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

<table>
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<th>Subtopic</th>
<th>Benchmarks (You Should Be Able To)</th>
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| **Synaptic Neurotransmission** | Identify the organelles and their functions  
Link the anatomic zones of neurons to specific functions  
Describe the structure and function of the synapse  
Describe the time course of neurodevelopment  
Explain neurogenesis, neuronal selection, and neuronal migration  
Describe the process of synaptogenesis  
Describe synaptic plasticity  
Explain the process of competitive elimination  
Explain the process of excitotoxicity | Additional Resources**  
| **Chemical Neurotransmission** | Differentiate between the types of neurotransmission  
Explain the process of signal transduction cascade  
Explain the process of formation of second messengers  
Describe how second messenger systems regulate downstream events  
Describe the processes underlying up- and downregulation of receptors | Learning Activities*  
[Back to Basics: Signal Transduction and Activation of Transcription Factors (CME animation)](http://cdn.neiglobal.com/content/mpp/studyguide/studyguide_basicneuro.pdf)  
Additional Resources**  
[The Importance of Tonic and Phasic Dopamine Firing in Psychiatric Illnesses (animation)](http://cdn.neiglobal.com/content/mpp/studyguide/studyguide_basicneuro.pdf) |

*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*  
The Molecular Mechanisms of Epigenetics (CME animation)  
Serotonin and its Role as a Command Neurotransmitter (CME animation)  
Neurobiology of Sleep (CME animation)  
Additional Resources**  
Basic Neuroscience: From Circuits to Symptoms (CME video)  
Molecular Neuroscience: From Genes to Mental Health (CME video) |

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