



Virus-Induced Inhibition of Mu Opioid Receptors and Anxiety in Mice



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Introduction

- The opioid epidemic continues to grow. While opioids' link to addiction is clear, less is known about their tie to anxiety.
- Mu opioid-receptors are one class of three known opioid-receptors in the brain. We focused on the mu opioid-receptors located in the Basolateral Amygdala (BLA) which projects to the Nucleus Accumbens.
- By administering Adeno Associated Virus (AAV) to transgenic mice, their mu opioid-receptors were inhibited.
- This allowed us to study the connection between opioids, anxiety, and possible treatments.

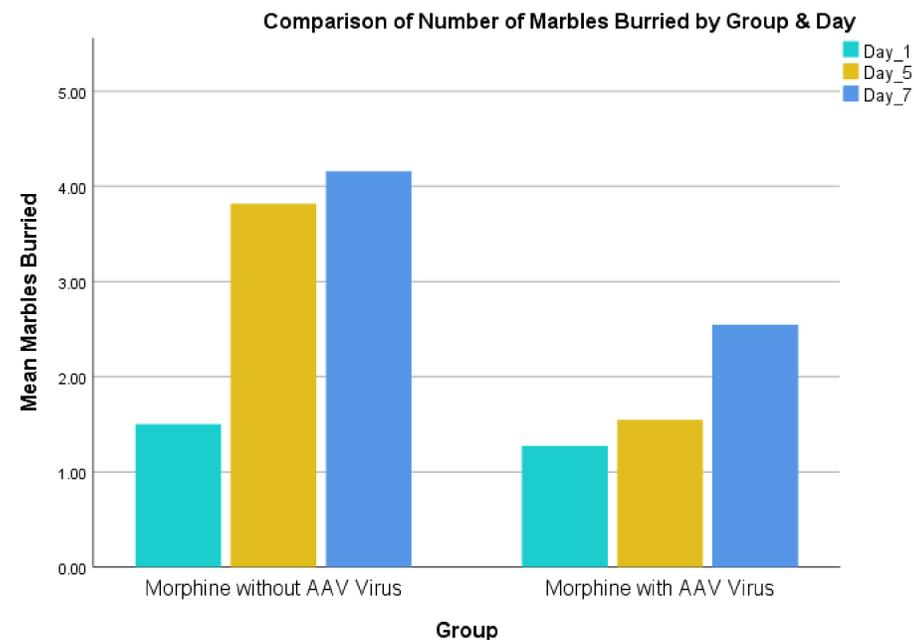
Research Question

Does opioid use increase anxiety in mice? Can we block this rise by knocking out opioid receptors in the basolateral amygdala?

Methods

- Young male MORFIFI (transgenic mice for potential mu opioid-receptor knock out with virus) were given the AAV via surgical injection of the basolateral amygdala.
- Mice were given daily injections of morphine for 5 days and then saline injections for 2 days at 100 mL/kg between 2:00-4:00 PM.
- Marble burying behavior exam included placing a single mouse in an open-air chamber filled with marbles, observing them for 30 minutes, and counting the number of marbles buried to a depth of at least two-thirds.
- Open field behavior exam included placing a single mouse in an open-air chamber and recording their movements and ultrasonic vocalization (USV) for twenty minutes.
- Video data was analyzed using MouseActivity. USV data was analyzed using DeepSqueak.

Results



An ANOVA test (represented by graph above) showed that the difference between the number of marbles buried by mice chronically addicted to morphine with and without the AAV virus was not significant at day 1 ($p = .74$) or day 5 ($p = .12$); but approached significance at day 7 ($F(1, 21) = 4.32, p = .051$).

Analysis

- By blocking the mu opioid-receptors in the basal lateral amygdala of mice addicted to morphine, mouse anxiety was significantly lowered by day 7.
- From this, we confirm that addiction to opioids results in higher levels of anxiety and that the mu opioid-receptor plays a significant role in addiction symptoms.
- By blocking the mu opioid-receptor, symptoms of withdrawal are decreased.
- This discovery shows promise for future treatments for opioid addiction.

Future Directions

Our results show that, as time increased, the virus had a greater effect on mu receptors, but our study was limited to 7 days. Future research should investigate how receptors are affected after this time span.

References

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