Morphine-induced place preference affects mRNA expression of G protein α subunits in rat brain

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Abstract:
Background: The conditioned place preference (CPP) test is an animal model serving to assess addictive potential of drugs in which environmental cues become associated with the subjective effects of drugs of abuse. Morphine, a known addictive drug, is an agonist of opioid receptors that couple to the G(i/o) family of guanine nucleotide-binding proteins (GP). We have recently found that chronic treatment with morphine affects mRNA levels of GPs that are not coupled to opioid receptors (OR). Therefore, in this study, we investigated the influence of morphine-induced CPP on mRNA expression of the Gα subunits, Gα(i2), Gα(oA) and Gα(12), in the rat prefrontal cortex (PFC) and nucleus accumbens (NAc) using standard PCR techniques.

Methods: CPP and NO-CPP experiments were conducted; Wistar rats were either subjected to the standard CPP procedure or were injected with morphine (or saline) in their home cage. All rats were decapitated 24 h after the last injection.

Results: We found that mRNA levels of Gα(q), Gα(11) and Gα(12) were increased after morphine in non-conditioned treatment in the PFC but remained unchanged in the NAc. In rats showing conditioned place preference to morphine, levels of Gα(i2) in the PFC and levels of Gα(oA) in the NAc were diminished by ~58% and ~30%, respectively (p < 0.05 vs. saline), but levels of Gα(s-l) in NAc were increased (~60%, p = 0.05).

Conclusion: Our data indicate that only Gα(i/o) and Gα(s) were specifically changed in animals after morphine-induced CPP, thus suggesting that the effect was related to learning environmental cues associated with morphine.

Key words: conditioned place preference, Gα subunits mRNA, morphine, nucleus accumbens, prefrontal cortex