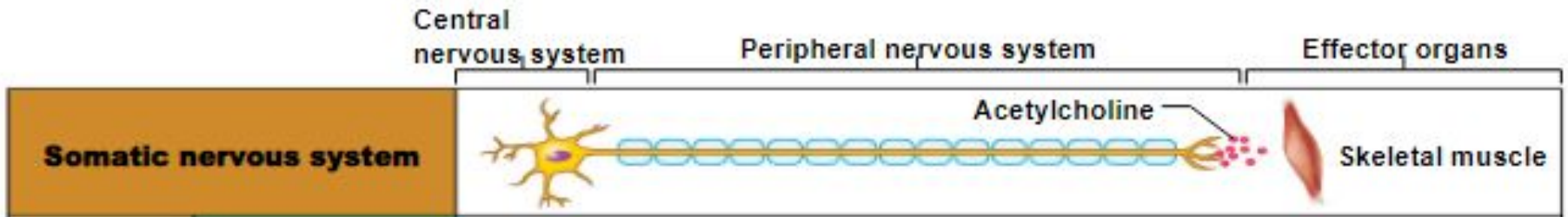


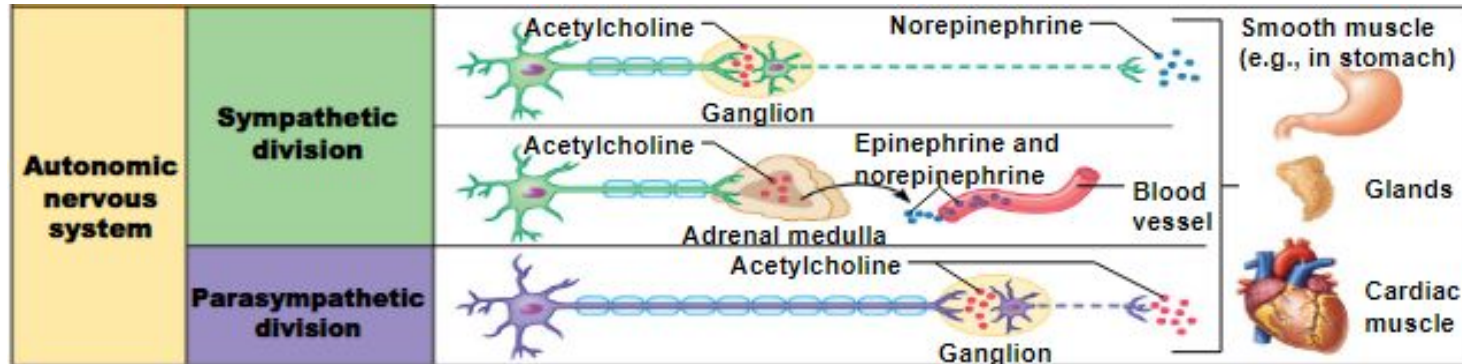
Somatic and Autonomic Nervous Systems: Anatomy Compared

- Somatic nervous system
 - **Motor neuron cell bodies originate inside the CNS**
 - **Axons extend to skeletal muscles**
 - **Neuron releases acetylcholine to the effector**



Somatic and Autonomic Nervous Systems: Anatomy Compared

- Autonomic nervous system
 - Chain of **two** motor neurons
 - **Preganglionic neuron is in the brain or spinal cord**
 - **Postganglionic neuron extends to effector organ**
 - **Ganglia = group of nerve cell bodies in PNS**

