

Synaptic Transmission Learning Outcomes

As a result of studying the synaptic transmission online lesson you should:

1. Understand what is meant by the terms neuromuscular junction, neuroeffector junction, synapse and synaptic transmission.
2. Be able to describe the difference between axodendritic, axosomatic and axoaxonic synapses.
3. Know the main structural elements of a synapse and the relationship between these.
4. Appreciate that the close apposition of neurones is not sufficient for information to flow between them.
5. Understand the theories of synaptic transmission championed by John Eccles and Henry Dale.
6. Be able to describe the structural characteristic of electrical synapses and be able to identify some of the places where they are located.
7. Understand the difference between rectifying and bidirectional (reciprocal) synapses.
8. Be able to describe the structural characteristic of a chemical synapse.
9. Appreciate that there are two major classes of neurotransmitter, that these are stored in different vesicle types and know the names of transmitters belonging to the different families.
10. Understand that some neurotransmitters perform important cellular functions in addition to their roles as neurotransmitters and that many neurones contain more than one neurotransmitter.
11. Understand the physiological processes involved in neurotransmitter exocytosis from the presynaptic neurone.
12. Be able to describe the mechanisms by which the duration of action of neurotransmitters is limited.
13. Appreciate that anything that blocks the degradation or reuptake of a neurotransmitter results in an increased concentration of the neurotransmitter in the synaptic cleft.
14. Understand what is meant by the term synaptic delay and what contributes to this process.
15. Appreciate that it is the receptor for the neurotransmitter that determines whether a synapse is excitatory or inhibitory.
16. Be able to describe the fundamental differences between ionotropic and metabotropic neurotransmitter receptors.
17. Understand the ionic-basis of the excitatory postsynaptic potential produced when either glutamate binds to a glutamate receptor or acetylcholine binds to the nicotinic acetylcholine receptor.
18. Understand the ionic-basis of an inhibitory postsynaptic potential.
19. Appreciate the relationship between metabotropic receptors, G-proteins, intracellular enzymes and second messengers in relation to synaptic transmission.
20. Know some of the second messengers that are released following metabotropic receptor activation and some of their effects on cellular function.
21. Be able to describe the mechanisms by which acetylcholine produces different effects depending on whether it binds to nicotinic or muscarinic acetylcholine receptors.
22. Understand the different types of summation and be able to explain how these mechanisms underpin the large number of decisions we make every day.