

تفريغ فارما ١

اسم الموضوع: Central Nervous System /L6

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Central Nervous system

Central Nervous System

Dr Abdelrahim Alqudah

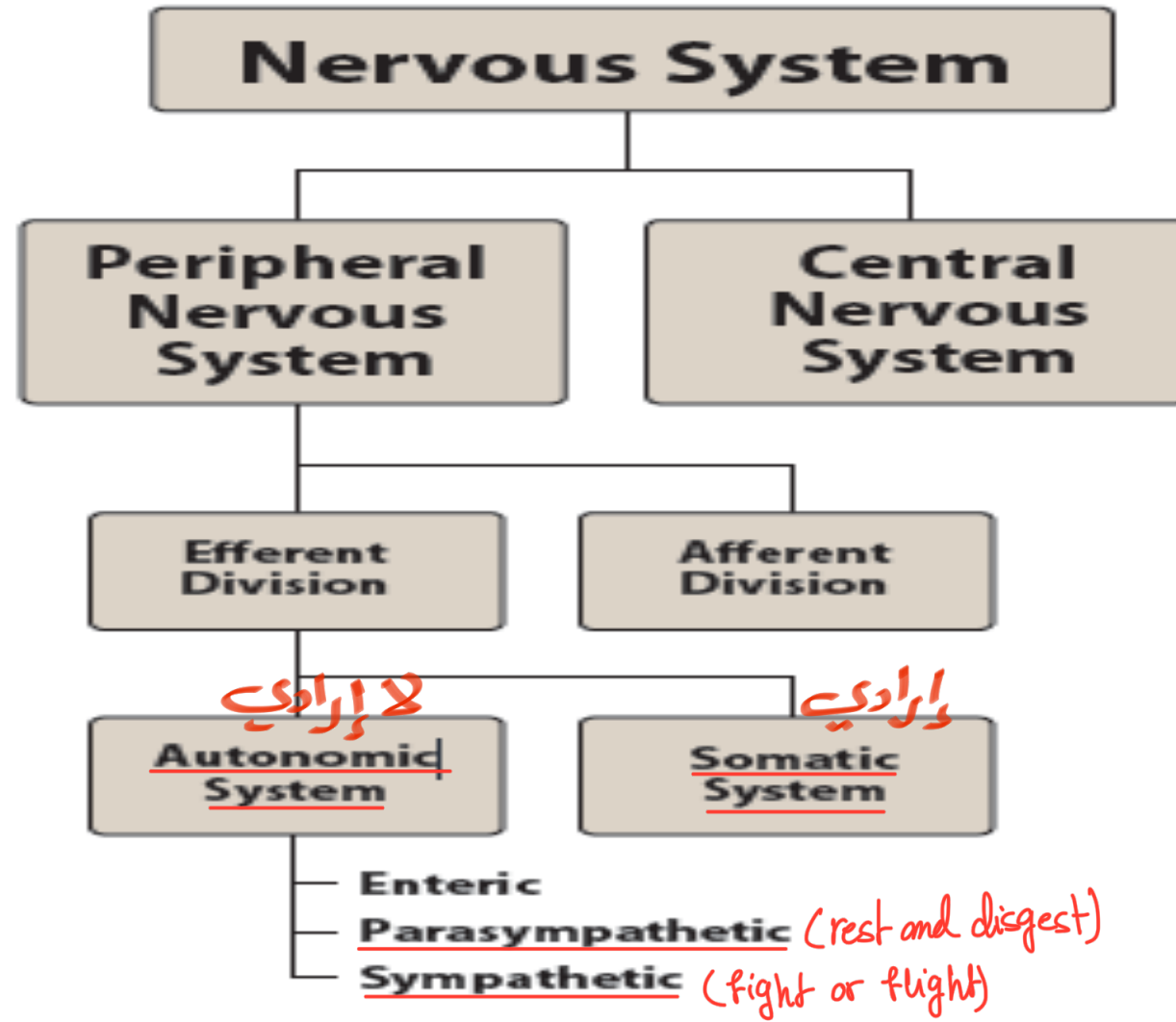


Figure 3.1
Organization of the nervous system.

