Ch 7: Nervous System – part 3

Parasympathetic
- Constricts pupil
- Stimulates tear glands
- Strong stimulation of salivary flow
- Inhibits heart, dilates arterioles
- Constricts Bronchi
- Stimulates stomach motility and secretion, stimulates pancreas
- Stimulates intestinal motility

Sympathetic
- Dilates pupil
- No effect on tear glands
- Weak stimulation of salivary flow
- Accelerates heart, constricts arterioles
- Dilates bronchi
- Inhibits stomach motility, and secretion, inhibits pancreas and adrenals
- Inhibits intestinal motility

Parasympathetic - relaxes bladder neck
Sympathetic - contracts bladder neck
- Stimulates ejaculation
Types of Reflexes and Regulation

- Autonomic reflexes
  - Smooth muscle regulation
  - Heart and blood pressure regulation
  - Regulation of glands
  - Digestive system regulation
Types of Reflexes and Regulation

- Somatic reflexes
- Activation of skeletal muscles
Protection of the Central Nervous System

- Scalp and skin
- Skull and vertebral column
- Meninges
Protection of the Central Nervous System

- Cerebrospinal fluid
  - Clear fluid found in spine and brain
  - Cushions brain, transports materials, removes waste products
- Blood brain barrier
Meninges

- 3 layers of connective tissue
  - **Dura mater**
    - Double-layered external covering
    - Periosteum – attached to surface of the skull
    - Meningeal layer – outer covering of the brain
  - Folds inward in several areas
Meninges

- Arachnoid layer
  - Middle layer
  - Web-like
- Pia mater
  - Internal layer
  - Clings to the surface of the brain
Blood Brain Barrier

- Includes the least permeable capillaries of the body
- Excludes many potentially harmful substances
- Useless against some substances
  - Fats and fat soluble molecules
  - Respiratory gases
  - Alcohol
  - **Nicotine**
  - Anesthesia
Spinal Cord

- Extends from the medulla oblongata to the region of T12
- Below T12 is the cauda equina (a collection of spinal nerves)
- Enlargements occur in the cervical and lumbar regions

Figure 7.18
Spinal Cord Anatomy

- Exterior white mater – conduction tracts
Spinal Cord Anatomy

- Internal gray matter - mostly cell bodies
- Dorsal (posterior) horns
- Anterior (ventral) horns

Figure 7.19
Spinal Cord Anatomy

- **Central canal** filled with cerebrospinal fluid
Spinal Cord Anatomy

- **Meninges** cover the spinal cord
- Nerves leave at the level of each vertebrae
  - **Dorsal root**
    - Associated with the dorsal root ganglia – collections of cell bodies outside the central nervous system
  - **Ventral root**
Peripheral Nervous System

- Nerves and ganglia outside the central nervous system
- Nerve = bundle of neuron fibers
- Neuron fibers are bundled by connective tissue
Structure of a Nerve

- **Endoneurium** surrounds each fiber
- Groups of fibers are bound into fascicles by perineurium
- Fascicles are bound together by epineurium
Classification of Nerves

- Mixed nerves – both sensory and motor fibers
- Afferent (sensory) nerves – carry impulses toward the CNS
- Efferent (motor) nerves – carry impulses away from the CNS
There is a pair of spinal nerves at the level of each vertebrae.

- Spinal Nerves

(a)
Autonomic Nervous System

- The *involuntary* branch of the nervous system
- Consists of only motor nerves
- Divided into two divisions
  - Sympathetic division
  - Parasympathetic division
Comparison of Somatic and Autonomic Nervous Systems

Figure 7.24
Anatomy of the Autonomic Nervous System

Figure 7.25
Autonomic Functioning

- Sympathetic – “fight-or-flight”
  - Response to **unusual stimulus**
  - Takes over to **increase activities**
  - Remember as the “E” division = exercise, excitement, emergency, and embarrassment
Autonomic Functioning

- Parasympathetic – housekeeping activities
  - Conserves energy
  - Maintains daily necessary body functions
  - Remember as the “D” division - digestion, defecation, and diuresis
Development Aspects of the Nervous System

- The nervous system is formed during the first month of embryonic development.
- Any maternal infection can have extremely harmful effects.
- The hypothalamus is one of the last areas of the brain to develop.
<table>
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<tr>
<th>Period of Dividing Zygote, and Implantation</th>
<th>Age of Embryo (in weeks)</th>
<th>Fetal Period (in weeks)</th>
<th>Full Term</th>
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<tr>
<td>Period of Dividing Zygote, and Implantation</td>
<td>C.N.S. Heart</td>
<td>Eye</td>
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Indicates common site of action of teratogen

Central nervous system

- Heart
- Upper limbs
- Lower limbs
- Teeth
- Palate
- External genitalia
- Ears

Prenatal Death

Major Defects in Body Parts and Structures

Defective Bodily Systems and Minor Defects in Body Parts and Structures

- Time of greatest vulnerability
- Time of lesser vulnerability
Development Aspects of the Nervous System

• No more neurons are formed after birth, but growth and maturation continues for several years (new evidence!)

• The brain reaches maximum weight as a young adult

• However, we can always grow dendrites!