The Effect of Odor Cues Associated with Acute Morphine Withdrawal

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**Introduction**

- Environmental cues, such as odors, associated with withdrawal can motivate drug use¹.
- Withdrawal following a single dose of opiate produces an elevation of the acoustic startle reflex, indicating a state of anxiety².
- Odors associated with aversive stimuli potentiate startle³, and odors associated with pleasurable stimuli attenuate startle⁴.

The purpose of this study was to examine if odors paired with withdrawal from acute morphine can elevate anxiety in the rat.

**Methods**

- Baseline Startle Testing
- Acclimation
- Training
- Odor Preference Testing
- Odor Startle Testing
- Baseline Startle Testing

**Results**

**Potentiated Startle**

<table>
<thead>
<tr>
<th>Group</th>
<th>% change from pre-odor startle</th>
</tr>
</thead>
<tbody>
<tr>
<td>MORPHINE GROUP</td>
<td>2 trials</td>
</tr>
<tr>
<td>SALINE GROUP</td>
<td>3 trials</td>
</tr>
</tbody>
</table>

**Odor Aversion**

<table>
<thead>
<tr>
<th>Group</th>
<th>% change from pre-odor startle</th>
</tr>
</thead>
<tbody>
<tr>
<td>MORPHINE GROUP</td>
<td>NAL</td>
</tr>
<tr>
<td>SALINE GROUP</td>
<td>NAL</td>
</tr>
</tbody>
</table>

* p < 0.05
** p < 0.01

**Figure 1: Single Cue Experiment: Lemon**

Rats show potentiation of startle to the withdrawal-paired odor(a). Rats receiving MOR/NAL show significantly more aversion to the withdrawal-paired odor compared to all other groups (b).

**Figure 2: Two Cue Experiment: Lemon and Mint**

Withdrawal –paired odor potentiates the startle response in the MOR/NAL group compared to SAL/SAL (a). Both groups showed an aversion to the withdrawal-paired odor (b).

**Conclusions**

- The findings suggest that odors associated with drug withdrawal elevate anxiety in rats.
- Startle potentiation is negatively correlated with odor preference index.
- Olfactory mediated cues may play a role in relapse to drug-taking behavior.

**Future Directions**

- Investigate the mechanism by which olfactory cues lead to potentiation of startle
- Investigate the effect of natural odors on these behaviors

**References**


**Acknowledgments**

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