General Functions of the Autonomic Nervous System.

- ❖ Autonomic nervous system regulates the activities of structures that are not under voluntary control and that function below the level of consciousness.
- ❖ Thus, respiration, circulation, digestion, body temperature, metabolism, sweating, and the secretions of certain endocrine glands are regulated, in part or entirely, by the autonomic nervous system.
- ❖ Thus, the autonomic nervous system is the primary regulator of the constancy of the internal environment of the organism

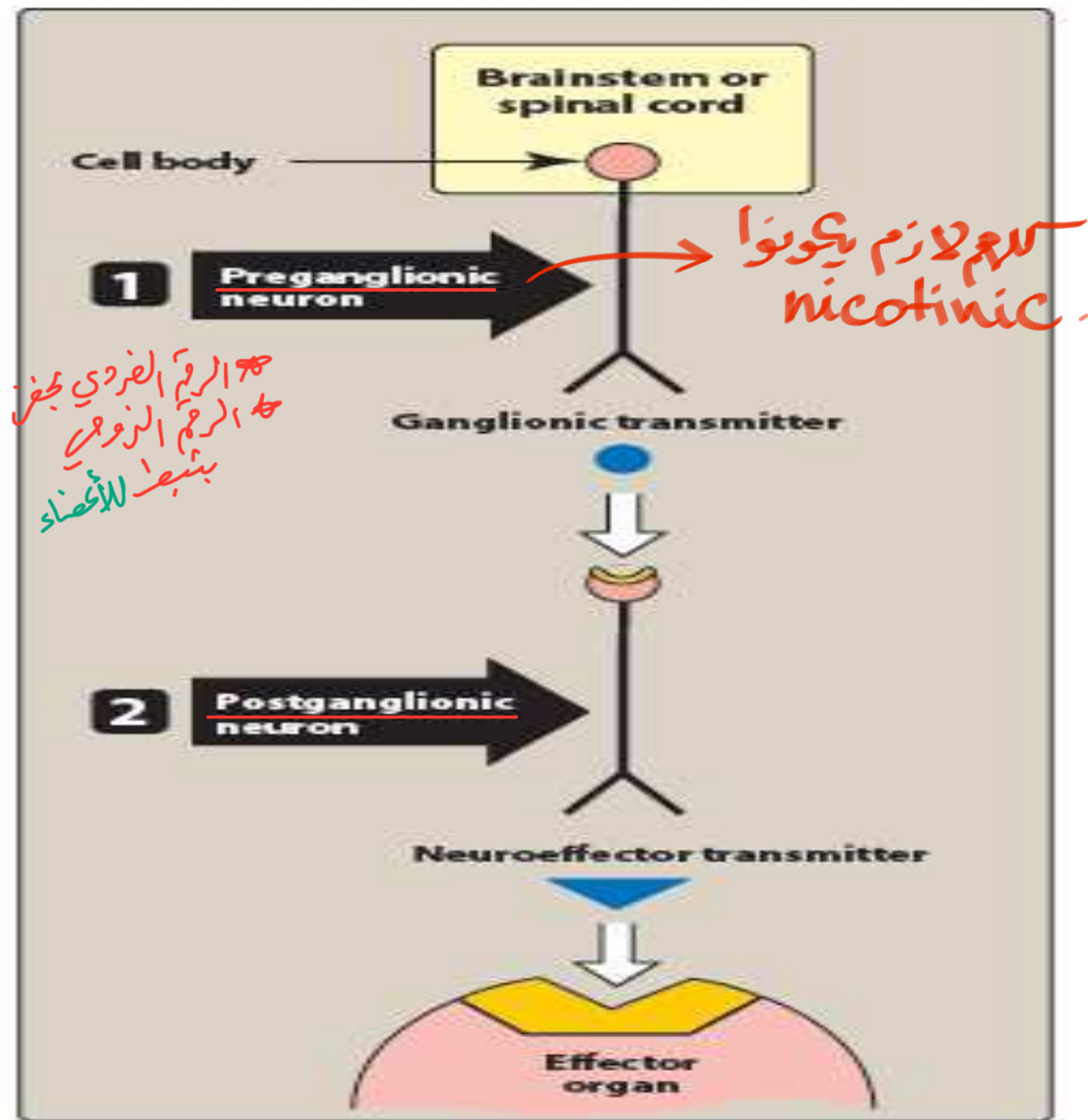


Figure 3.2
Efferent neurons of the
autonomic nervous system.

