Adolescent Intermittent Alcohol Exposure Alters Pain Related Behaviors and Anxiety-like Responses in Mice

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Background

- Adolescence is a critical period of brain maturation, making it a time of increased vulnerability to the effects of alcohol.
- Early onset of alcohol use during adolescence increases the risk of developing an alcohol use disorder (AUD) and other substance use disorders later in life.
- Alcohol use and chronic pain shares a bidirectional association.

In this study, we aim to determine potential long-lasting alterations in pain- and anxiety-like behavior following Adolescent Intermittent Ethanol (AIE) exposure in mice.

Methods

Male and female C57BL/6J mice were exposed to air or AIE between post-natal day 29-38. AIE involves two 4-day cycles of ethanol or water vapor for 16 h in chamber followed by 8 h out of the chamber for four days separated by three days of no vapor exposure.

Following vapor exposure, mice underwent four weeks of behavioral testing. Mice underwent the acetone and marble burying tests in weeks 1 and 3 post-vapor and dry ice and sucrose tests in weeks 2 and 4 post-vapor.

Acetone Test: a drop of acetone was placed on mouse's hind-paw and time spent displaying pain-like behaviors was recorded for the next 60 s. Each mouse underwent two trials (once per hind-paw) and the results were averaged.

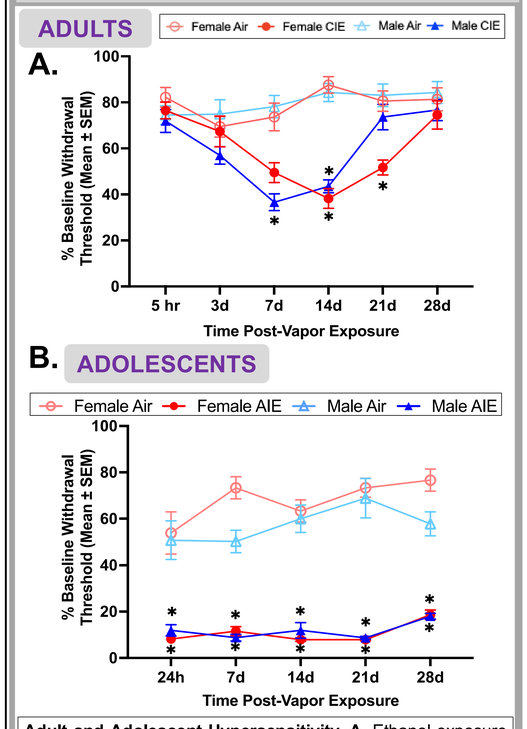
Cold Plantar Test: mice were placed onto a glass screen and dry ice was applied onto the glass underneath the hind-paw. Latency of paw withdrawal was recorded.

Marble Burying Test: mice were placed into a cage with 15 marbles for 30 min and the number of marbles that were less than 25% visible was recorded.

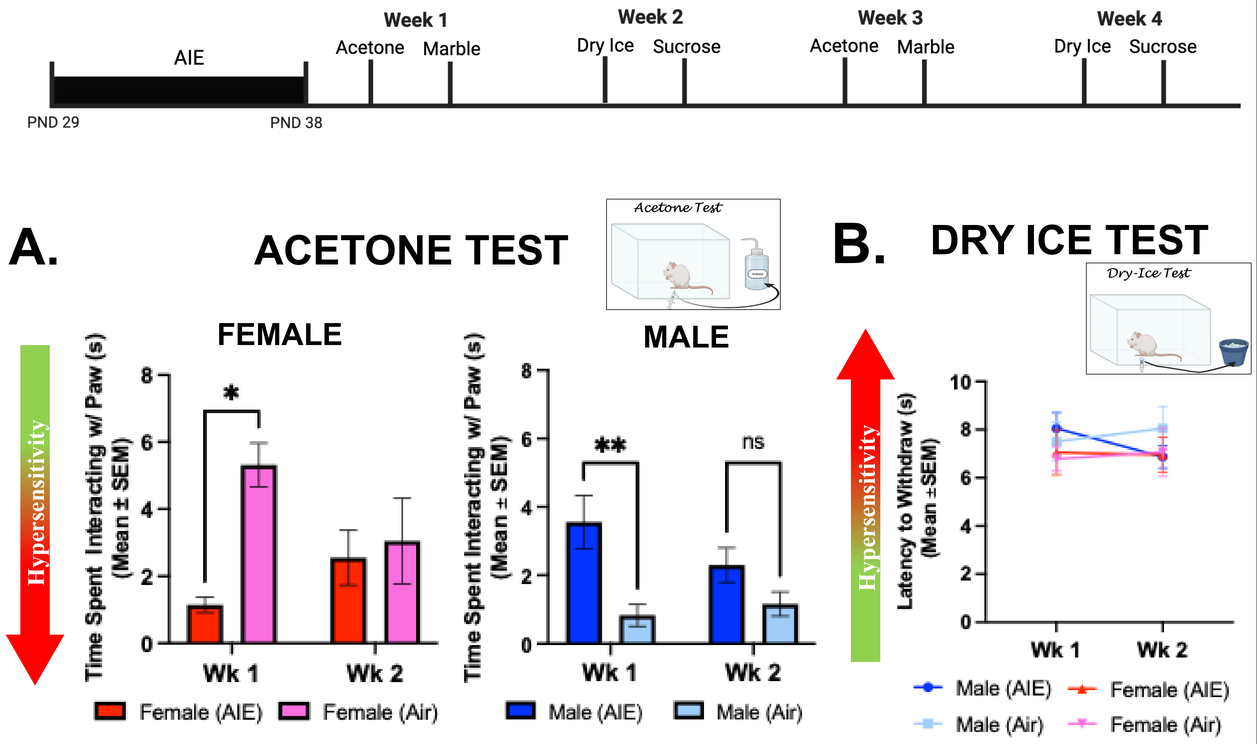
Sucrose Spray Test: a 10% sucrose solution was applied to the dorsal coat of the mouse with a spray bottle. Mice were video recorded for the following 5 min. These recordings were analyzed and total time spent grooming during was measured.

