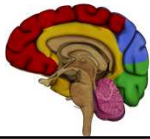
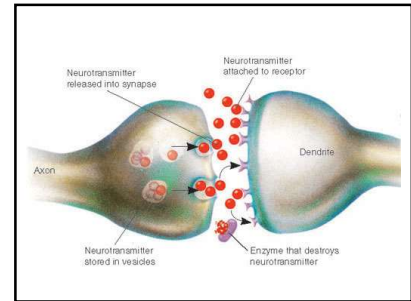


## The Nervous System: Clinical Considerations



## Synapse Review

- Action potential depolarizes the terminal button (end of axon)
- Neurotransmitter is released from vesicle
- Diffuses across space (synapse)
- Binds to receptors
- + or - sodium channels (excitatory or inhibitory)



## Common Neurotransmitters

- **Acetylcholine:** release of Ca for muscle contraction
- **Norepinephrine:** involved with attention/consciousness
- **Dopamine:** + or -; precise movements; euphoria/love
- **Serotonin:** sleep cycles & emotional states (usually inhibitory)



## Drugs and Synaptic Function

- Interfere w/ neurotransmitter synthesis
- Alter rate of neurotransmitter release
  - botulism – paralysis
  - Black widow – massive release of ACh-spasms
- Prevent neurotransmitter inactivation
  - Nerve gas inhibits AChE
- Prevent neurotransmitter binding to receptors (pain killers)
- Binds to Na<sup>+</sup> channels so action potential cannot be sent

## Habituation

- If a synapse has high levels of neurotransmitter for a long time..... The receiving cell (postsynaptic) may decrease the number of receptors.
- More drug is needed to get same effect
- Normal feedback mechanism

## Anti-depressants

- With states of depression, serotonin is in short supply
- Drug inhibits reabsorption of serotonin
  - SSRI = selective serotonin reuptake inhibitor
- More left in synapse ; gives a balance

## Doctors who Study the Mind

### Psychologist

- MS, mostly PhD in Psychology
- Studies mind & behavior
- Cannot prescribe medication

### Psychiatrist

- MD
- Branch of medicine dealing with mental, emotional, or behavioral disorders
- Can prescribe medication

## Doctors who Study the Mind

### Neurologist

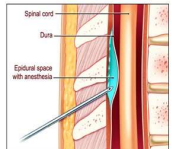
- MD
- specialist in the anatomy, functions, and organic disorders of nerves and the nervous system

### Neurosurgeon

- MD
- specialty concerned with the diagnosis & surgical treatment of disorders which affect the nervous system


### CSF Usage

- **Epidural:**
  - local anesthetic into epidural space via catheter; continuous medicine dosing



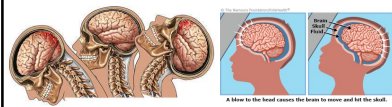
### CSF Usage

- **Lumbar Puncture (LP) or "Spinal Tap":**
  - removal of CSF from the spine in the lower back through a hollow needle, usually done for diagnostic purposes (Look for pathogens or blood)



### Traumatic Disorders

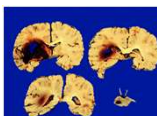
- **Concussion:** brain injury caused by an impact with an object
- **Contusion:** "bruise", non-penetrating injury to surface of brain



### Traumatic Disorders


**Cerebrovascular Accident (CVA) – aka Stroke**

- Disruption of blood flow
  - hemorrhage or clot
- Symptoms vary by area



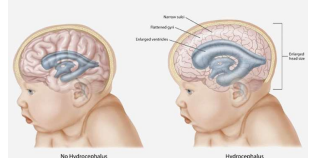
### Congenital Diseases

- **Spina bifida:** defect in spinal column; cord &/or meninges stick out of vertebrae.
  - Varying degrees of numbness & paralysis below site of protrusion



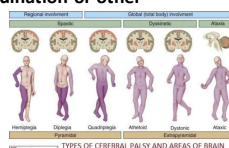
### Congenital Diseases

- **Hydrocephalus:** overproduction of CSF
  - Treatment = draining excess fluid



### Congenital Diseases

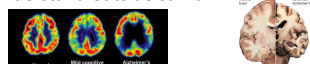
- **Cerebral palsy:** damage to cerebrum during gestation or birth; results in lack of motor coordination or other neurological defects



### Degenerative Diseases

**Alzheimer's**


- Degeneration of neurons in the brain; mental capacity worsens over time
- Symptoms include memory loss, inability to use familiar objects, inability to understand outside stimuli



### Degenerative Diseases

**Amyotrophic Lateral Sclerosis - ALS (Lou Gehrig's disease)**

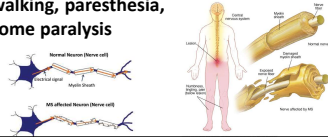
- Motor neuron degeneration; loss of muscle control & death



## Degenerative Diseases

### Multiple Sclerosis (MS)

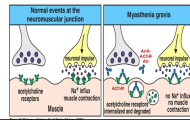
- Destruction of myelin sheath
- Extreme weakness & fatigue, unsteady walking, paresthesia, some paralysis



## Degenerative Diseases

### Myasthenia gravis

- Overproduction of antibodies blocks neurotransmitters (autoimmune)
- Muscles become very tired very quickly



## Degenerative Diseases

### Parkinson's

- Decreased dopamine production
- Tremors, weakness, difficulty walking

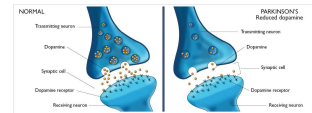
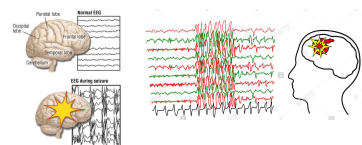


FIGURE 1. Illustration showing low level of dopamine in a neuron affected by Parkinson's disease (right) and normal levels (left).

## Other Disorders

### Epilepsy

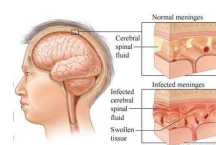
- Chronic, recurrent seizures
- Sudden, excessive electrical activity



## Other Disorders

### Meningitis

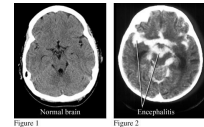
- Inflammation of meninges
- Bacterial or viral causes



## Other Disorders

### Encephalitis

- Inflammation of the brain
- Usually viral



## Other Disorders

### Guillain-Barré Syndrome

- Immune system suddenly attacks peripheral nerves
- Weakness → difficulty breathing & paralysis
- Symptoms last a few weeks to several months



## Other Disorders

### Bell's Palsy

- Temporary facial paralysis resulting from damage or trauma to the facial nerve (CN7)



## Paralysis

- Loss of movement & sensation in a part of the body
- 3 common types:
  - Hemiplegia – 1 side of the body
  - Paraplegia – from waist down (2 limbs)
  - Quadriplegia – from neck (C4) down (4 limbs)

