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ANATOMY

300lvl

Describe synthesis of two neurotransmitters.

1.)Norepinephrine (NE) is the primary neurotransmitter for postganglionic sympathetic adrenergic nerves. It is synthesized inside the nerve axon, stored within vesicles, then released by the nerve when an action potential travels down the nerve. Below are the details for release and synthesis of NE:

* The amino acid tyrosine is transported into the sympathetic nerve axon.
* Tyrosine (Tyr) is converted to DOPA by tyrosine hydroxylase (rate-limiting step for NE synthesis).
* DOPA is converted to dopamine (DA) by DOPA decarboxylase.
* Dopamine is transported into vesicles then converted to norepinephrine (NE) by dopamine β-hydroxylase (DBH); transport into the vesicle can by blocked by the drug reserpine.
* An action potential traveling down the axon depolarizes the membrane and causes calcium to enter the axon.
* Increased intracellular calcium causes the vesicles to migrate to the axonal membrane and fuse with the membrane, which permits the NE to diffuse out of the vesicle into the extracellular (junctional) space. DBH, and depending on the nerve other secondary neurotransmitters (e.g., ATP), is released along with the NE.
* The NE binds to the postjunctional receptor and stimulates the effector organ response.

2.)Epinephrine synthesis and release: Epinephrine is synthesized from norepinephrine within the adrenal medulla, which are small glands associated with the kidneys. Preganglionic fibers of the sympathetic nervous system synapse within the adrenals. Activation of these preganglionic fibers releases acetylcholine, which binds to postjunctional nicotinic receptors in the tissue. This leads to stimulation of NE synthesis within adenomedullary cells, but unlike sympathetic neurons, there is an additional enzyme (phenylethanolamine-N-methyltransferase) that adds a methyl group to the NE molecule to form epinephrine. The epinephrine is released into the blood perfusing the glands and carried throughout the body.