Chemicals that transmit the signal from one neuron to the next are called neurotransmitters. They are synthesized in the cell body or nerve terminal of the presynaptic neuron. Neurotransmitters are released from the synapse and cross the synaptic cleft. The dendrite on the nerve cell body receives the signal. Various receptors on the postsynaptic membrane of the dendrite accept only certain neurotransmitters.

In the brain, 30 different neurotransmitters have been classified as amino acids, amines, and neuropeptides.

- **Amino acid neurotransmitters:**
  - **Glutamate, GABA,** and **glycine.** Glutamate is an **excitatory** neurotransmitter. GABA and glycine are **inhibitory** neurotransmitters. GABA is the major inhibitory neurotransmitter within the CNS.
- **Amines:**
  - Include the **catecholamines — dopamine, norepinephrine,** and **epinephrine** — as well as **serotonin, histamine,** and **acetylcholine.**
- **Neuropeptides —** most are also hormones; these include vasopressin, oxytocin, insulin, somatostatin, gastrin, substance P, endorphin, and enkephalin.

Remember:

- **Acetylcholine:** effects in CNS generated by interaction with a mixture of nicotinic and muscarinic receptors
- **Dopamine:** a catecholamine which acts through at least two subtypes D1 *(activates adenyl cyclase)*, D2 *(inhibits adenyl cyclase)*
- **Serotonin:** is 5-hydroxytryptamine which works through at least 14 subreceptor "tryptominergic" type neurons

Notes

1. Biosynthetic pathway of **ACH:** **Step (1)** Choline *(taken up into nerve via action of permease)*
   Step (2) Choline acetyltransferase catalyzes the synthesis of Ach from acetyl CoA and choline

2. Biosynthesis of **NE and E:** **Step (1)** Tyrosine to DOPA *(enzyme is tyrosine hydroxylase*
   Step (2) DOPA to Dopamine *(enzyme is aromatic L-amino acid decarboxylase)*
   Step (3) Dopamine to NE *(enzyme is dopamine beta hydroxylase)*
   Step (4) *(mostly in the adrenal medulla)*: NE to E *(enzyme is phenylethanolamine N-methyltransferase)*