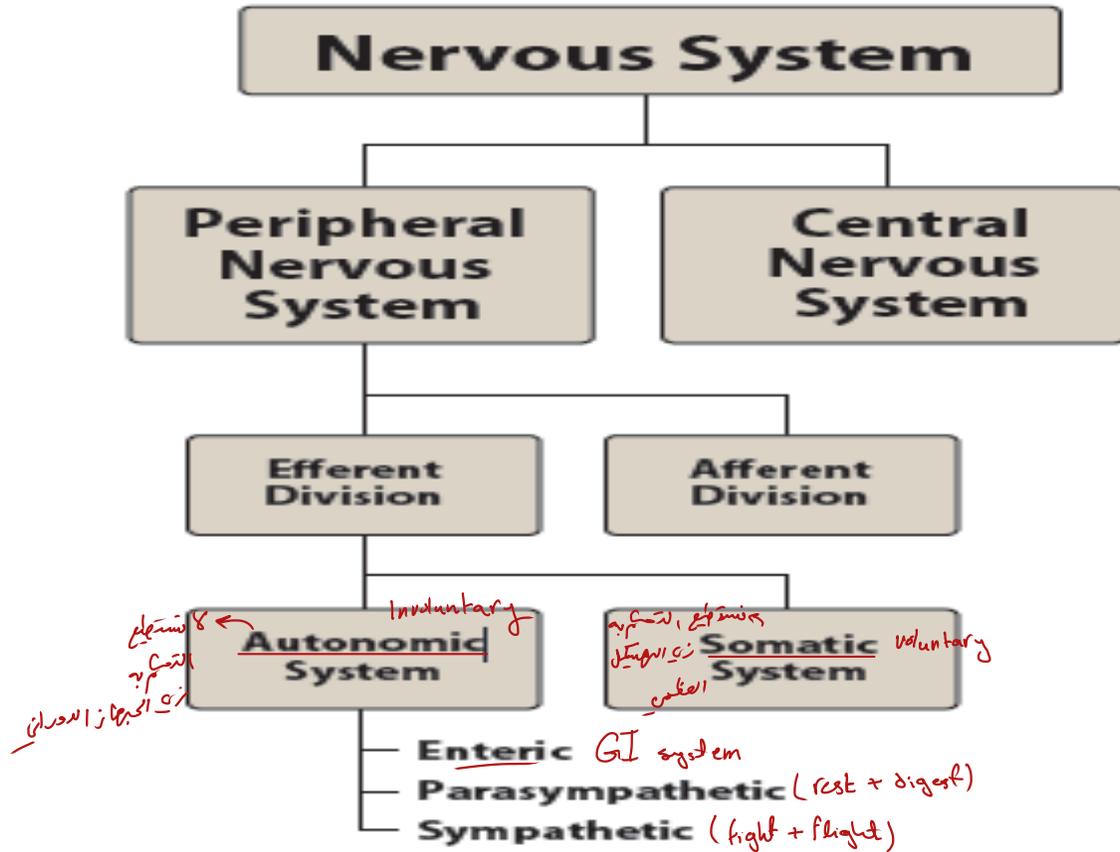


# تفريغ فارما 1

اسم الموضوع: Lec .5

إعداد الصيدلاني/ة: ياسمين خليل





**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. *involuntary*
- ❖ 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



- ❖ 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

مؤل الوقتة سخال بس يزداو ماله من الحظان إلى بهما

طاقة أو نديمة

توترو جهه ...

- 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 → increase the diameter of airways
  - Blood flow is shifted from the skin to the skeletal muscles; blood

+ inhibit GI movements

-bronchioles and pupils dilate <sup>توسع</sup>

-organism is better prepared for "fight or flight." <sup>Symp</sup>

- 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 slows the heart rate, lowers the blood pressure, stimulates gastrointestinal movements and secretions, aids absorption of nutrients, protects the retina from excessive light, and empties the urinary bladder and rectum.
- Many parasympathetic responses are rapid .