fight & flight

- ❖ The sympathetic system is associated with adrenal medulla
- ❖ Sympatho-adrenal functions becomes evident under circumstances of stress.

Examples :

- ✓ Body temperature
- ✓ concentration of glucose in blood
- ✓ vascular responses
- ✓ instinctive reactions to the external environment

- The sympathetic system normally is continuously active; the degree of activity varies from moment to moment and from organ to organ.
- Examples on SNS actions include :
 - Increase Heart Rate
 - Increase Blood pressure
 - Increase Breathing Rate
 - Blood flow is shifted from the skin to the skeletal muscles;
blood

vasoconstriction
bronchodilation

- bronchioles and pupils dilate *bronehodilation*
- organism is better prepared for "fight or flight."

➤ Many of these effects result primarily from or are reinforced by the actions of epinephrine secreted by the adrenal medulla

The parasympathetic system

- concerned primarily with conservation of energy and maintenance of organ function during periods of minimal activity.
- The parasympathetic system ¹slows the heart rate, lowers the ³blood pressure, ⁴stimulates gastrointestinal movements and ⁵secretions, ⁶aids absorption of nutrients, ⁷protects the retina from excessive light, and ⁸empties the urinary bladder and rectum.
- Many parasympathetic responses are rapid .

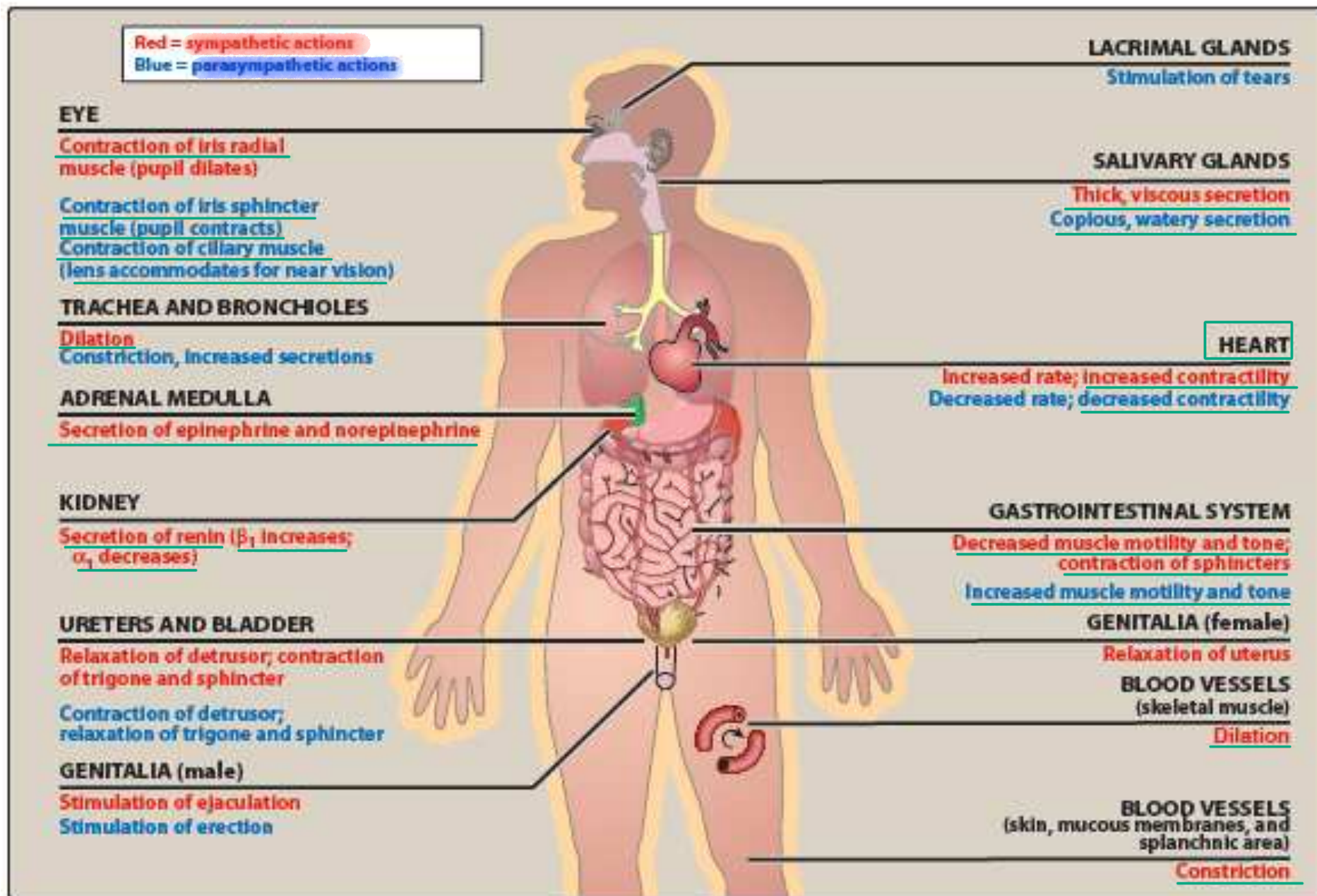


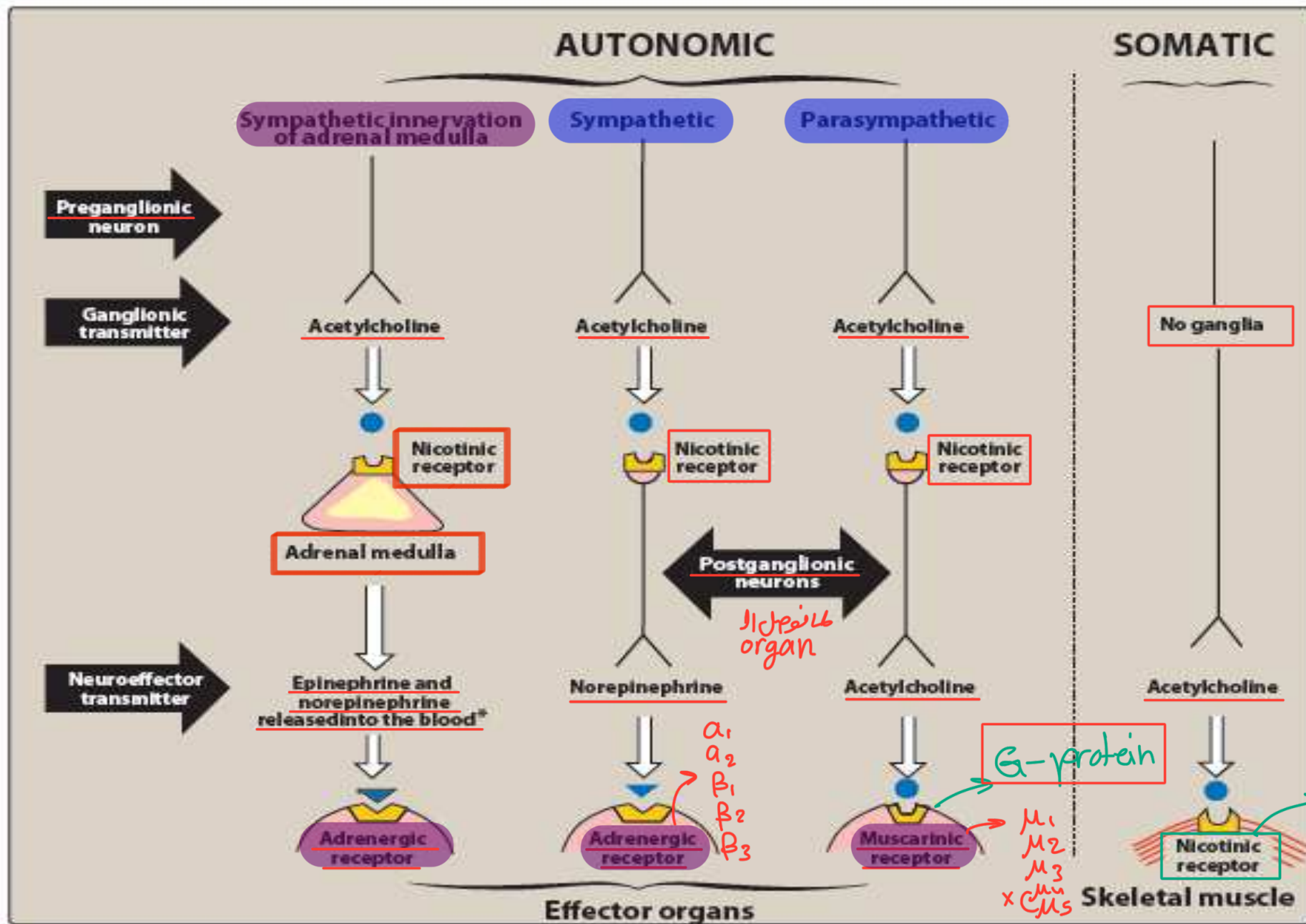
Figure 3.3

Actions of sympathetic and parasympathetic nervous systems on effector organs.

Neurotransmitters

- **Neurotransmitters** are endogenous chemicals which transmit signals from a neuron to a target cell across a synapse.
- Neurotransmitters are packaged into synaptic vesicles, and are released into the synaptic clefts, where they bind to receptors in the membrane on the postsynaptic side of the synapse.
- Neurotransmitters are synthesized from plentiful and simple precursors, such as amino acids

nicotinic: the fastest
منسب إلى النيكوتين



Neurotransmitters

- Excitatory : ^{eg} Glutamate
- Inhibitory : GABA

Examples :

- [Glutamate](#) is used at the great majority of fast excitatory synapses in the brain and spinal cord..
- [GABA](#) is used at the great majority of fast inhibitory synapses in virtually every part of the brain. Many sedative/tranquilizing drugs act by enhancing the effects of GABA.
- [Glycine](#) is the inhibitory transmitter in the spinal cord.

- Acetylcholine is distinguished as the transmitter at the neuromuscular junction NMJ connecting motor nerves to muscles. Acetylcholine also operates in many regions of the brain, but using different types of receptors.
- Dopamine has a number of important functions in the brain, dysfunction of the dopamine system is also implicated in Parkinson Disease PD and Schizophrenia.

انقسام الشخصية

- Serotonin

Most is produced by and found in the intestine (approximately 90%), and the remainder in CNS.

