Morphine reward and neural activity of subcortical areas of the brain

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Introduction: Ventral tegmental area (VTA) of the mesocorticolimbic system has a key role in mechanisms of opioid reward. Opioid reward depends on morphine receptors function in the VTA dopaminergic neurons. These neurons are implicated in various aspects of reward including reward prediction error and working memory. Opioids affect neural functions in many brain areas, including VTA, nucleus accumbens, amygdala, hippocampus and striatum.
Results: Previous studies showed that morphine injection for 3 days produced a marked increase in the firing of VTA dopamine neurons, but in rostromedial tegmental nucleus morphine inhibited neural firing rate. In addition, morphine injection for 5 days resulted in the significant decrease of neural activity in lateral paragigantocellularis nucleus neurons. In CA3 area of the hippocampus and dental gyrus morphine reward led to the decrease of neuronal response magnitude; reducing the fraction of responding neurons, and shortening the response duration. Electrical activity of lateral geniculate nucleus neurons increased after 4 days morphine injection. Moreover, field potential recording showed that morphine reward had no any significant effect on the electrical activity in the central of amygdala, but increased neural firing rate in the VTA and medial striatum.
Conclusion: These finding revealed that the effect of morphine reward on neural activity in various areas of the brain is different and it seems that one of the most effects of morphine reward is the change in neural activity which, in turn, results in the alteration of the neural function. Therefore, Study of neural activity can be helpful for understanding of morphine reward mechanisms.

Keywords: Morphine reward; Electrical activity; Neural firing rate