

## Module 14 LO4

# Neurotransmitters and Receptors of ANS

Dr. Lisa Brinn

[lbrinn@fiu.edu](mailto:lbrinn@fiu.edu)

## 4. ANS Neurotransmitters and Receptors

- Both neurotransmitters and receptors can be classified under one of two general categories
  - A. Cholinergic
  - B. Adrenergic

# A. Cholinergic

## ■ Neurotransmitter

### □ Acetylcholine

- Released by preganglionic neurons of both system
- Released by postganglionic neurons of the parasympathetic nervous system and sympathetic postganglionic neurons

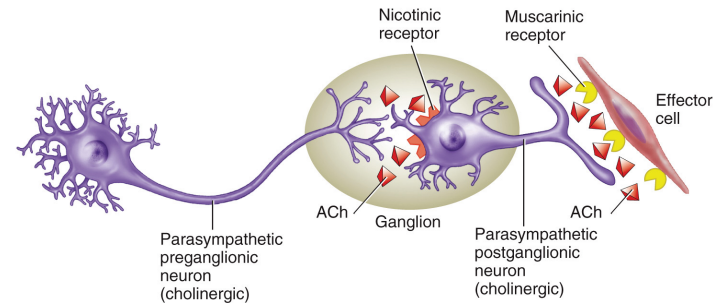
## ■ Receptors

### □ Nicotinic

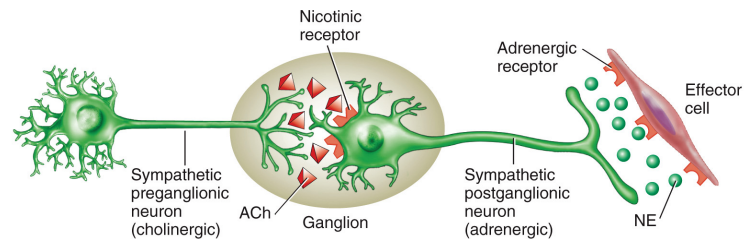
- Found on postganglionic neuron cell body and dendrites, plasma membrane of chromaffin cells and skeletal muscles (NMJ)

### □ Muscarinic

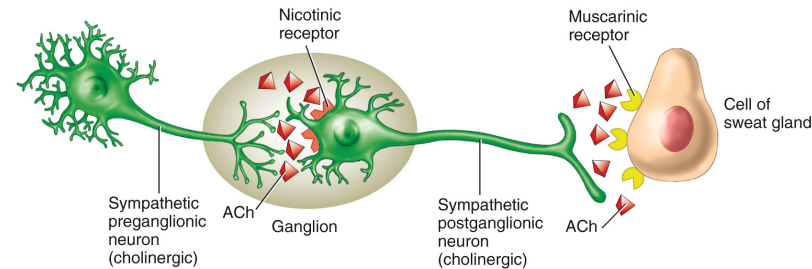
- Found on plasma membrane of effectors (smooth muscle, cardiac muscle and glands) innervated by parasympathetic nervous system