عضف مؤثر

Red = sympathetic actions  
Blue = parasympathetic actions

### EYE

Contraction of Iris radial muscle (pupil dilates)

Contraction of Iris sphincter muscle (pupil contracts)  
Contraction of ciliary muscle (lens accommodates for near vision)

### TRACHEA AND BRONCHIOLES

Dilation  
Constriction, increased secretions

### ADRENAL MEDULLA

Secretion of epinephrine and norepinephrine

### KIDNEY

Secretion of renin ( $\beta_1$  increases;  $\alpha_1$  decreases)

### URETERS AND BLADDER

Relaxation of detrusor; contraction of trigone and sphincter

Contraction of detrusor; relaxation of trigone and sphincter

### GENITALIA (male)

Stimulation of ejaculation  
Stimulation of erection

### LACRIMAL GLANDS

Stimulation of tears

### SALIVARY GLANDS

Thick, viscous secretion  
Copious, watery secretion

### HEART

Increased rate; increased contractility  
Decreased rate; decreased contractility

### GASTROINTESTINAL SYSTEM

Decreased muscle motility and tone; contraction of sphincters

Increased muscle motility and tone

### GENITALIA (female)

Relaxation of uterus

### BLOOD VESSELS (skeletal muscle)

Dilation

### BLOOD VESSELS (skin, mucous membranes, and splanchnic area)

Constriction

sym + parasygm

علا كل عضو

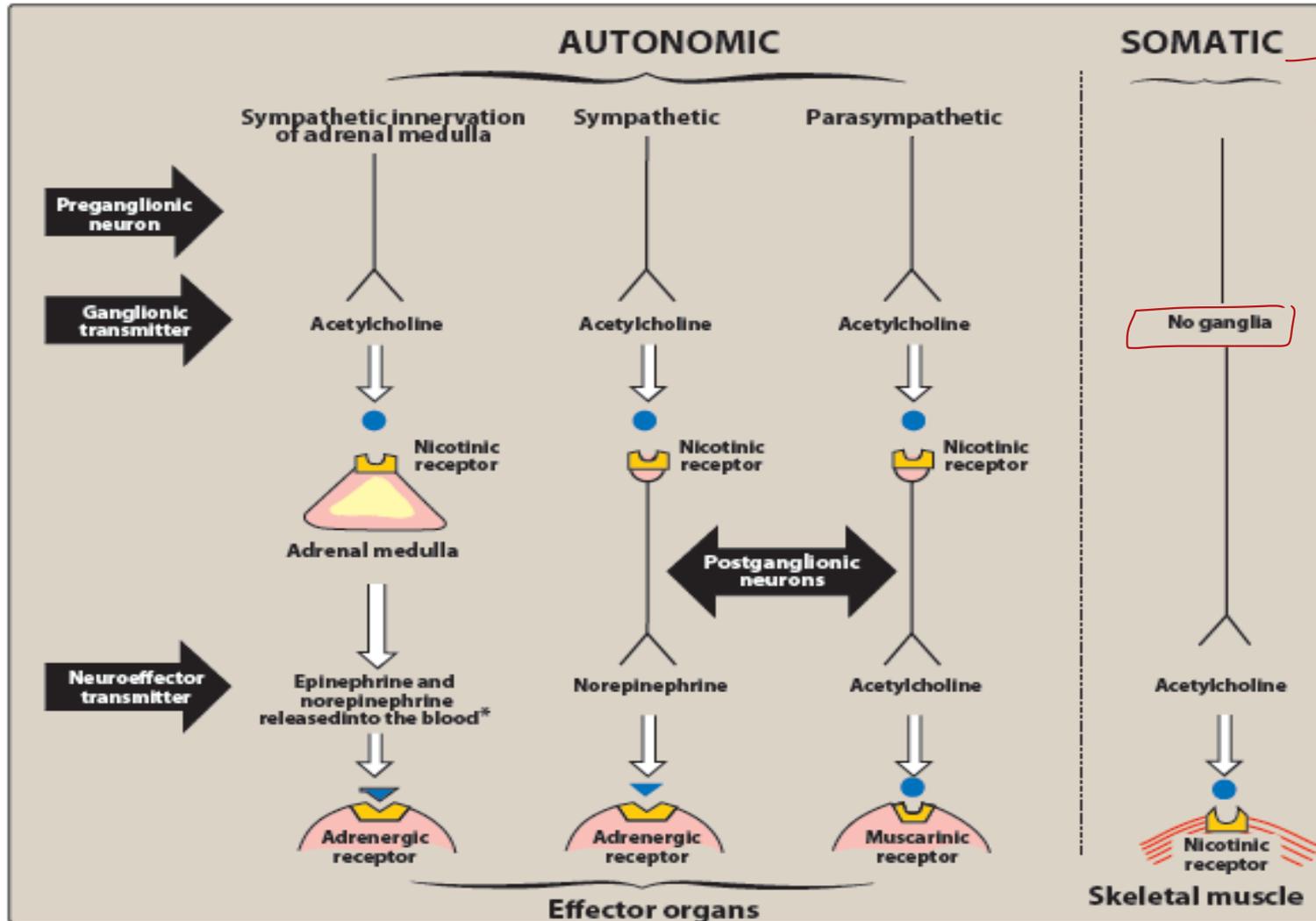
الدرتقار صكا زهم  
سلايه بالماهنرة!

