

Neurotransmitters

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Small molecules

Rapidly acting transmitters, Synthesis in presynaptic terminal (no need to be transported there as it's already in the terminal) Packed in vesicles, Recyclable, both Ionotropic and Metabotropic.

Neuropeptides

Synthesized in the neuronal cell body or soma (because they require gene expression then transported along the axon to the axon terminals), Released in smaller quantities than small neurotransmitters and more potent than them (less amounts achieve the same effect), Slower but prolonged effect, Usually, the vesicle is autolyzed not reused, Metabotropic only

Acetylcholine [1]

Nitric Oxide [4]

Norepinephrine [2]

Dopamine [2]

Substance P

Oxytocin

Synthesized at the same site where it is released (the axon terminal) from choline and acetyl-CoA by the enzyme choline acetyltransferase (ChAT). Secreted by **neurons at the skeletal muscles (NMJ), Basal forebrain and Neurons of the autonomic nervous system**, associated with Muscle contraction, thinking and judgment

Not preformed and stored in vesicles, synthesized instantly as needed, Usually doesn't alter membrane potential greatly but changes intracellular metabolic functions that modify neuronal excitability

Secreted by the terminals of neurons in the brainstem, specifically, **locus ceruleus** that plays a role in wakefulness and arousal, and by most **postganglionic neurons of the sympathetic nervous system**

Secreted by **neurons in nigrostriatal, mesolimbic, mesocortical, and tuberoinfundibular* pathways** [Pathway color indicates in which pathway happens the disorder]

Released from **sensory neurons, spinal cord and the hypothalamus**. Associated with pain transmission (chronic pain—a long lasting pain), inflammation and stress

Produced in **the hypothalamus and Released from the posterior pituitary** into the blood stream.
 • Stimulates uterus contractions during labor
 • Promotes ejection of milk during lactation
 • Social bonding and emotional behavior

Mostly Inhibitory (not in slides)

Both, but mostly Excitatory (not in slides)

*Medications that block dopamine in the tuberoinfundibular pathway can cause unintended milk production by increasing prolactin levels.

Both Excitatory and Inhibitory

ADHD Depression

Schizophrenia Parkinsonism

Mostly Excitatory

Myasthenia gravis Alzheimer's

(decrease in functional receptors, not low release)

Glycine [3]

GABA [3]

Glutamate [3]

Serotonin [2]

Secreted mainly at **synapses in the spinal cord**. The primary inhibitory neurotransmitter in the spinal cord.

Gamma-aminobutyric acid (GABA). The primary inhibitory neurotransmitter in the brain

A Glutamate is the main excitatory neurotransmitter (in the CNS)

Secreted by **raphe nucleus of the brain stem, control mood, sleep, appetite and pain reception**.

Almost always Inhibitory

The main inhibitory neurotransmitter.

Both Excitatory and Inhibitory (not in slides)

Epilepsy

Depression

Can be treated by SSRIs (Selective Serotonin Reuptake Inhibitors), which keep more serotonin in the synapse and increase its availability.

Color key [1] Choline [2] Amines [3] Amino acids [4] Others

Iono and Metabo	Excess neurotransmitter activity
Metabotropic	Reduced neurotransmitter activity
Ionotropic	اللهم إني أستودعك ما حفظت وما قرأت وما تعلمت فرده إلي عند حاجتي إليه. إنك على كل شيء قدير. سبحانك اللهم وبحمدك أشهد أن لا إله إلا أنت أستغفرك وأتوب إليك. لا تنسوننا من صالح دعائكم
Neither	