# NEUROTRANSMITTERS

Background Information: How do messages travel across the gaps between neurons? The arrival of an action potential at an axon's terminal buttons triggers the release of neurotransmitters - chemicals that transmit information from one neuron to another. Within the buttons, most of these chemicals are stored in small sacs, called synaptic vesicles. The neurotransmitters are released when a vesicle fuses with the membrane of the presynaptic cell and its contents spill into the synaptic cleft. Neurotransmitters then spread across the synaptic cleft to the membrane of the receiving cell. There they may bind with special molecules in the postsynaptic cell mem brane at various receptor sites. These sites are specifically "tuned" to recognize and respond to some neurotransmitters but not to others.

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| Neurotransmitter | Characteristics and Functions Related to Behavior | Disorders Associated with  Malfunctions/Dysregulation |
| **A**cetylcholine (ACh) | * Released by motor neurons controlling skeletal muscles * Contributes to the regulation of muscle **a**ction, **a**ttention, learning, memory and **a**rousal * Some ACh receptors are stimulated by nicotine | * Alzheime’s Disease: deterioration of ACh-producing neurons |
| Dopamine (DA) | * Dopamine circuits in medial forebrain bundle characterized as '**"reward pathway"** * Influences learning, attention and emotion * Contributes to the control of voluntary movement * Cocaine and amphetamines elevate activity at DA synapses | * Parkinsonism: undersupply of DA * Schizophrenia: oversupply of DA receptor activity  Addictive disorders |
| Norepinephrine (NE) | * Contributes to levels of **alertness and arousal (vigilance**), as well as eating behavior * Cocaine and amphetamines elevate activity at NE synapses | * Depressive disorders: undersupply of NE |
| Serotonin | * Involved in the regulation of **mood**, sleep, hunger and arousal * Prozac and similar antidepressant drugs affect serotonin circuits | • Depressive disorders: undersupply of Serotonin  • Obsessive-compulsive disorders   * Eating disorders |
| Gamma-Amino  Butyric Acid (GABA) | * Serves as a widely distributed inhibitory neurotransmitter, contributing to regulation of anxiety and sleep [arousal] * Valium and similar anti-anxiety drugs work at GABA synapses | * Anxiety disorders: undersluply * Seizures/tremors: undersupply * Insomnia: undersupply of GABA |
| Glutamate (Glu) | * Serves as a widely distributed excitatory neurotransmitter * Involved in learning and memory | * Seizures: oversupply of Glutamate * Migraines: oversupply of Glutamate |
| Endorphins | * Resemble opiate drugs in structure and effects * Play role in pain relief and response to stress * Contribute to regulation of eating behavior |  |