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. → *حوال الفزاع بين  
العصبونين*
- 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**



حرکتی  
 ارید مکتلاً صاحبها  
 ناقل عصبی عا۔  
 تتفرک بالسی  
 بتفرک ری صاحبها  
 (Voluntary)

# Neurotransmitters

- تحفز العصب الموجودة عليه
- Excitatory : Glutamate → receptors that have <sup>فردية</sup> odd numbers :  $\alpha_1, \beta_1, \beta_3, \mu_1, \mu_3, \mu_5$
- Inhibitory : GABA → receptors that have <sup>زوجية</sup> even numbers :  $\alpha_2, \beta_2, \mu_2, \mu_4$
- صميم فهم
- تثبط العصب وليس المستقبل المجموعة عليه

# Examples :

صحة الكائن الحي

- 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.   
*صحة النوم النفسية*
- Glycine is the inhibitory transmitter in the spinal cord.

حسب محضر و مقرر

- 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.

- Serotonin

Most is produced by and found in the intestine (approximately 90%), and the remainder in CNS. 10%.

as renalin  
hormone  
note as renalin  
neurotransmitter

It functions to regulate <sup>السيطرة</sup> **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.

ناقض الشعور بالألم

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

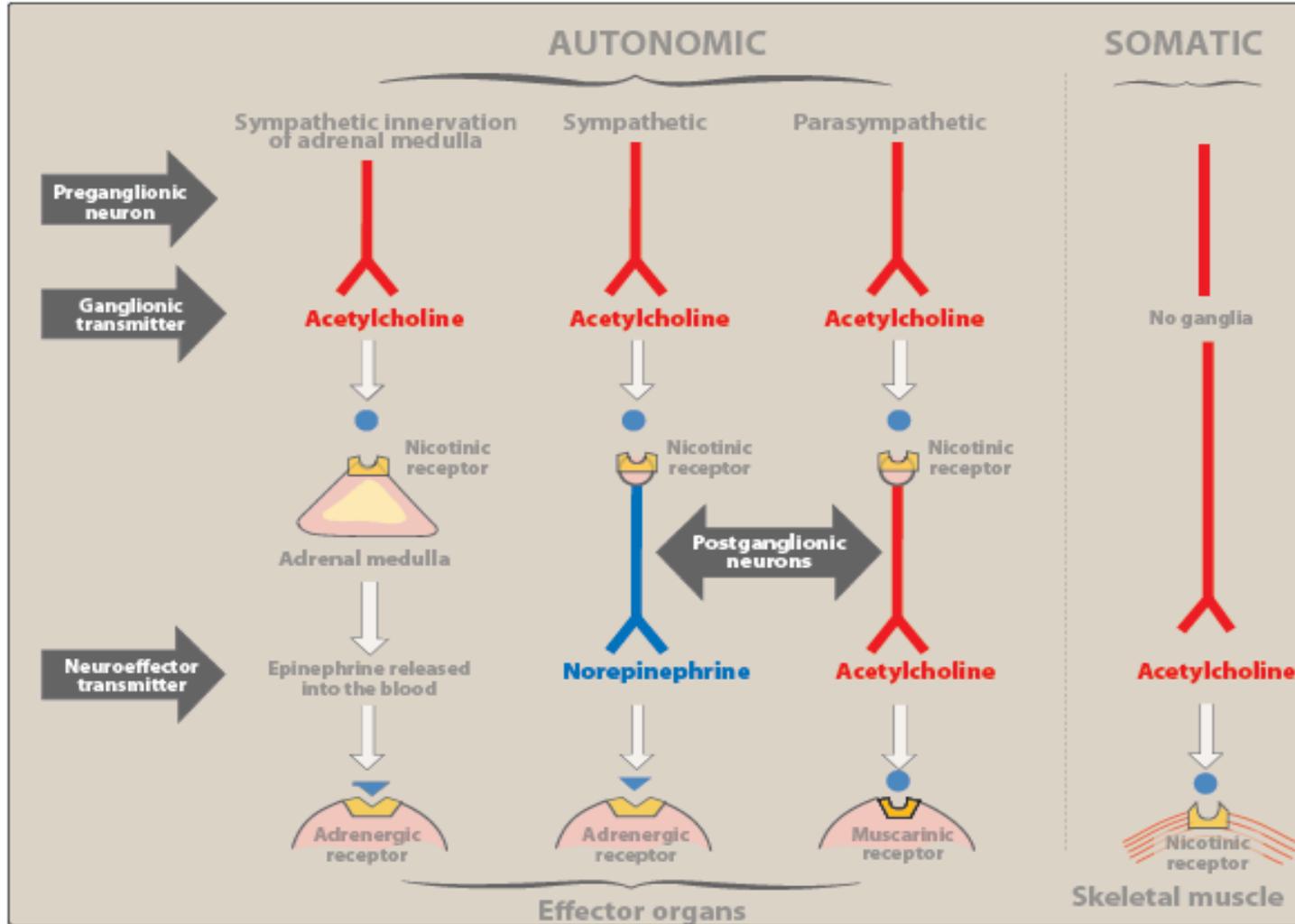
**Norepinephrine**: the major neurotransmitter for sympathetic activity (adrenergic transmission), which is mainly secreted by adrenal medulla

post ganglionic neuron

هو ناقل عصبى  
من الغدة الكظرية  
الى  
↓

adrenaline → hormone

nor adrenaline → neurotransmitter



كيفية التخلص من neurotransmitter ما يدخل تخفيفاً؟

① تحطم الناقل العصبي مثل الناقل ACh عن طريق إنزيم ACh esterase - يحوله إلى } acetate ← الجسم يتخلص منه  
Choline ← يرجع للخلية مرة ثانية ويرجع للجسم للاستعمال مرة ثانية