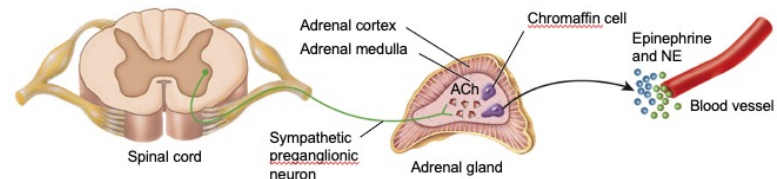
(a) Parasympathetic nervous system



(b) Sympathetic nervous system—innervation to most effector tissues



(c) Sympathetic nervous system—innervation to most sweat glands



## B. Adrenergic

### ■ Neurotransmitters

#### □ Norepinephrine

- Released by postganglionic cells of the sympathetic nervous system

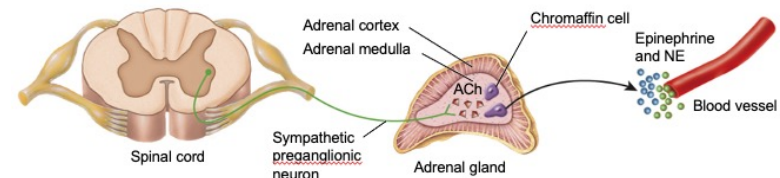
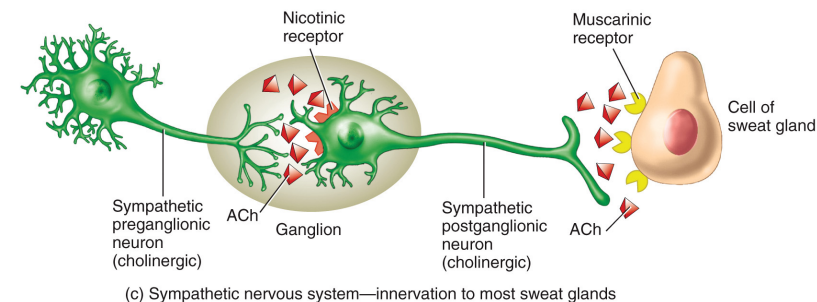
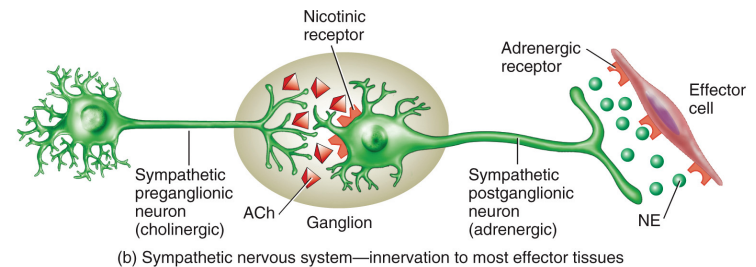
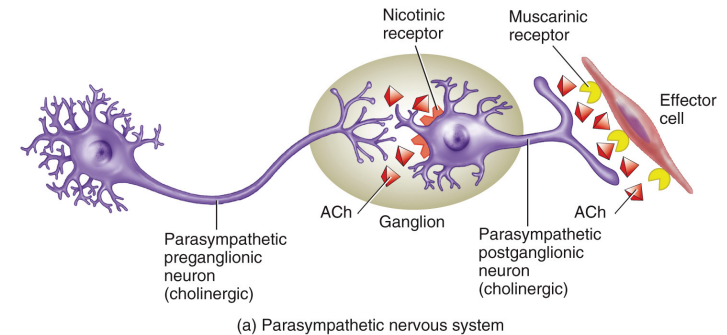
#### □ Epinephrine

