

Role of the endocannabinoid system in learning and memory

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Introduction

Following the discovery of an endocannabinoid system in the central nervous system, which consists of the endogenous ligands arachidonylethanolamide (anandamide) and the monoacylglycerol 2-arachidonoyl glycerol (2-AG) that bind to the CB₁ receptor [1, 2], a great deal of effort has been focused on understanding the physiological function of this system. The identification of these and other putative endogenous cannabinoids, including noladin ether [3] and virodhamin [4], has sparked further in understanding the physiological functions of the endogenous cannabinoid system. A growing body of evidence suggests that this system serves several physiological functions including the modulation of pain [5–7], feeding [8], drug dependence [9–11], excitotoxicity [12], and cognition [13, 14]. In this review, we discuss recent *in vivo* and *in vitro* research investigating the role that the endocannabinoid system plays in learning and memory. Recent behavioral evidence indicates that the endocannabinoid system modulates key components of learning and memory, which include memory consolidation and extinction. On the molecular level, endocannabinoids have been demonstrated to modulate electrophysiological correlates of learning, suggesting that they play an important role in synaptic plasticity. Investigations into the role of the endocannabinoid system in learning processes should make important advances in the following three areas: (1) development of new cannabinoid-based pharmacotherapies with minimal undesirable side effects, (2) understanding the long-term consequences of marijuana use (which remains the most commonly used illicit drug [15]), and (3) shedding light on basic issues in neuroscience such as how are memories formed, stored, and forgotten?

Behavioral effects of cannabinoid agonists in learning paradigms

It has long been recognized that marijuana and its chief psychoactive component, Δ^9 -tetrahydrocannabinol (Δ^9 -THC), produce disturbances in various