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Perspective

Dopamine: A Rewarding Hormone

Richard Daniel*

Editorial Office, Journal of Steroid and Hormonal Science, Brussels, Belgium

PERSPECTIVE

In neuromodulation, the dopaminergic system is involved in motor control, motivation, reward, cognitive function, maternal, and reproductive behaviours, among other things. Dopamine is a neurotransmitter that acts by binding to G protein-coupled receptors in both the central nervous system and the peripheral nervous system. Dopamine receptors are found in both the peripheral and central nervous systems and are broadly distributed in the body. Dopaminergic signalling pathways are critical for the maintenance of physiological activities, and their imbalanced activity can contribute to neurodegenerative disease-related dysfunctions. Uncovering the neurobiology and molecular mechanisms that underpin these diseases may aid in the development of innovative medicines that improve the quality of life for people all around the world. In this study, we cover dopamine signalling pathways evoked by dopamine receptor activation in normal brain function, as well as characteristics of dopamine as a catecholaminergic neurotransmitter. Dopamine is a biogenic monoamine that belongs to the "catecholamines" family of neurotransmitters, which includes the neurotransmitters dopamine, norepinephrine (noradrenalin), and epinephrine (adrenalin). These neurotransmitters, along with serotonin (5-HT), which is also a biogenic monoamine but belongs to the "indolamines" group, are definitely the most important in both normal and disordered behaviour. The majority of psychotropic medicines alter brain activity by attaching to specific binding sites. Although medications frequently bind to many binding sites, these binding sites are unique to a single neurotransmitter. Specific neurotransmitters often play significant roles in certain physiological and psychological functions, resulting in a form of chemical coding in the brain. Dopamine is a tiny molecule neurotransmitter found mostly in the central nervous system, but also in the peripheral nervous system. Based on the amount of Pubmed citations, it is the most studied neurotransmitter, indicating its importance in a variety of central nervous system diseases and disorders. Thus, Parkinson's disease, schizophrenia, attention deficit hyperactivity disorder, Gilles de la Tourette's syndrome, Huntington's disease, prolactin production, emesis, the sense of smell, and drug dependence all require dopamine function. In the human brain, there are four primary dopaminergic systems. The nigrostriatal route is by far the most extensive, accounting for 80% of the dopamine in the brain. Dopaminergic fibres originate largely in the substantia nigra pars compacta, and to a lesser extent in the substantia nigra. Dopamine is thought to have a 'gating' effect. Fibers from the bed nuclei of these small molecule neurotransmitters, like those of the other biogenic amines and acetylcholine, bypass thalamic circuitry to alter the passage of electrical activity through their target structures. Thus dopamine likely influences the flow of electrical activity from the glutaminergic corticostriate pathway to the globus pallidus, thalamus, and finally the frontal cortex in the striatum. In the central nervous system, there are multiple dopamine-containing routes. The nigrostriatal dopamine pathway is responsible for roughly 70% of the dopamine in the brain. The substantia nigra pars compacta houses the cell bodies in this pathway, which project to the caudate, putamen, and globus pallidus. A mixture of reuptake and enzymatic degradation is used to inactivate dopamine. Dopamine uptake is an energy-intensive mechanism that necessitates the addition of salt and chloride. Two enzymatic pathways are involved in catabolism.

Correspondence to: Richard Daniel, Editorial office, Journal of Steroid and hormonal Science, Belgium E-mail: harmonesci@scholarcentral.org

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