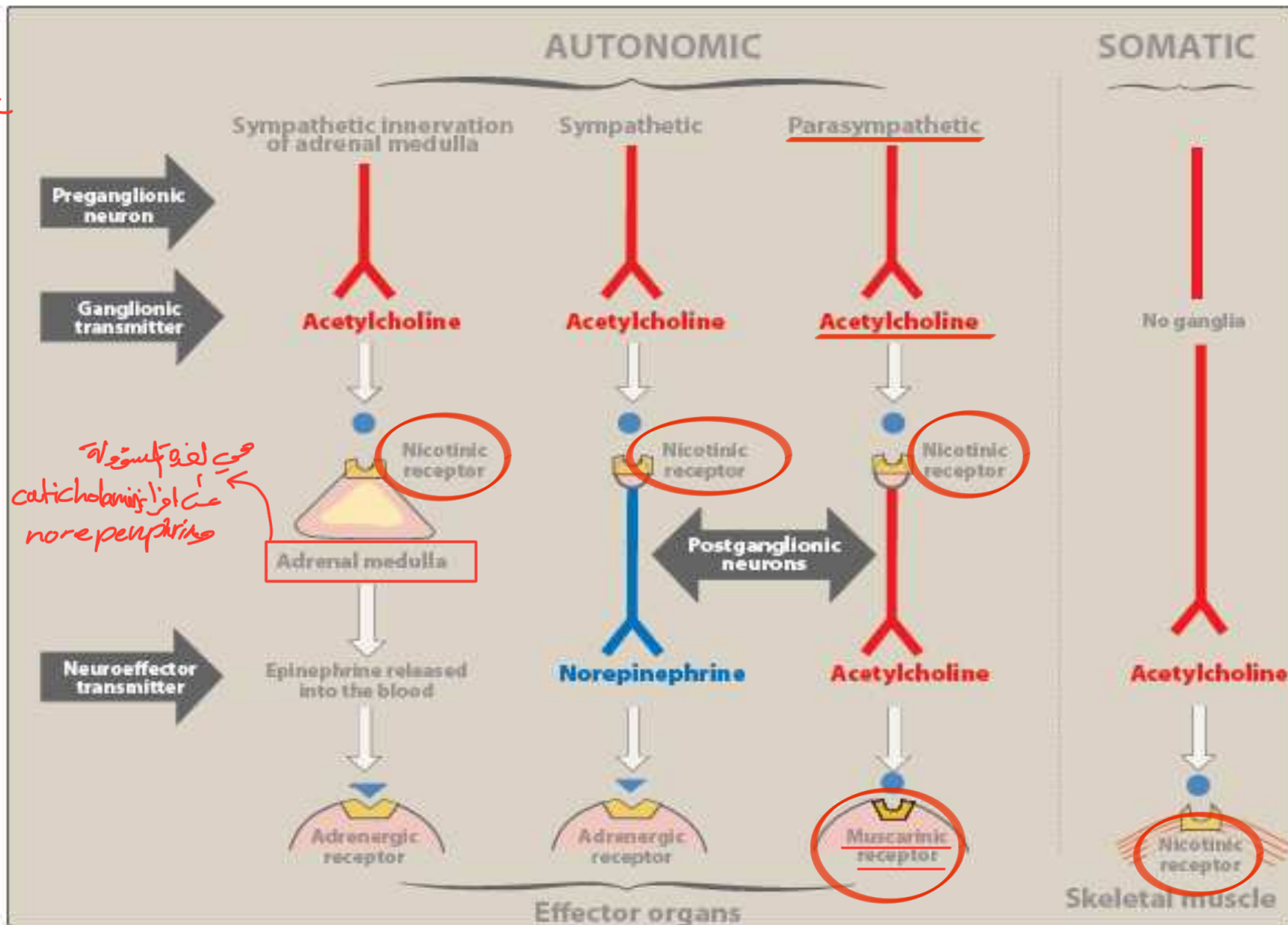
It functions to regulate ^{الشهية} appetite, sleep, memory and learning, temperature, **mood**, behaviour, muscle contraction, and function of the Cardiovascular System.

It is speculated to have a role in depression, as some depressed patients are seen to have lower concentrations of metabolites of serotonin in their cerebrospinal fluid and brain tissue.

Substance P is responsible for transmission of pain from certain sensory neurons to the central nervous system.

Norepinephrine: the major neurotransmitter for sympathetic activity(adrenergic transmission), which is mainly secreted by adrenal medulla

إذا كان عصب ال nerve
 Sympathetic
 chemical transmitter
 هو ACh في حالة
 Sympathetic cholinergic
 e.g.
 supra renal medulla
 renal gland.

