

# Neurotransmitters and Their Functions

Neurotransmitter	Function	Oversupply	Undersupply
<b>Acetylcholine (ACh)</b>	<ul style="list-style-type: none"> <li>Enables movement (transmitted from motor neurons to muscles)</li> <li>Involved in learning and memory (many ACh receptors are in the hippocampus)</li> </ul>	<ul style="list-style-type: none"> <li>Blurred vision</li> <li>nausea and vomiting</li> <li>slow heart rate</li> <li>difficulty breathing</li> <li>paralysis due to wearing out ACh receptors</li> </ul>	<ul style="list-style-type: none"> <li><b>Myasthenia Gravis</b> (muscle weakness due to destruction of ACh receptors in muscles)</li> <li><b>Alzheimer's disease</b> (memory loss due to deterioration of ACh neurons in the brain)</li> </ul>
<b>Dopamine</b>	<ul style="list-style-type: none"> <li>Helps the brain coordinate and initiate physical movement</li> <li>Released in response to pleasurable experiences (makes you feel good and more likely to do that thing again)</li> <li>Influences motivation and goal-directed behavior</li> <li>Influences cognition and executive function</li> </ul>	<ul style="list-style-type: none"> <li><b>Schizophrenia</b> (most likely due to an overabundance of a certain type of dopamine receptor which makes it more easy for dopamine to activate neurons)</li> <li>Euphoria, overly-energized, difficulty sleeping; psychosis</li> </ul>	<p><b>Parkinsons disease</b> (tremors and decreased mobility due do deterioration of dopamine producing neurons that coordinate movement)</p> <p><b>ADHD</b> (associated with dopamine dysregulation, but the mechanism is not fully understood)</p>
<b>Serotonin</b>	<ul style="list-style-type: none"> <li>Involved in mood regulation</li> <li>Involved in sleep and arousal regulation</li> <li>Involved in regulation of appetite and digestion</li> </ul>	<ul style="list-style-type: none"> <li><b>Serotonin Syndrome</b> (potentially life threatening; usually caused by drugs that lead to serotonin overactivity) – nervousness, nausea/vomiting, dilated pupils, tremors, agitation, restlessness, sweating/shivering, confusion/disorientation, rapid heart rate, high blood pressure, seizures</li> </ul>	<ul style="list-style-type: none"> <li>Linked with depression, but the mechanism is not fully understood</li> <li>Linked with anxiety, worry, nervousness,</li> <li>Linked with sleep difficulties</li> </ul>

<b>Norepinephrine</b>	<ul style="list-style-type: none"> <li>Involved in promoting wakefulness, alertness, and arousal</li> <li>Released in response to stress and helps initiate the fight or flight response</li> </ul>	<ul style="list-style-type: none"> <li>Stress</li> <li>Anxiety</li> <li>Associated with manic episodes in bipolar disorder</li> </ul>	<ul style="list-style-type: none"> <li>Depressed mood, sleep problems</li> </ul>
<b>Neurotransmitter</b>	<b>Function</b>	<b>Oversupply</b>	<b>Undersupply</b>
<b>GABA (gamma-aminobutyric acid)</b>	<ul style="list-style-type: none"> <li>Major inhibitory neurotransmitter</li> <li>Makes it less likely for a neuron to fire</li> <li>Reduces brain activity</li> </ul>	<ul style="list-style-type: none"> <li>Drowsiness</li> <li>Muscle weakness</li> <li>Cognitive impairment due to reduced brain activity</li> </ul>	<ul style="list-style-type: none"> <li>Anxiety</li> <li>Insomnia</li> <li>Chronic pain</li> <li>Depressed mood</li> <li>Seizures</li> </ul>
<b>Glutamate</b>	<ul style="list-style-type: none"> <li>Major excitatory neurotransmitter</li> <li>Makes it more likely for a neuron to fire</li> <li>Increases brain activity</li> <li>Involved in learning and memory</li> </ul>	<ul style="list-style-type: none"> <li>Seizures</li> <li>Migraines</li> </ul>	<ul style="list-style-type: none"> <li>Cognitive impairments</li> <li>Learning deficits</li> </ul>
<b>Endorphins</b>	<ul style="list-style-type: none"> <li>Regulates the perception of pain (acts as the brain's natural opiates)</li> <li>Enhances mood (feelings of euphoria and pleasure)</li> <li>Can reduce the body's stress response</li> </ul>		<ul style="list-style-type: none"> <li>Increased sensitivity to pain</li> </ul>
<b>Substance P</b>	<ul style="list-style-type: none"> <li>Involved in the perception of pain (helps transmit pain signals from the body's skin, muscle, and tissues to the central nervous system)</li> <li>Plays a role in promoting inflammation in response to injury</li> <li>Involved in regulating emotion and social behavior</li> </ul>		

