What is Neurotransmission?

Worksheet

Neurotransmission is the process by which an electrical impulse (action potential) travels along a neuron, triggers the release of chemical neurotransmitters at the synapse, and these bind to receptors on the next cell to pass the signal on.

Questions

1. What directly triggers the release of neurotransmitters at the synapse?

A) Sodium efflux
B) Calcium influx
C) Potassium leakage
D) Chloride binding

2. Where do neurotransmitters bind after being released?

A) Receptors on the postsynaptic membrane
B) The presynaptic nucleus
C) The myelin sheath
D) The axon hillock

3. What is acetylcholine an example of?

A) A hormone
B) A neurotransmitter
C) An enzyme
D) An ion channel

4. How is a neurotransmitter signal typically ended?

A) It stays in the synapse forever
B) By reuptake or enzymatic breakdown
C) By more calcium entering
D) By the muscle contracting harder

5. A motor neuron needs to make a muscle contract. Trace the neurotransmission steps at the neuromuscular junction.

6. A drug blocks the reuptake of serotonin at the synapse (like an SSRI). Explain the effect on neurotransmission.

7. A toxin destroys voltage-gated calcium channels at the presynaptic terminal. Predict the effect.

8. Define: What is a synapse?

9. Define: What triggers neurotransmitter release?

10. Define: What is a neurotransmitter?

Answer Key

1. B) Calcium influx - Calcium entering the axon terminal causes synaptic vesicles to fuse and release neurotransmitter.

2. A) Receptors on the postsynaptic membrane - Neurotransmitters cross the synaptic cleft and bind to receptors on the next neuron.

3. B) A neurotransmitter - Acetylcholine is a neurotransmitter used at neuromuscular junctions and elsewhere.

4. B) By reuptake or enzymatic breakdown - Reuptake or breakdown clears the neurotransmitter, ending the signal.

5. An action potential travels down the motor neuron's axon Calcium enters the axon terminal, triggering vesicle fusion Acetylcholine (the neurotransmitter) is released into the synaptic cleft Acetylcholine binds to receptors on the muscle fiber membrane This opens ion channels, triggering a new electrical signal that causes the muscle to contract

6. Normally, released serotonin is reabsorbed into the presynaptic neuron after signaling Blocking reuptake means serotonin stays in the synaptic cleft longer This increases and prolongs serotonin's binding to postsynaptic receptors Result: serotonin signaling between neurons is enhanced, which is why SSRIs are used to treat depression

7. Without functional calcium channels, calcium cannot enter the axon terminal when an action potential arrives Without calcium influx, synaptic vesicles cannot fuse with the membrane Result: neurotransmitter cannot be released, and the signal fails to cross the synapse - communication between the two neurons stops

8. The junction between two neurons (or a neuron and a muscle/gland) where signals are transmitted.

9. Calcium influx into the axon terminal after an action potential arrives.

10. A chemical messenger released by a neuron that binds to receptors on the next cell.