

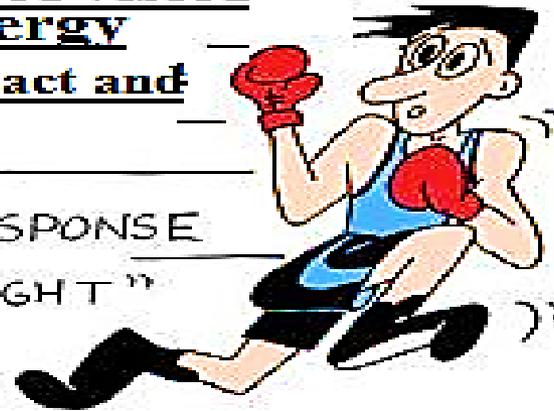
Autonomic Nervous System-2

increases the field of vision
provides energy
inhibits gastrointestinal tract and
urinary bladder activities

SYMPATHETIC
= STRESS

SS

S VC of all BVs
SYMPATHETIC RESPONSE
"FIGHT OR FLIGHT"
(STRESS)



Increases of gland secretion
Increases of motility and evacuation
VD of blood vesseles

PARASYMPATHETIC
= PEASE

OR SLEEP
PP



P PARASYMPATHETIC RESPONSE
"REST & DIGEST"
(PEACE)
"AUTONOMIC NERVOUS SYSTEM RESPONSE"

Prof. KHALED ABDEL-SATER,
PROF. OF PHYSIOLOGY

Study Objectives

- Compare and contrast the function of the sympathetic and parasympathetic systems.

● Functions of the Parasympathetic

I- Cranial Parasympathetic Outflow:

The Oculomotor (3rd Cranial) Nerve:

- 1- Contraction of the constrictor pupillae muscle → constriction of the pupil (miosis).
- 2- Contraction of the ciliary muscle → relaxation of the suspensory ligament and lens capsule → ↑↑ lens power (= accommodation reflex).

The Facial (7th Cranial) Nerve:

- 1-Secretory and vasodilator to sublingual and submaxillary salivary glands. It is true secretion i.e. water, large in amount and little in enzymes.
- 2-Vasodilator to anterior 2/3 of the tongue.

The Glossopharyngeal (9th Cranial) Nerve

Functions:

- 1-Secretory (true secretion) and vasodilator of the parotid gland.
- 2-Vasodilator of the posterior 1/3 of the tongue.

The Vagus (10th Cranial) Nerve:

A-Thorax:

1- Heart:

- Inhibition of all properties of atrial muscle (the vagi do not supply the ventricles).
- Vasoconstriction of coronary blood vessels.

2- Lungs:

- Bronchoconstriction (contraction of the muscles of bronchi).
- Vasodilatation of the pulmonary blood vessels.

The Vagus (10th Cranial) Nerve:

B-Abdomen:

1- G.I.T:

-Contraction of the wall of oesophagus, stomach, small intestine and colon and relaxation of their sphincters → evacuation of content.

-Contraction of wall of the gall bladder and relaxation of the sphincter of oddi→ evacuation of gall bladder.

2- Glands:

Increase all G.I.T secretions.

- ↑↑ gastric, pancreatic and bile secretions.

3- Vasodilatation of G.I.T blood vessels.

II-Sacral Parasympathetic Outflow

(=Sacral or Pelvic Nerve)

1- Micturition by Contraction of the urinary bladder wall and relaxation of the internal urethral sphincter.

2- Defecation by contraction of the rectum wall and relaxation of the internal anal sphincter.

3- Genital organs:

-Secretory to the seminal vesicles and prostate in male.

-Erection of penis in males and clitoris in females due to vasodilatation of the blood vessels of external genital organs.

It is Important to Note that:

Organs with Double Innervations

- 1. Reciprocal action: heart**
- 2. Antagonistic action: Pupillary**
- 3. Complementary action: saliva**
- 4. Cooperative action : sexual act**

