Summary of the Major Neurotransmitters (see page 55-58)

Neurotransmitter	General Function	Deficit relations	Surplus Relations
Serotonin	Involved in the regulation of sleep, wakefulness, dreaming eating, and impulse control. Low levels are associated with mood disorders.	Anxiety, mood disorders, insomnia; One factor associated with obsessive-compulsive disorder and depression	
Norepinephrine (noradrenaline)	Influences mood and arousal such as states of vigilance or a heightened awareness of danger. It is usually considered an excitatory neurotransmitter involved in stress, increasing heartbeat, arousal, learning, memory, and eating	One factor associated with depression.	Anxiety
Acetylcholine (ACh)	It produces muscle contractions 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
Glutamate	Generally, an excitatory neurotransmitter involved in enhancing transmission of information in the brain.		Seizures
GABA (gamma aminobutyric acid)	Generally, an inhibitory neurotransmitter that helps to balance and offset excitatory messages and reduces anxiety. It is also involved in allergies.	Anxiety	Sleep and eating disorders
Endorphins	Endorphins (endogenous morphine) regulate pain and positive emotions, associated with aerobic exercise. It is the brains natural opiates.	Body experiences pain	Body may not give adequate warning about pain
Dopamine	Involved in voluntary muscle movements, attention, learning, memory, and emotional arousal and rewarding sensations	A factor associated with Parkinson's disease: degeneration of neurons in the midbrain that produce dopamine.	One factor associated with schizophrenia-like symptoms such as hallucinations, perceptual disorders, and addiction.

Drugs Can Alter How Neurotransmitters Function (also see image from the class notes)

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 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.

Serotonin	LSD: Impairs the reuptake of serotonin, making more serotonin available. MDMA (ecstasy): Destroys serotonin nerve cells in animals with moderate and large doses. Prozac: Prevents the reuptake of serotonin, making more serotonin available
Norepinephrine	Amphetamines: Increases dopamine and norepinephrine, and inhibits their reuptake. To some extent, they also affect serotonin and activates the sympathetic nervous system. Caffeine: 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). Cocaine: Increases dopamine and norepinephrine and prevents the reuptake of dopamine in the synapse and activate the sympathetic nervous system.
Acetylcholine	Botulin: poisons found in improperly canned food, blocks the release of acetylcholine resulting in paralysis of the muscles Curare: blocks the receptor sites of acetylcholine Nicotine: increases the release of acetylcholine Nerve gas: continual release of acetylcholine Scopolamine: blocks ACh receptors and impairs learning and even at low doses causes drowsiness, amnesia and confusion
GABA (gamma aminobutyric acid)	Valium, Xanax, Depressants, GBH, easy lay and alcohol work by increasing GABA activity, which inhibits action potential and slows brain activity.
Endorphins	Naloxone: blocks endorphin receptor sites Opiates: Fits in endorphin receptor sites
Dopamine	Amphetamines: Increases dopamine and norepinephrine, and to some extent serotonin and activates the sympathetic nervous system. Cocaine: Increases dopamine and norepinephrine and prevents the reuptake of dopamine in the synapse and activate the sympathetic nervous system. L-dopa: converts into dopamine in the brain Phenothiazine: reduces dopamine in the brain