

Dopamine Encyclopedia Article

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Dopamine

Dopamine (DA) is a catecholamine according to its chemical structure and a neurotransmitter of special importance for drug addiction. DA is a decarboxylated form of dopa (an amino acid) found especially in the basal ganglia. Chemically known as 3, 4 dihydroxyphenylethylamine, DA arises from dihydroxyphenylacetic acid (dopa) by the action of the enzyme dopa decarboxylase. Dopamine-containing NEURONS (nerve cells) are widespread in the brain and the body. Small interneurons are found in the autonomic ganglia, retina, hypothalamus, and medulla. Long axon neurons are found in two extensive circuits: (1) the nigrostriatal pathway links the substantia nigra neurons to the basal ganglia neurons and regulates locomotor events; (2) the mesocortical and mesolimbic circuits arise in the ventral tegmental area and project to the neocortex, limbic cortices, nucleus accumbens, and amygdala, where they regulate emotional events, including several forms of drug addiction, reinforcement, or reward. DA is also found in minute amounts in other catecholamine neurons as a precursor to norepinephrine. The DA transporter, which transports DA from outside the nerve terminal to inside the nerve terminal, functions to retrieve released DA and help terminate its action at receptors. The transporter is the target of psychostimulant drugs that produce their effects, at least in part, by blocking the transporter and preventing its removal from receptors. A consistent observation, for example, is the efflux of DA from nerve terminal regions in the nucleus accumbens in response to giving animals a psycho-stimulant such as cocaine or amphetamine. DA is also thought to be involved in schizophrenia and psychosis since DA-receptor-blocking drugs are clinically useful antipsychotic agents. Another disease, in which DA is lost due to the degeneration of DA-containing neurons, is Parkinson's disease, which can be treated by replacing DA with its precursor, dopa.