**Common and differing features of amine and peptide transmitter synthesis and release**

Neurotransmitters are bioactive, endogenous substances. They are produced by neurons in order to transmitt information from one nerve cell to another. They belong to 2 main categories: the classic amine type and the non-classic peptide type groups. The two groups of neurotransmitters share the same scheme of life cycle. These neurotransmitter molecules are synthesized by enzymes in the cell body. After that, they are packaging into vesicles. The fusion of vesicles results in neurotransmitter release. When they bond to the postsynaptic receptors, they activate them. Finally released neurotransmitter molecules are deactivated either by enzymatic degradation or reuptake.

Classic amine neurotransmitters are also called as small molecule neurotransmitters.

For amine synthesis the enzymes and storage vesicles are synthesized in the cell body of the presynaptic cell. These agents are transported to the Golgi apparatus, where they are modified. The modification can be for example sulfation or glycosylation. Soluble enzymes are transported by slow axonal transport to the axon terminal. The transmitter synthesis and packaging take place in the axon terminal. After vesicle fusion, the neurotransmitters are released to the synaptic claft by exocytosis, and then they might be enzymatically degraded. The transmitter reuptake starts another cycle of synthesis, packaging, release, and removal.

The second group of neurotransmitters are the peptide type neurotransmitters. They are also called non-classic neurotrasmitters.

Polypeptides are synthesized in the RER, where their signal sequence of amino acids is removed. Peptide precursors, converting enzymes and storage vesicles are also synthesized in the cell body. In the Golgi apparatus propeptides and enzymes are packaged into vesicles. Vesicles are transported by fast axonal transport to the axon terminal, the enzymes cleave the propeptides to produce neurotransmitter peptides, After vesicle fusion and exocytosis to the synaptic claft, peptide neurotransmitters diffuse away and then proteolytic enzymes degrade them. They are not recycled like in the other case.

There are many common and differing features of amine and peptide transmitter synthesis and release. Amine neurotransmitters have less than 200 molecular weight. Peptide neurotransmitters have more than 300 molecular weight. In both cases the enzymes and storage vesicles are synthesized in the cell body. However, in case of a peptide transmitter the peptide precursor is also synthesized in the cell body. In the first situation synthesizing enzymes and the storage vesicles are transported by slow axonal transport, unlike the second one where only the storage vesicles are transported by fast axonal transport. During amine transmitter synthesis the axon terminal gets the supply of constituents from 3 locations. From the cell body, from local synthesis and from reuptake. During peptide transmitter synthesis the axon terminal gets the supply of constituents only from the cell body. Calssic neurotransmitters are stored within small (40-50 nm) sized vesicles. Non-classic neurotransmitters are packaged into neurosecretory granules (their diameter is around 80-200 nm). After amine transmitter release the neurotransmitters might be recycled, on the other hand peptide transmitters are never recycled.

Sources:

<http://what-when-how.com/neuroscience/neurotransmitters-the-neuron-part-1/>

<http://4miradas.rua.unam.mx/ingles/medicina/cap1_tema3.html>

<http://www.biologydiscussion.com/pharmacology-2/animals/classification-of-central-transmitters-pharmacology/74208>

<https://users.itk.ppke.hu/neurobiologia/2019-2020_SEMESTER_1/LECTURES/1.%20LECTUREE%20PDFs/Neurob_13.pdf>

<https://users.itk.ppke.hu/neurobiologia/2019-2020_SEMESTER_1/LECTURES/1.%20LECTUREE%20PDFs/Neurob_14.pdf>

<https://users.itk.ppke.hu/neurobiologia/2019-2020_SEMESTER_1/LECTURES/1.%20LECTUREE%20PDFs/Neurob_15.pdf>