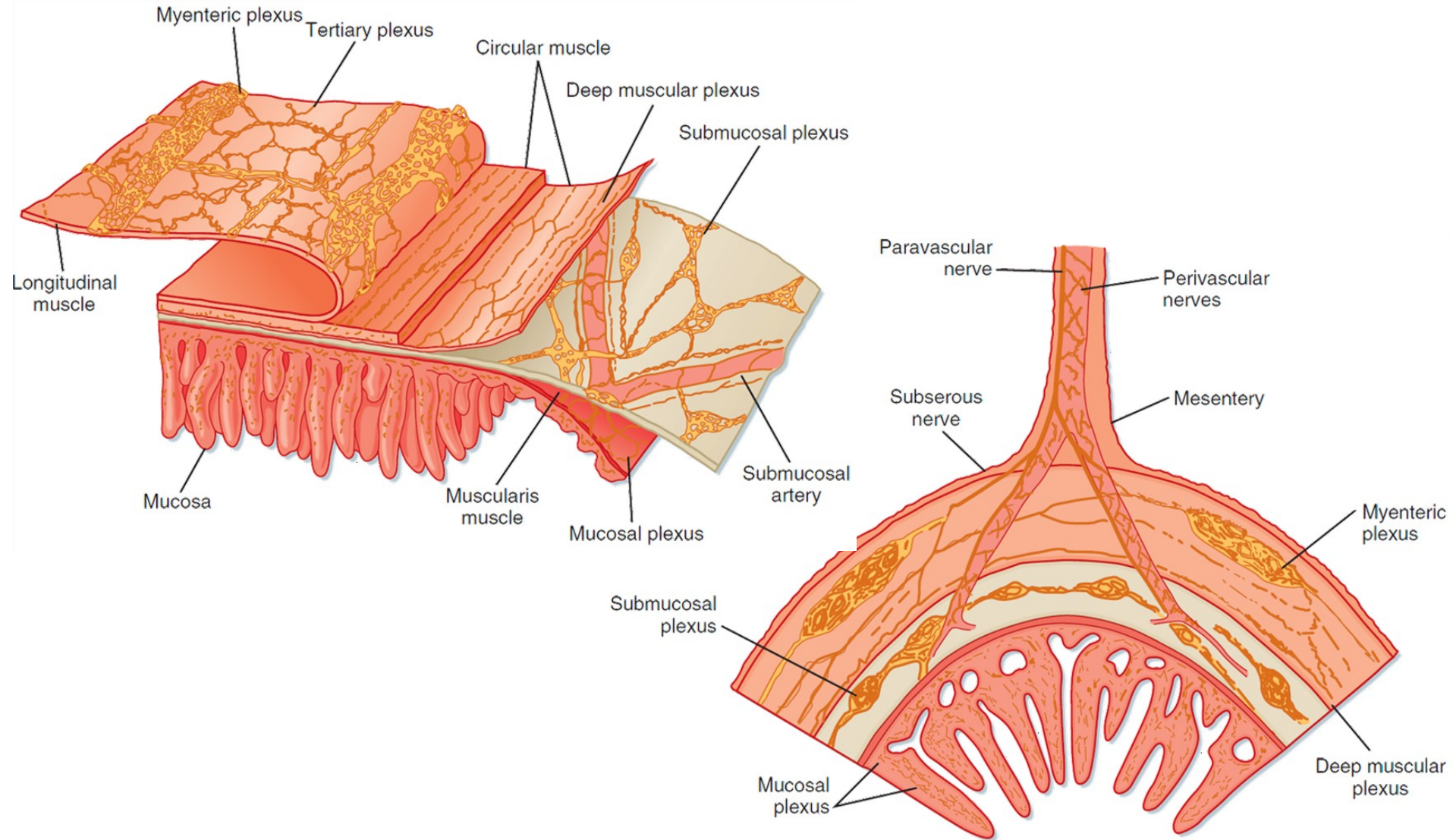
## SNS



## PNS



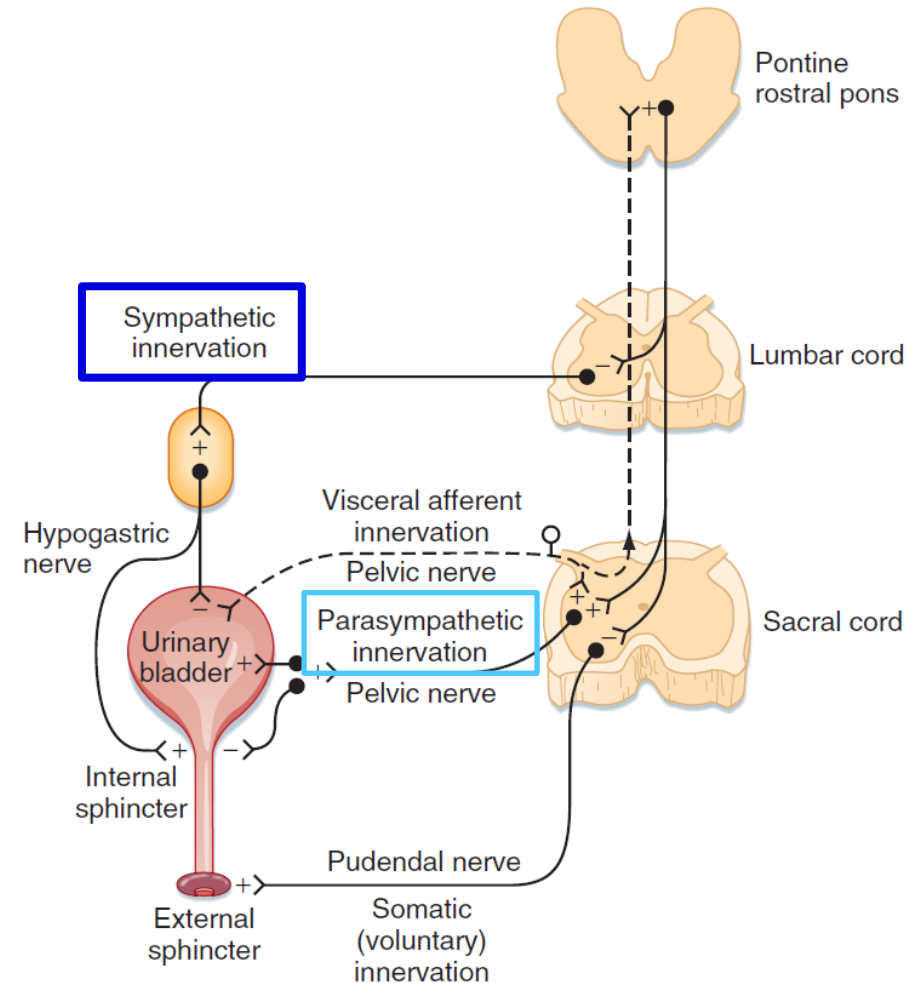
# GIT - Enteric Nervous System



# ANS and urinary bladder

SNS	
DETRUSOR	RELAXATION
SPHINCTER	CONTRACTION

PSN	
DETRUSOR	CONTRACTION
SPHINCTER	RELAXATION



**Thank you for your attention**