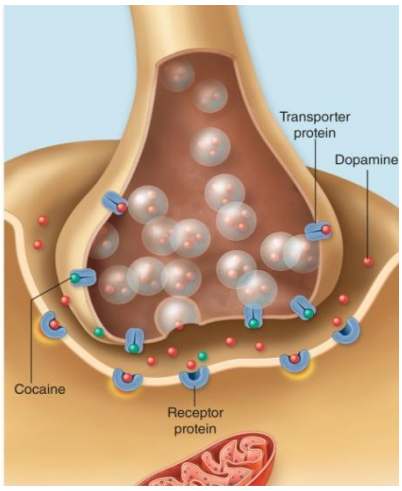
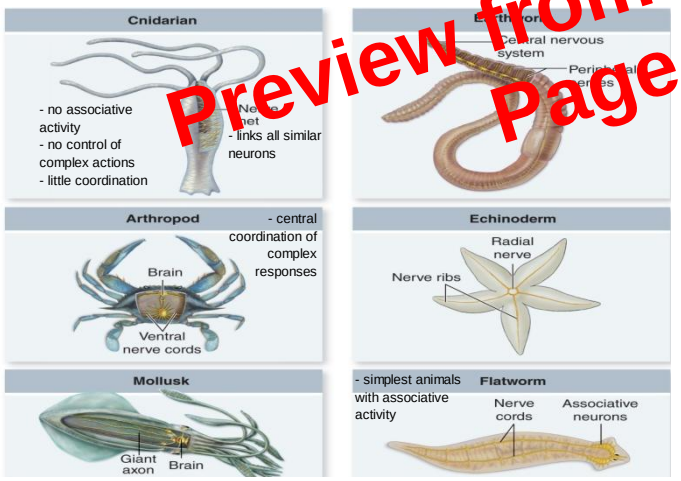
43.3.4 **Neurotransmitters play a role in drug addiction**

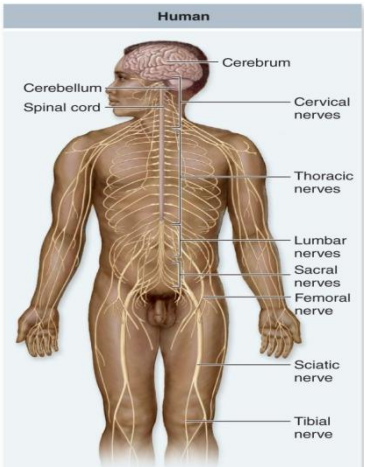


- **Habituation** – losing the ability to respond to a stimulus due to frequent exposure
- **Cocaine –** affects neurons in the brain's <u>pleasure pathway</u> (limbic system)
- **Nicotine –** binds directly to a specific receptor on postsynaptic neurons of the brain
  - **Nicotine receptors –** class of receptors that normally bind Ach
  - brain adjusts to prolonged exposure to nicotine by "turning down the volume" in two ways:
    - By making fewer receptor proteins to which nicotine can bind
    - By altering the pattern of activation of the nicotine receptors

43.4 **The Central Nervous System: Brain and Spinal Cord**

43.4.1 **Evolution of nervous systems**





- **cephalization** - an evolutionary trend, whereby nervous tissue, over many generations, becomes concentrated toward one end of an organism
- **Sponges** – only major phylum that lack nerves

43.4.2 **Three basic divisions of vertebrate Brains**

TABLE 43.3	Subdivisions of the Central Nervous System
Major Subdivision	**Function**
SPINAL CORD	Spinal reflexes; relays sensory and motor information
BRAIN	
Hindbrain (Rhombencephalon)	
Medulla oblongata	Sensory nuclei; reticular-activating system; autonomic functions
Pons	Reticular-activating system; autonomic functions
Cerebellum	Coordination of movements; balance
Midbrain (Mesencephalon)	Reflexes involving eyes and ears
Forebrain (Prosencephalon)	
Diencephalon	
Thalamus	Relay station for ascending sensory and descending motor tracts; autonomic functions
Hypothalamus	Autonomic functions; neuroendocrine control
Telencephalon (cerebrum)	
Basal ganglia	Motor control
Corpus callosum	Connects and relays information between the two hemispheres
Hippocampus (limbic system)	Memory, emotion
Cerebral cortex	Higher cognitive functions; integrates and interprets sensory information; organizes motor output

- **Hindbrain** (**rhombencephalon**) - extension of spinal cord devoted primarily to coordinating motor reflexes
  - **Cerebellum** (little brain)
  - **Pons**
  - **Medulla oblongata**
- **Midbrain** (**mesencephalon**)
  - **Optic tectum** (in fishes) – receives and processes visual information
- **Forebrain** (**procencephalon**)
  - (in fishes) processing of olfactory information
- **Dominant Forebrain in Most Recent Vertebrates** (Reptiles, amphibians, birds and mammals)
  - **Diencephalon**
    - **Thalamus** – integration and relay center between incoming sensory information and the cerebrum
    - **Hypothalamus –** participates in basic droves and emotions and controls the secretion of the pituitary gland
  - **Telencephalon** (end brain)
    - Devoted largely to associative activity
- **The expansion of the cerebrum**
  - **Cerebrum** (telencephalon in mammals)
    - center for correlation, association, and learning in the mammalian brain
    - receives sensory data from the thalamus
    - issues motor commands to the spinal cord
  - CNS neurons and neuroglia
    - **ascending tracts** – carry sensory information to the brain
    - **descending tracts** – carries impulses from the brain to the motor neurons