Neuron

Multipolar Neuron

Glia or Glial Cells
(“supporting cells” of the nervous system)
- 10X more numerous than neurons but one-tenth the size
- make up about half of brain weight
- several distinct types
- assist neurons in multiple ways

Astrocytes Exchange Materials With Neurons

Form Myelin Sheath
- Oligodendrocyte forms CNS myelin
- Schwann cell forms PNS myelin
Multiple sclerosis — patchy loss of myelin sheaths that can interfere with any CNS function (depending on which neurons lose their insulation).

- Loss of White Matter in Multiple Sclerosis

- Blood-Brain Barrier

- Radial Glial Cells

- Neurons & Synapses
Synapse

Presynaptic Terminal

Synapse

Postsynaptic membrane

Synapse Under Electron Microscope

Released Transmitter
Removed or Cleaned Up By:
• 1. Reuptake back into the presynaptic ending and/or
• 2. enzymatic breakdown

Excess transmitter inside neuron also broken down by enzymes.

Best Known Small Molecule Neurotransmitter Groups
• Acetylcholine (ACh)
• Monoamines
  • Norepinephrine (NE)
  • Dopamine (DA) These 3 are “catecholamines”
  • Epinephrine (E)
• Serotonin (5HT) (an “indoleamine”)
• Amino Acids
  • Glutamate
  • GABA
  • Aspartate
  • Glycine

Autoreceptors are presynaptic receptors!
Neurons using different neurotransmitters as their messenger are not evenly distributed throughout the nervous system.

Most neurotransmitters serve as messengers just in particular areas or systems, and thus are related to particular behaviors or functions.

**ACh:** parasympathetic neurons; motor neurons; many cortical neurons

**NE:** sympathetic n.s.; reticular formation; hypothalamus; limbic system

**SHT:** limbic system; sleep system; pain suppression system

**DA:** basal ganglia; reward system; prefrontal cortex; hypothalamus-pituitary

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**Large Molecule Transmitters**

- Neuropeptides (small proteins)
  - Pituitary peptides – like LH
  - Hypothalamic peptides – like oxytocin
  - Brain-gut peptides: like insulin
  - Opiate peptides – like endorphins
  - Miscellaneous others

**Unconventional Transmitters**

- Unconventional in their chemistry, their release and their effects

**Soluble Gases**
  - Nitric Oxide (NO) – causes blood vessels to dilate
  - Carbon Monoxide (CO)

**Endocannabinoids**
  - Anandamide