Results

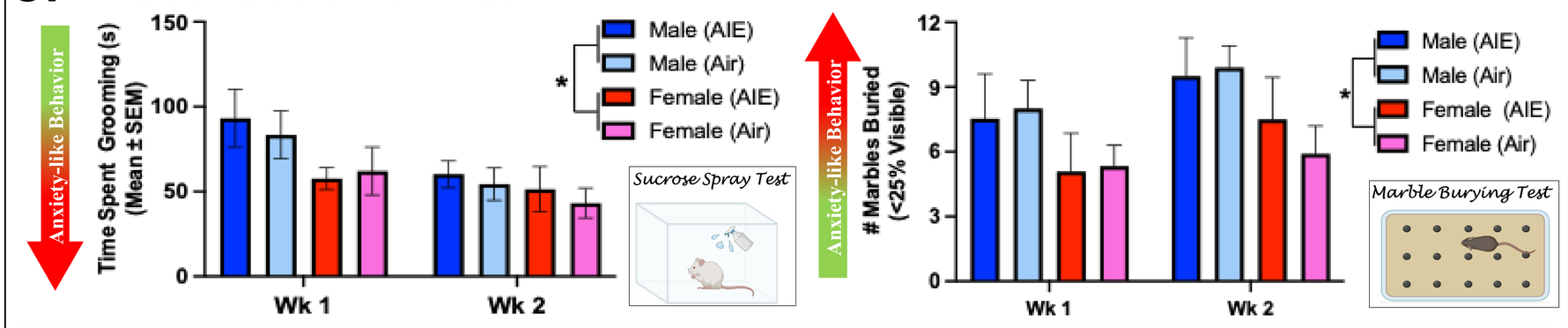
PREVIOUS DATA



Adult and Adolescent Hypersensitivity. A. Ethanol exposure in adulthood produces mechanical hypersensitivity but return to baseline after 21- or 28-day post-ethanol exposure. **B.** Ethanol exposure in adolescent produces a persistent mechanical hypersensitivity in both sexes into adulthood. * indicates statistical significance ($p<0.05$) compared to air-exposed mice at corresponding timepoints.



Post-AIE assessments of thermal sensitivity **A.** Time spent interacting with hind-paw after acetone application in female and male mice. **B.** Latency to withdraw hind-paw after dry ice application. * <0.05, ** <0.01



Post-AIE assessments of anxiety-like behaviors **C.** Time spent grooming after being sprayed with sucrose spray **D.** Number of marbles buried during a 30-min session. *<0.05

Conclusion

- In the acetone test, AIE promoted thermal hypersensitivity in females while these effects were opposite in male mice.
- There was no effects in the dry ice test in either male and female mice.
- In the sucrose spray test, females show higher anxiety-like behavior than male mice.
- In the marble burying test, male mice showed higher anxiety-like behavior than females.

Future Directions

Future directions should include additional behavioral testing to further explore these distinct phenotypes. Other possible options are to look at neurological alterations that might mediate the sex differences observed.

This research project was supported by Award Number: DBI-2349224 through the National Science Foundation (NSF), Research Experiences for Undergraduates (REU) Program