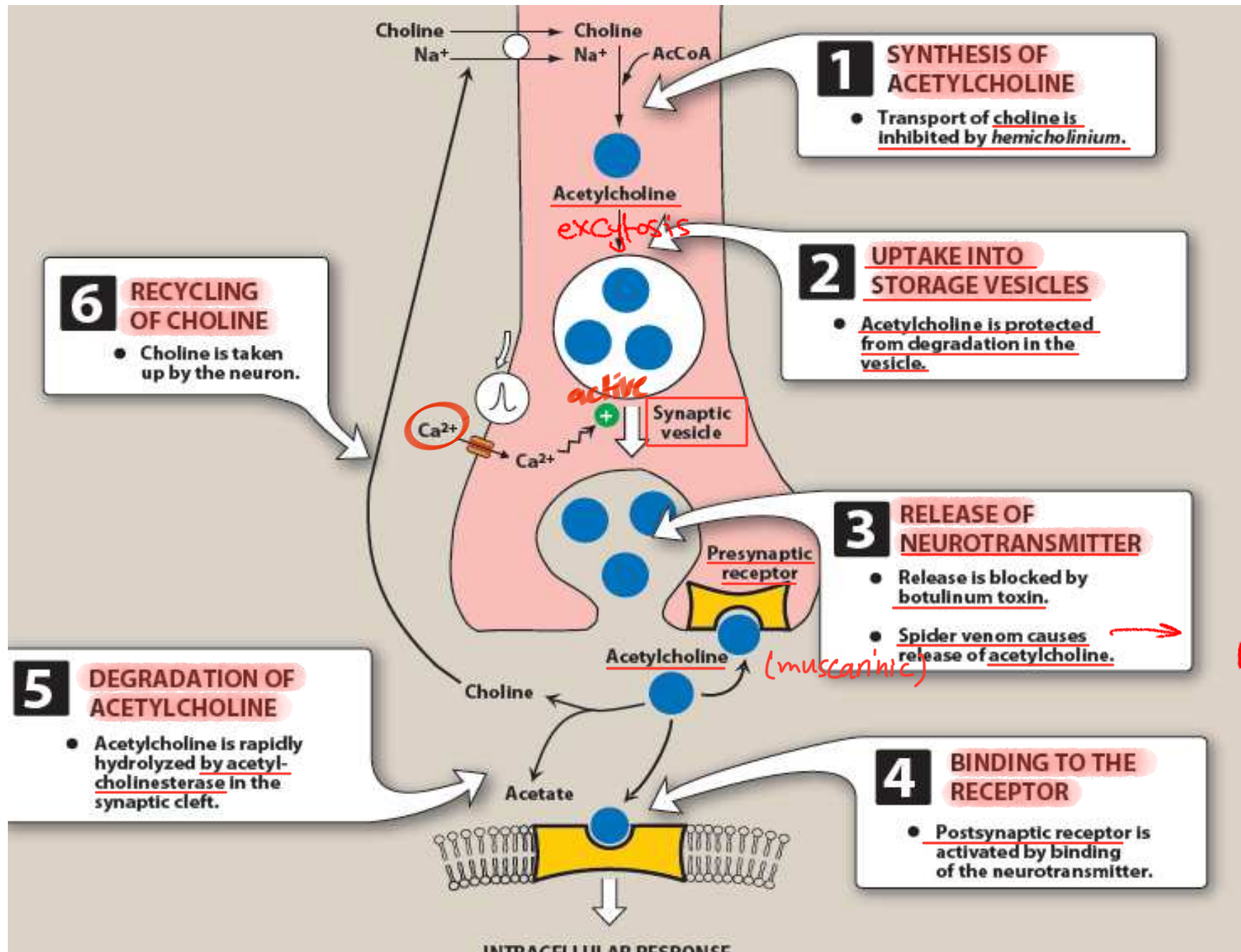


Cholinergic Transmission

Neurotransmission at cholinergic neurons

↳ release acetylcholine

- 1) Synthesis
- 2) Storage,
- 3) Release
- 4) Binding of ACh to a receptor,
- 5) Degradation of the neurotransmitter in the synaptic cleft
- 6) Recycling of choline and acetate



Cholinergic Transmission

شرح الرسمة
بالسلايد التالي قبل

- Acetylcholine synthesis is catalyzed by Choline **Acetyltransferase enzyme**.
- Axonal terminals contain a large number of mitochondria, where acetyl CoA is synthesized.
- After its synthesis from choline, ACh is taken up by the storage vesicles principally at the nerve terminals
- The release of ACh and other neurotransmitters occurs by exocytosis, in which the vesicles move to the prejunctional synapse

Acetylcholinesterase (AChE)

- For ACh to serve as a neurotransmitter in the motor system and at other neuronal synapses, it must be removed or inactivated within the time limits
- AChE digests Acholine.