- Released by chromaffin cells of the adrenal medulla

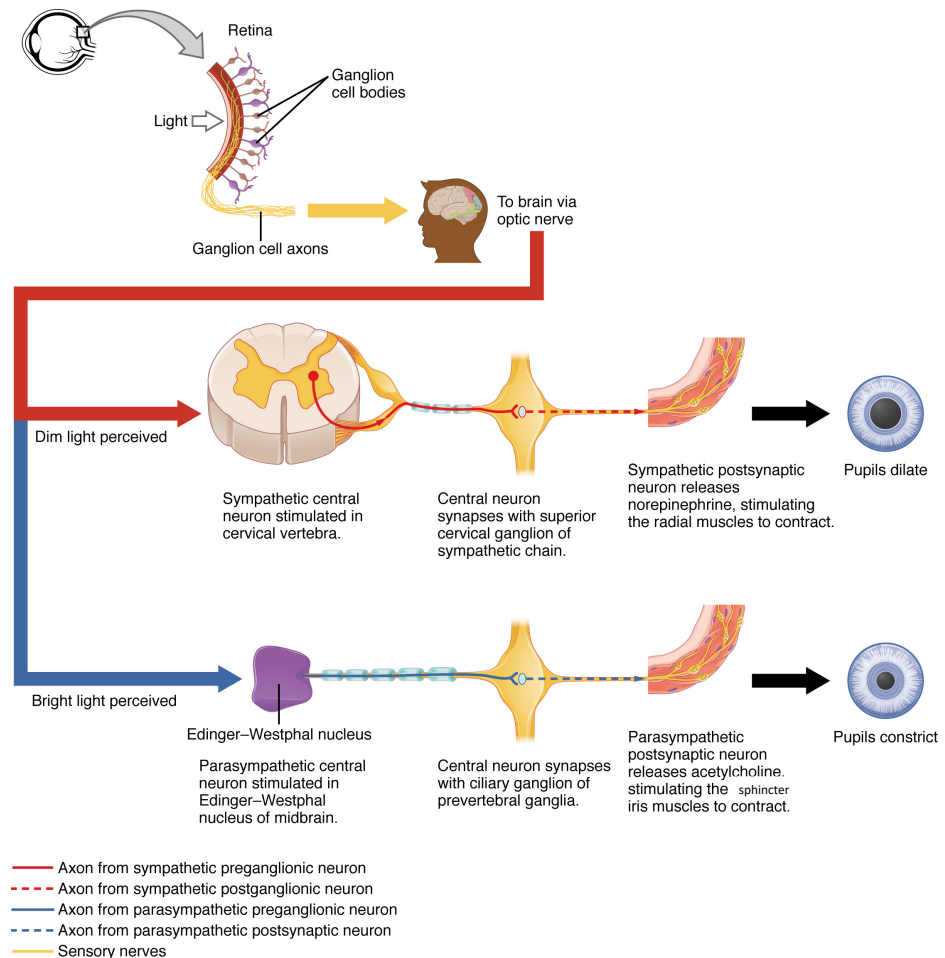
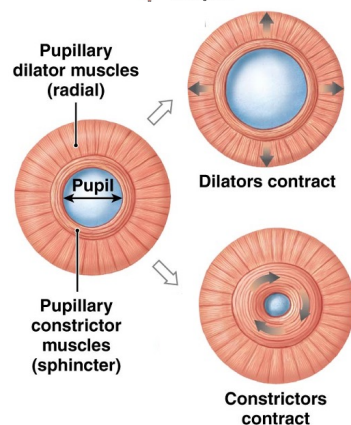
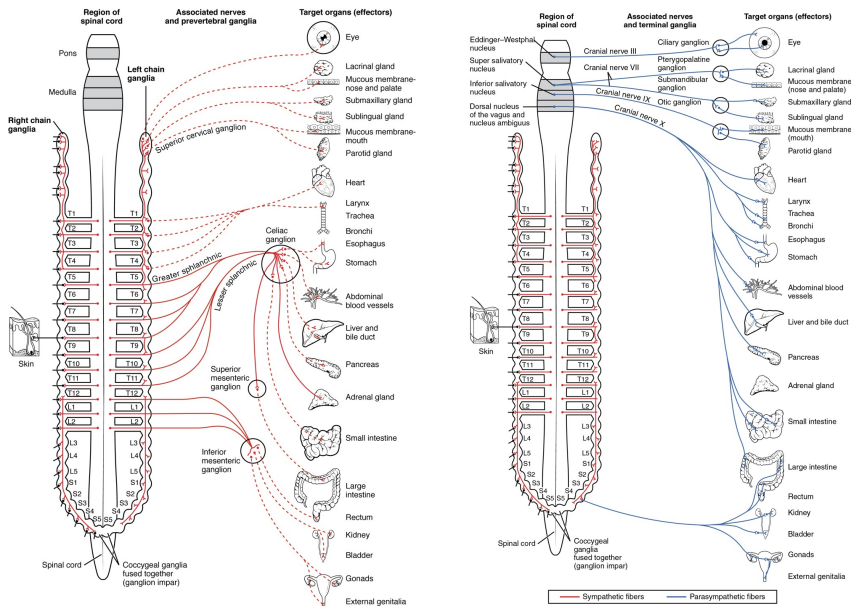
### ■ Receptors

#### □ Alpha - $\alpha_1$ and $\alpha_2$ (NE)

#### □ Beta - $\beta_1$ (both), $\beta_2$ (Epinephrine), and $\beta_3$ (NE)



# Autonomic Control of Pupillary Reflex



# Comparison of Sympathetic and Parasympathetic Divisions of ANS

Characteristics	Sympathetic Division	Parasympathetic Division
Visceral Motor Neurons CNS Location	Lateral gray horns of spinal segments T1-L2	Brain stem and spinal segments S2-S4
Location of PNS Ganglia	Paravertebral sympathetic chain; collateral ganglia located anterior and lateral to the descending aorta	Within tissues of target organs (intramural ganglion) or located close to target organ (terminal ganglion)
Preganglionic fibers <ul style="list-style-type: none"> <li>Length</li> <li>Neurotransmitter released</li> </ul>	<ul style="list-style-type: none"> <li>Relatively short, myelinated</li> <li>Ach</li> </ul>	<ul style="list-style-type: none"> <li>Relatively long, myelinated</li> <li>Ach</li> </ul>
Postganglionic fibers <ul style="list-style-type: none"> <li>Length</li> <li>Neurotransmitter released</li> </ul>	Relatively long, unmyelinated Usually NE	Relatively short, unmyelinated Always ACh
Neuroeffector Junction	Varicosities and enlarged terminal knobs that release transmitter near target cells	Neuroeffector junctions that release transmitter to special receptor surface
Degree of Divergence from CNS to Ganglion Cells	Approximately 1:32	Approximately 1:6
General Functions	Stimulate metabolism, increase alertness, prepare for emergency "fight or flight" response	Promote relaxation, nutrient uptake, energy storage ("rest and repose") = SLUDD