EFFECTS OF MORPHINE SELF-ADMINISTRATION ON BRAIN GLUCOSE METABOLISM IN RATS

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Introduction: Chronic exposure to opiates has been shown to influence neural activity in brain regions related to the rewarding process. It also induces neuroadaptations which lead to addiction. We have found in previous works that morphine self-administration produces neuroadaptative changes in brain areas of Fischer-344 rats. The aim of this study is to examine the effect of chronic self-administration of morphine on cerebral glucose metabolism. Materials and Methods: Two groups of male Fischer- 344 rats studied: Group-A (N=7): intravenous morphine self-administration (10-15 mg) (1 mg/kg/injection in 12 hour daily sessions for 15 days) and Group-B (N=7): saline, with the same pattern. Positron emission tomography study was performed after the last self-administration. PET scan was performed 35 min after intravenous injection of 2-deoxy-2-[F- 18] fluoro-D-glucose (FDG). Images were reconstructed by 3-D-OSEM and regions of interest (ROIs) were drawn on coronal sections.

Results: ROI analysis revealed a significantly lower metabolism in thalamus (p=0.048) and frontal cortex (p=0.021) in Group-A. Discussion: Endogenous opioid system might have a role in thalamic nuclei activity given the high-density of □-opioid receptors. Hypo-metabolism in the thalamus suggests an inhibition of neural activity mediated by □-opioid receptors during morphine self-administration. Hypo-metabolism in frontal cortex suggests a reduction in neuronal activity induced by the presence of morphine, which agrees with the metabolic effects of other drugs of abuse in this area, as reported for humans.

Conclusions: Results demonstrate that morphine self-administration changes cerebral glucose metabolism in areas related to rewarding system, and suggest that there are brain metabolic changes induced by opiate abuse.