

Summary of the Known Major Neurotransmitters

Neurotransmitter	Function	Effect of Deficit	Effect of Surplus
Acetylcholine (ACh)	Excitatory: It produces muscle contractions and is found in the motor neurons; in the hippocampus, it is involved in memory formation, learning and general intellectual function.	Paralysis; A factor associated with Alzheimer's disease: levels of acetylcholine are severely reduced associated with memory impairment.	Violent muscle contractions
Dopamine	Excitatory: involved in voluntary muscle movements, attention, learning, memory, and emotional arousal and rewarding sensations	Muscle rigidity; A factor associated with Parkinson's disease: degeneration of neurons in the substantia nigra that produce dopamine.	One factor associated with schizophrenia-like symptoms such as hallucinations and perceptual disorders, addiction
Serotonin	Inhibitory or excitatory: involved in mood, sexual behavior, pain perception, sleep, eating behavior, maintaining a normal body temperature and hormonal state	Anxiety, mood disorders, insomnia; One factor associated with obsessive-compulsive disorder and depression	Autism
Endorphins	Inhibitory: regulates pain perception and involved in sexuality, pregnancy, labor, and positive emotions associated with aerobic exercise—the brains natural opiates.	Body experiences pain	Body may not give adequate warning about pain
Norepinephrine	Excitatory and inhibitory: involved in increasing heartbeat, arousal, learning, memory, and eating	One factor associated with depression.	Anxiety
GABA (gamma aminobutyric acid)	Inhibitory: communicates messages to other neurons, helping to balance and offset excitatory messages. It is also involved in allergies	Destruction of GABA-producing neurons in Huntington's disease produces tremors and loss of motor control, as well as personality changes.	Sleep and eating disorders

Also see Table 2.1 on page 52

How Drugs Can Affect Synaptic Transmission (Also see figure 2.7 on page 54)

1. Drugs can mimic specific neurotransmitters. Nicotine is chemically similar to acetylcholine and can occupy acetylcholine receptor sites, stimulating skeletal muscles and causing the heart to beat more rapidly.
2. Drugs can mimic or block the effects of a neurotransmitter by fitting into receptor sites and preventing the neurotransmitter from acting. For example, the drug curare produces almost instant paralysis by blocking acetylcholine receptor sites on motor neurons.
3. Drugs can affect the length of time the neurotransmitter remains in the synaptic gap, either increasing or decreasing the amount available to the postsynaptic receptor.
4. Drugs can increase or decrease the amount of neurotransmitters released by neurons.

Acetylcholine	<p><u>Nicotine</u>: increases the release of acetylcholine</p> <p><u>Curare</u>: blocks the receptor sites of acetylcholine</p> <p><u>Botulin</u>: poisons found in improperly canned food, blocks the release of acetylcholine resulting in paralysis of the muscles</p> <p><u>Nerve gas</u>: continual release of acetylcholine</p> <p><u>Scopolamine</u>: blocks ACh receptors and impairs learning and even at low doses causes drowsiness, amnesia and confusion</p>
Dopamine	<p><u>L-dopa</u>: converts into dopamine in the brain</p> <p><u>Phenothiazine</u>: reduces dopamine in the brain</p> <p><u>Amphetamines</u>: Increases dopamine and norepinehrine, and to some extent serotonin and activates the sympathetic nervous system.</p>
Serotonin	<p><u>LSD</u>: Impairs the reuptake of serotonin, making more serotonin available.</p> <p><u>Prozac</u>: Prevents the reuptake of serotonin, making more serotonin available</p> <p><u>MDMA (ecstasy)</u>: Destroys serotonin nerve cells in animals with moderate and large doses.</p> <p><u>Cocaine</u>: Affects norepinephrine and serotonin, and prevents the reuptake of dopamine in the synapse and activate the sympathetic nervous system.</p>
Endorphins	<p><u>Opiates</u>: Increases the production of endorphins</p> <p><u>Naloxone</u>: blocks endorphin receptor sites</p>
Norepinephrine	<p><u>Caffeine</u>: Reduces the ability of the brain to produce adenosine, the “brakes” of the brain and CNS. Doses of 700 mg can contribute to panic attacks (200 mg is two strong cups of coffee, Mountain Dew is 54 mg).</p> <p><u>Cocaine</u>: Affects norepinephrine and serotonin, and prevents the reuptake of dopamine in the synapse and activate the sympathetic nervous system.</p> <p><u>Amphetamines</u>: Increases dopamine and norepinehrine, and to some extent serotonin and activates the sympathetic nervous system.</p>
GABA (gamma aminobutyric acid)	<p><u>Valium, Xanax, Depressants, GBH, easy lay and alcohol</u> work by increasing GABA activity, which inhibits action potential and slows brain activity.</p>