② العودة الناقل العصبي لنفس العصب

**Cholinergic Transmission** ③ by presynaptic receptor / يثبت ACh ويقلل من إفرازه

---

UAO COMT } إنزيم إنزيم norepinephrine إنزيم

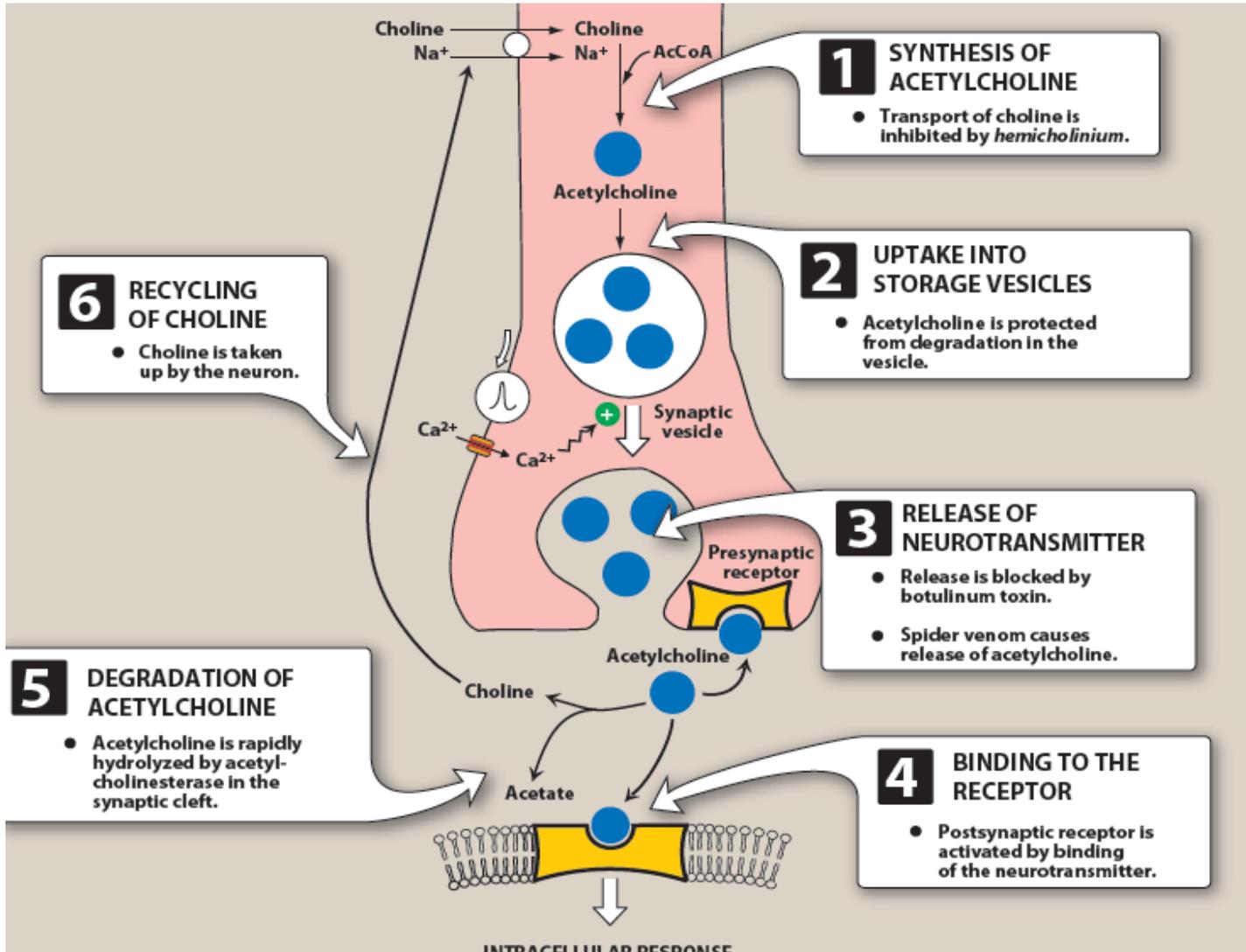
# Neurotransmission at cholinergic neurons

- 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 ✓

يرجع للخلية

تتحلل  
في

طريقة انتقال الناقل (نفسه)



# Cholinergic Transmission

- 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

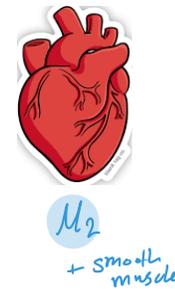
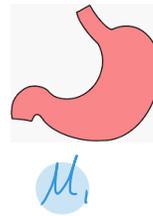
# Acetylcholinesterase (AChE)

- 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)

