Effects of binge-drinking on motivational valence of meth addiction in C57BL/6J female mice

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Global Impacts of Meth Abuse

▷ 24,000,000 abusers worldwide\(^1\)
▷ No medical treatments for addiction
▷ There is a high rate of comorbidity
  between methamphetamine and alcohol\(^2\)
▷ A history of alcohol abuse increases risk
  for meth addiction\(^3\)

\(^1\) https://www.drugabuse.gov/publications/research-reports/methamphetamine/letter-director
\(^2\) UN Office on Drugs and Crime, 2015
\(^3\) Fultz & Szumlinski, 2018
Binge-Drinking Effects on Affective Valence

▷ Previous research from our lab has shown a link between binge-drinking and methamphetamine affinity (Fultz & Szumlinski, 2018)

▷ Similar experiments have been conducted using the same procedure, but with different variables

Objectives

▷ 1. Establish a history of binge-drinking and alcohol dependence through successive alcohol exposure

▷ 2. Assess for the affinity of first-time methamphetamine exposure through conditioned place-preference (CPP)
Alcohol Exposure

- 23 adult female mice
  - 11 alcohol-drinking + 12 water-drinking
- 14 days of drinking, followed by 3 days of rest

Drinking Schedule

- **11 am** - Lights are turned off
- **1 pm** - Mice are moved to drinking room
- **2 pm** - Alcohol is given to mice (only 11)
- **4 pm** - Alcohol is taken/mice returned to home cages
Conditioned Place-Preference (CPP)

Day 1: Pre-test (open divider)

4 PM: Allow mice to choose which side they prefer (determined by greater time spent on a given side)

Conditioned Place Preference (CPP)

Day 2-5: Place Conditioning (closed divider)

9 AM: Inject mice w/ (0.01 mL x g) saline, place on preferred side

4 PM: Inject mice w/ 0.25, 0.5, 1, or 4 mg meth/kg bodyweight, place on non-preferred side
Conditioned Place-Preference (CPP)

Day 6: Post-test (open divider)

Allow mice to choose which side they prefer.

**Hypothesis:** A greater amount of time spent will be spent on non-preferred side, due to methamphetamine association

**Lowest Dose Showed Significant Place Preference**

- 0.25 mg/kg dose showed significant place preference for drinking mice
  - Place preference = Preference to be on one side

![Graph showing CPP Score vs MA Dose (mg/kg)]
Lowest Dose Showed Significant Place Preference

▷ 0.25 mg/kg dose showed significant place preference for drinking mice
  ○ Place preference = Preference to be on one side

Middle Doses Showed No Significant Preference

▷ General trend shows that alcohol has an effect, although not statistically significant (p>0.05)
Highest Dose Showed Significant Place Aversion

- 4 mg/kg dose showed significant place aversion for drinking mice
  - Place aversion: Preference to stay away

Results for Objective 1

- Average intake was 4.57 ± 0.5 g/kg
  - (>0.08 BAC)
- Exceeded minimum level for binge-drinking
- Successfully established a history of binge-drinking
Results for Objective 2

▷ Although not significant, a general trend showed prior binge-drinking increased motivational valence of methamphetamine.
▷ Interestingly, the highest dose showed an opposite effect to the observed general trend.

Limitations

▷ Small sample size (n=23)
▷ Uncontrolled variables during CPP (temperature, noise, light)
▷ Possible inflicted stress during handling
▷ Multiple researchers running CPP
Future Directions

▷ Increase sample size and sample diversity
▷ Further investigate effect of highest dose
  ○ Behavioral scoring, immunoblotting
▷ Microdialysis to study neurotransmitter activity

Acknowledgements

▷ Leo Jimenez-Chavez
▷ Michal Coelho
▷ Karen Szumlinski
▷ Samantha Davis & CSEP
▷ My family and EUREKA! friends
References