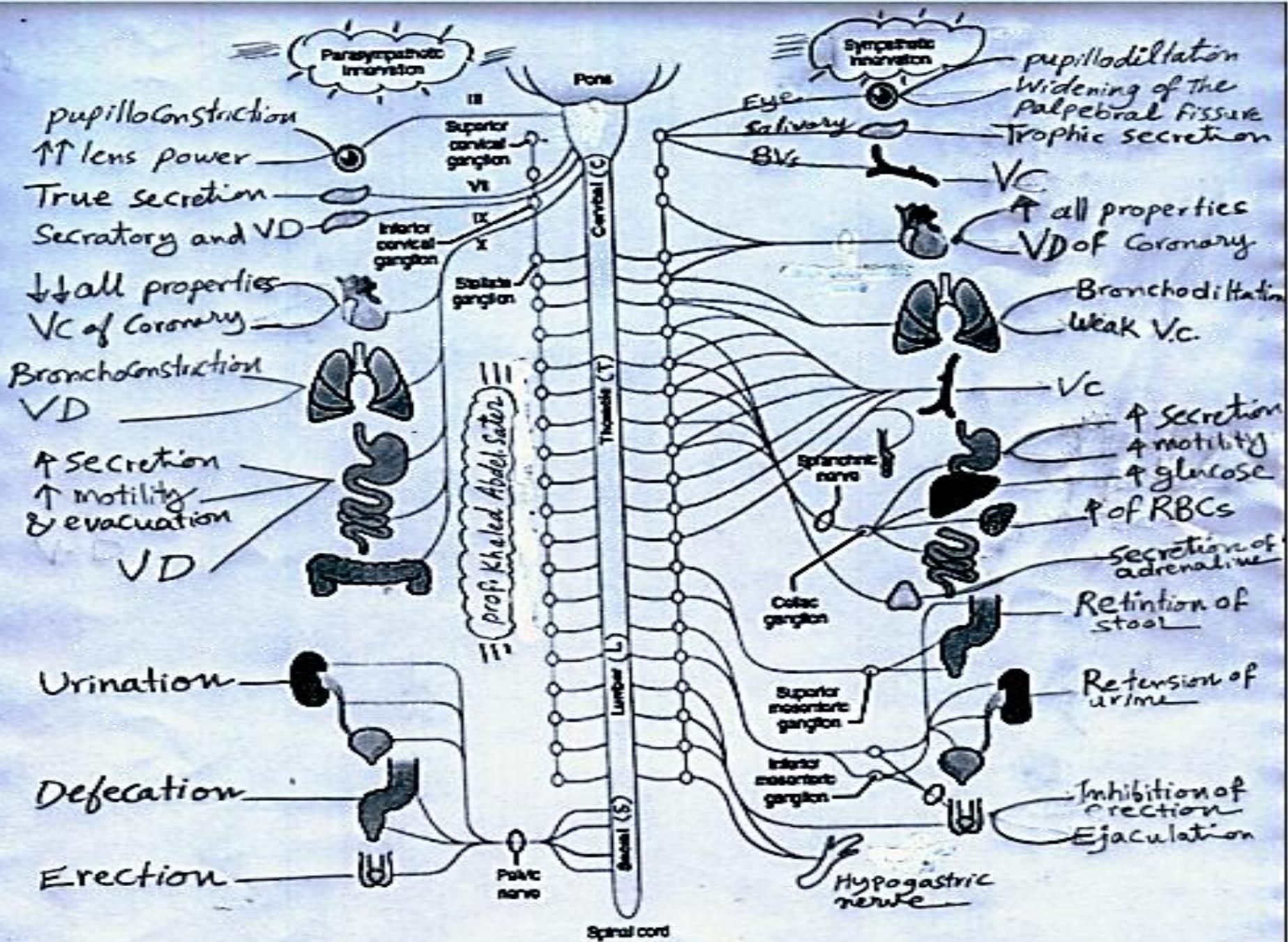
Organs Supplied by Sympathetic Only

e.g. skin, spleen, skeletal muscle blood vessels, suprarenal medulla, ventricles of the heart and dilator pupillae muscle.

Organs Supplied by Parasympathetic Only

constrictor pupillae muscle

| Structure | Sympathetic nervous system action | Parasympathetic nervous system action |
|-------------------------------------|--|---|
| Eye | Pupil dilatation | Pupil constriction Accommodation of vision |
| Lacrimal gland | | Tear secretion |
| Salivary glands | Secretion of thick saliva | Secretion of watery saliva |
| Heart | Increased heart rate and force of contraction | Decreased heart rate and force of contraction |
| Lungs | Bronchodilatation | Bronchoconstriction Bronchosecretion |
| Alimentary system | Decrease motility and muscle tone | Increase motility and tone Increase gut secretions |
| Liver Biliary system Pancreas | Gluconeogenesis Glyconeogenesis Decrease exocrine and endocrine secretions | Increase exocrine and endocrine secretions |
| Adrenal gland | Release adrenaline | |
| Bladder | Relaxation/contraction of detrusor muscle | Micturition |
| Large intestine | Decrease motility | Increase motility |
| Uterus | Contraction/relaxation (hormone dependent) | |
| Reproductive organs | Stimulates ejaculation | Stimulates erection |
| Rectum | Initiates defecation | Stimulates defecation |
| Sweat glands | Increased sweating | |
| Erector pili muscles | Piloerection of hair follicles | |
| Blood vessels | Vasoconstriction Vasodilatation | |



Define

| | |
|--------------------------|--|
| Stellate ganglion | When the inferior cervical & upper thoracic ganglia fuse together forming ganglia called “a stellate ganglion |
| Orbelli phenomena | Increase of the blood flow to skeletal muscle by sympathetic → better contraction, delayed fatigue and rapid recovery. |
| Sympathetic tone | It continuous basal sympathetic impulses to supply organ during rest |
| Trophic secretion | Secretion of little viscous saliva rich in enzyme by stimulation of sympathetic. |

GIVE REASONS

1-The lateral ganglia are also called the sympathetic chains.

Because they are the main sites for preganglionic sympathetic neuron relay

2-Autonomic ganglia are not 31 as the spinal cord but only about 22.

Because some on ganglia have fused together

3-Presence of autonomic ganglia in autonomic nervous system.

To act as the distributing centers because autonomic nerves arise from limited origin

GIVE REASONS

4-Terminal ganglia cannot be sympathetic.

Because the preganglionic secreting A.ch and postganglionic secreting noradrenaline and so due to short distance between them, antagonizing can be occurs.

5-Suprarenal medulla the sympathetic ganglia is terminal without antagonism.

Because the suprarenal medulla secretes its hormones directly into blood.

GIVE REASONS

6-Stimulation of greater splanchnic nerve causes a rise of ABP. Due to a) sympathetic V.C & b) release of adrenaline and noradrenaline from the medulla.

7-Presence of cholinestrases in between cholinergic synapse. To localize the effect of acetyl choline

8-Action of acetyl choline is of short duration.

Due to presence of choinestrase enzyme.

9-Acetyl choline must be destruct rapidly after its action. To localize the parasympathetic action.

TEST YOUR SELF

Thanks