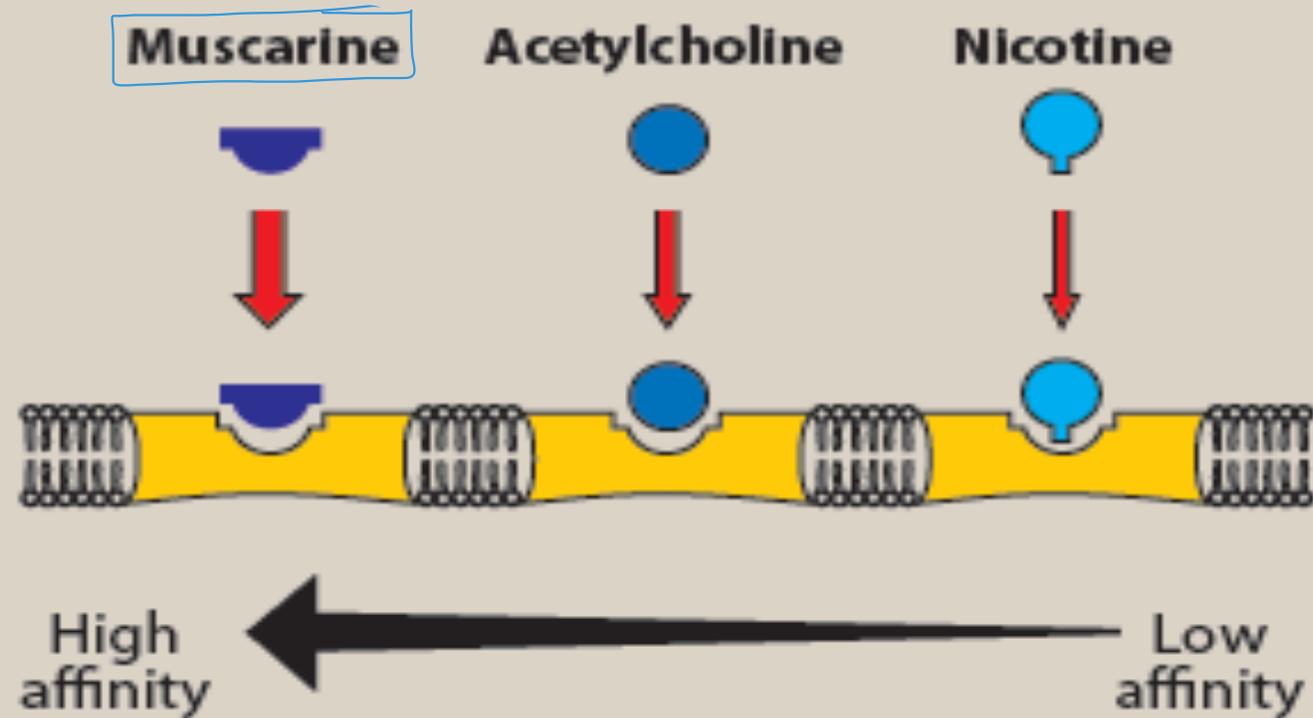
- **Muscarinic receptors**
  - **Nicotinic receptors**
- post of para
- pre of para + sym

