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Morphine-induced conditioned place preference increases dendritic spine densities and enhances drug relaps

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Statement of the Problem: Drugs of abuse have the potential to produce structural and functional changes in the brain that are implicated in learning and memory. Dendritic spines represent key components involved in these changes, as they drive neuronal connectivity and synaptic plasticity. The overall aim of this study was to evaluate the effect of morphine-induced Conditioned Place Preference (CPP) on the dendritic spine density in the ventral hippocampus, a region involved in associative memory and emotional behaviors.

Methodology & Theoretical Orientation: Male Sprague Dawley rats (320-400 g) were subjected to the morphine-induced CPP test during 10 days, consisting of a pre-test, 8 conditioning trials and a post-test. During conditioning days, rats received 10 mg/kg morphine. After the post-test, rats were anesthetized and brains were removed. The brains were subjected to Golgi staining to evaluate changes in spine density.

Finding: The results showed that rats that received morphine exhibited more place conditioning as compared to saline treated rats and rats that were exposed to the CPP paradigm without any injections. Locomotor activity did not change significantly in these groups. The morphine-CPP group displayed a significant increase in spine density as compared to the saline-CPP and CPP without injection groups in the dentate gyrus and CA1 area of the ventral hippocampus.

Conclusion & Significance: In conclusion, our findings support the idea that morphine-induced reward-related memory is associated with synaptic plasticity changes by up-regulation of spine density in the ventral hippocampus. Such neural changes could underlie contextual cue-induced drug relapse in morphine exposure subjects.

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