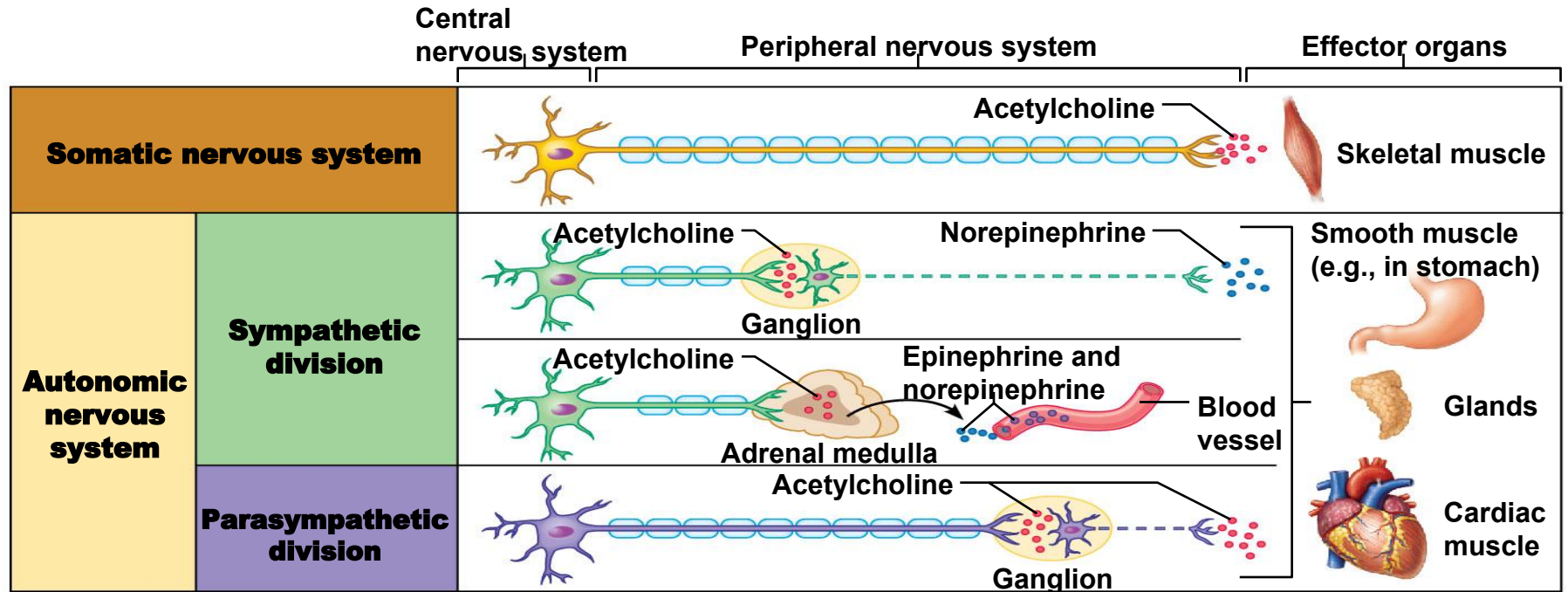


Autonomic Nervous System Divisions






- Autonomic nervous system has **two** divisions
 - **Sympathetic division: “fight or flight”**
 - **Parasympathetic division: “rest and digest”**

Autonomic Functioning

- When the parasympathetic and sympathetic divisions serve the same organ, they cause **opposite effects** due to different **neurotransmitters**
 - **Preganglionic axons of *both* divisions release acetylcholine**
 - **Parasympathetic postganglionic fibers release acetylcholine**
 - **Sympathetic postganglionic fibers release norepinephrine**



KEY

-  Preganglionic axons (sympathetic)
-  Postganglionic axons (sympathetic)
-  Myelination
-  Preganglionic axons (parasympathetic)
-  Postganglionic axons (parasympathetic)

Autonomic Functioning

- Sympathetic—“fight or flight” division
 - Response to unusual stimulus when **emotionally or physically stressed or threatened**
 - Takes over to increase activities
 - Remember as the “E” division
 - ✓ **Exercise**
 - ✓ **Excitement**
 - ✓ **Emergency**
 - ✓ **Embarrassment**

Autonomic Functioning

- Parasympathetic—“housekeeping” activities
 - “Rest-and-digest” system
 - **Conserves energy**
 - Maintains daily necessary body functions
 - Remember as the “D” division
 - ✓ **Digestion**
 - ✓ **Defecation**
 - ✓ **Diuresis**

Table 7.4 Effects of the Sympathetic and Parasympathetic Divisions of the Autonomic Nervous System

Target organ/system	Parasympathetic effects	Sympathetic effects
Digestive system	Increases smooth muscle mobility (peristalsis) and amount of secretion by digestive system glands; relaxes sphincters	Decreases activity of digestive system and constricts digestive system sphincters (for example, anal sphincter)
Liver	No effect	Causes glucose to be released to blood
Lungs	Constricts bronchioles	Dilates bronchioles
Urinary bladder/urethra	Relaxes sphincters (allows voiding)	Constricts sphincters (prevents voiding)
Kidneys	No effect	Decreases urine output
Heart	Decreases rate; slows and steadies	Increases rate and force of heartbeat
Blood vessels	No effect on most blood vessels	Constricts blood vessels in viscera and skin (dilates those in skeletal muscle and heart); increases blood pressure
Glands—salivary, lacrimal, gastric	Stimulates; increases production of saliva, tears, and gastric juice	Inhibits; result is dry mouth and dry eyes

Table 7.4 Effects of the Sympathetic and Parasympathetic Divisions of the Autonomic Nervous System *(continued)*

Target organ/system	Parasympathetic effects	Sympathetic effects
Eye (iris)	Stimulates constrictor muscles; constricts pupils	Stimulates dilator muscles; dilates pupils
Eye (ciliary muscle)	Stimulates to increase bulging of lens for close vision	Inhibits; decreases bulging of lens; prepares for distant vision
Adrenal medulla	No effect	Stimulates medulla cells to secrete epinephrine and norepinephrine
Sweat glands of skin	No effect	Stimulates to produce perspiration
Arrector pili muscles attached to hair follicles	No effect	Stimulates; produces "goose bumps"
Penis	Causes erection due to vasodilation	Causes ejaculation (emission of semen)
Cellular metabolism	No effect	Increases metabolic rate; increases blood sugar levels; stimulates fat breakdown
Adipose tissue	No effect	Stimulates fat breakdown