# Muscarinic Receptors



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

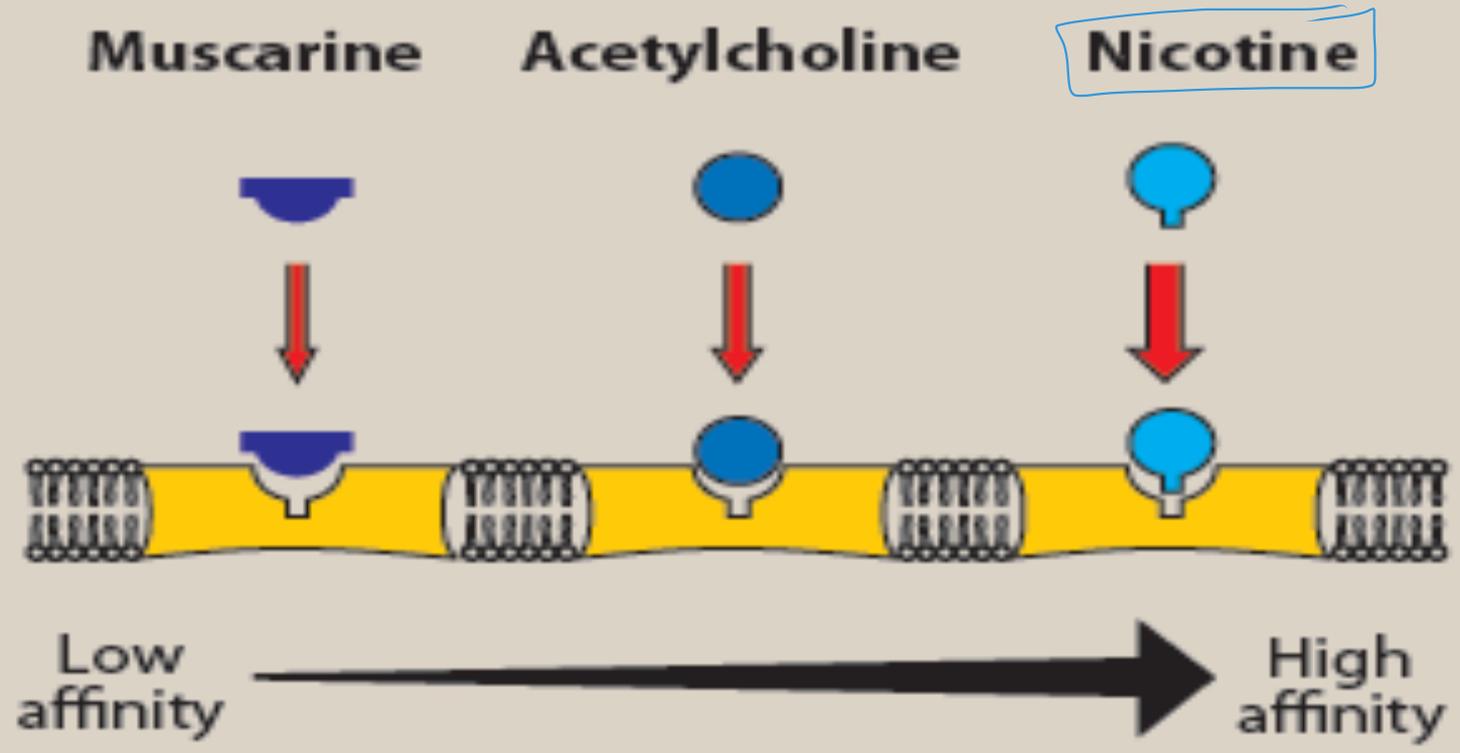
# **A** Muscarinic receptors



# Nicotinic Receptor $\longrightarrow$ pre of sym + parasymp

- 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



• اللهم اغفر لي ولوالدي وللمسلمين والمسلمات الأحياء والأموات

• اللهم إنا نسأل الجنة ونعوذ بك من النار وما قرب إليها من قول أو عمل

• اللهم انصر الإسلام والمسلمين، وزلزل الأرض تحت أعداء الإسلام وأخوانهم وأخوانهم وأخوانهم

• اللهم اجعلنا وأهلنا والمسلمين عند حوضك رسولك الكريم صلى الله عليه وسلم

• اللهم ارحم أئمتنا وأئمة المسلمين وأئمة الأئمة وأئمة الأئمة وأئمة الأئمة

• رَبِّ إِنِّي لَمَّا أَنْزَلْتَ إِلَيَّ مِنْ صُفْحٍ فَخِيرٍ

• اللهم ادخلنا مدخلهم ، واخرجنا مخرجهم ، واجعلنا من أهلهم

• سبحان الله ، الحمد لله ، لا إله إلا الله ، الله أكبر ، اللهم ارزقني وارحمني واغفر لي وأكرم مني بئور الدنيا والآخرة