### NEI’s Master Psychopharmacology Program
Study Guide: Basic Neuroscience

<table>
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<tr>
<th>Subtopic</th>
<th>Benchmarks (You Should Be Able To)</th>
<th>Recommended Resources</th>
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<tr>
<td>Synaptic Neurotransmission</td>
<td>Identify the organelles and their functions&lt;br&gt;Link the anatomic zones of neurons to specific functions&lt;br&gt;Describe the structure and function of the synapse&lt;br&gt;Describe the time course of neurodevelopment&lt;br&gt;Explain neurogenesis, neuronal selection, and neuronal migration&lt;br&gt;Describe the process of synaptogenesis&lt;br&gt;Describe synaptic plasticity&lt;br&gt;Explain the process of competitive elimination&lt;br&gt;Explain the process of excitotoxicity</td>
<td>Additional Resources**&lt;br&gt;Stahl SM. Stahl’s essential psychopharmacology, fourth edition. New York, NY: Cambridge University Press; 2013. (Chapter 1)</td>
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<td>Chemical Neurotransmission</td>
<td>Differentiate between the types of neurotransmission&lt;br&gt;Explain the process of signal transduction cascade&lt;br&gt;Explain the process of formation of second messengers&lt;br&gt;Describe how second messenger systems regulate downstream events&lt;br&gt;Describe the processes underlying up- and downregulation of receptors</td>
<td>Learning Activities*&lt;br&gt;<strong>Back to Basics: Signal Transduction and Activation of Transcription Factors (CME animation)</strong>&lt;br&gt;Additional Resources**&lt;br&gt;Stahl SM. Stahl’s essential psychopharmacology, fourth edition. New York, NY: Cambridge University Press; 2013. (Chapter 1)</td>
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*You may choose any 24 non-expired Learning Activities to complete the requirements of the Master Psychopharmacology Program. For the full list of Master Psychopharmacology Program requirements, please visit nei.global/mpp.

**These resources do not count toward the requirements of the Master Psychopharmacology Program and are merely listed here as useful resources for additional study.
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| Receptors, Ion Channels, and Enzymes | Differentiate G-protein-coupled receptors from ligand-gated receptors from voltage-sensitive ion channels  
Differentiate the mechanisms of action and functions of monoamine transporters vs. vesicular monoamine transporters  
Describe the function of agonists, partial agonists, antagonists, and inverse agonists  
Identify modulators of ligand-gated ion channels  
Explain the role of ion channels in neurotransmission  
Distinguish between voltage-sensitive sodium and calcium channels  
Differentiate how the various glutamate receptors are regulated  
Describe the major functions of enzymes | **Additional Resources**  
One Neurotransmitter to Rule Them All: The Serotonin Network (CME video)  
The Serotonin System: Focus on 5HT3 Receptors (animation) |
| Genes, Environment, Symptoms, and Circuits | Describe the relationship between genes, environment, and behavior  
Describe an endophenotype  
Explain the concept of epigenetics  
Identify the major functional areas of the cortex  
Identify major subcortical regions relevant to psychiatric symptoms and conditions  
Identify the major projections for different neurotransmitter systems  
Differentiate the functions of major circuits originating in the cortex  
Identify brain imaging techniques used in psychiatric research | **Learning Activities**  
My Microbiota Made Me Do It: How the Microbiome Can Influence Behavior (CME animation)  
How Can Exercise Improve Cognition? The Role of BDNF (CME animation)  
**Additional Resources**  
Neurobiology of Sleep (animation)  
Basic Neuroscience: From Circuits to Symptoms (CME video)  
Molecular Neuroscience: From Genes to Mental Health (CME video) |

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