CHOLINERGIC RECEPTORS (CHOLINOCEPTORS)

- Muscarinic receptors

موجود ہیں در کل ال
postganglionic

- Nicotinic receptors

موجود ہیں در کل ال
preganglionic.
or
somatic

G-protein نوعها

Muscarinic Receptors

functional

- M1, M2, M3, M4, and M5
- Only M1 M2 and M3 are considered functional
- M1 receptors are found on gastric parietal cells (increase Ca^{+2})
- M2 receptors on cardiac cells and smooth muscle (cGMP and increase K)
- M3 receptors on the bladder, exocrine glands, and smooth muscle.

A

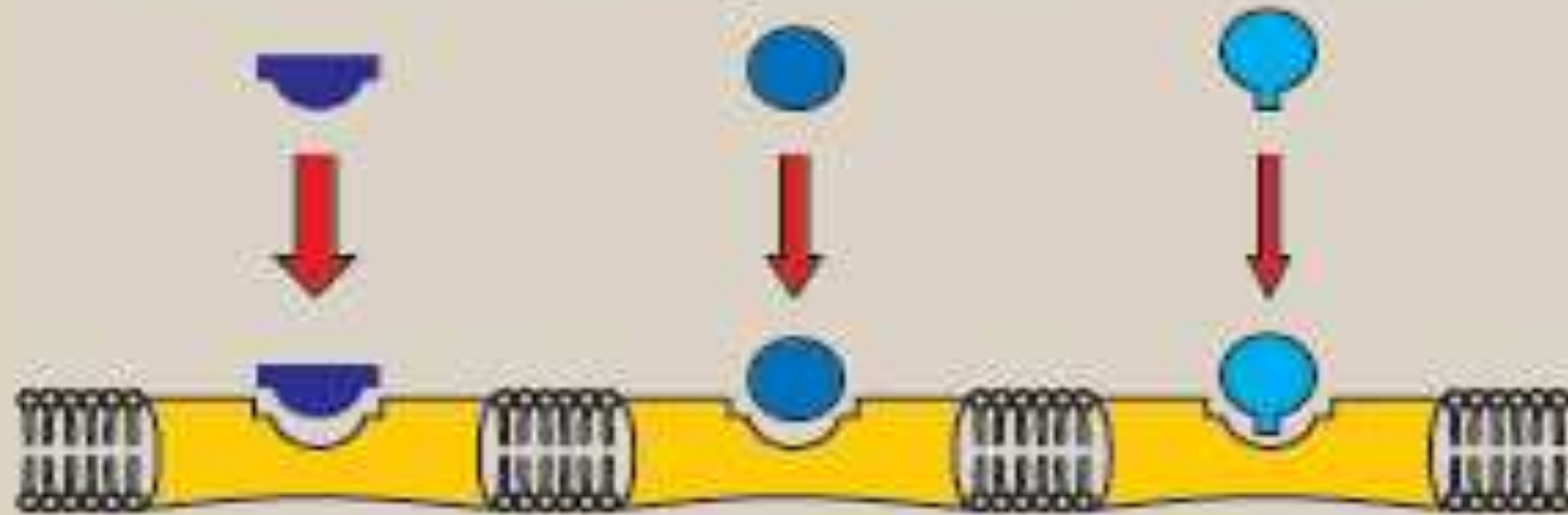
Muscarinic receptors

← مادة كيميائية عصبية بالفطر .

* Muscarine

Acetylcholine

Nicotine



High
affinity

Low
affinity

Nicotinic Receptor

- The nicotinic receptor is composed of five subunits and it functions as a ligand-gated ion channel
- Binding of two ACh molecules elicits a conformational change that allows the entry of sodium ions, resulting in the depolarization of the effector cell

B

Nicotinic receptors

