The Behavioral Effects of Endocrine-Disrupting Chemicals and Sexual Aggression in Female Adolescent Rats

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Background

- Endocrine-disrupting chemicals (EDCs) disturb normal functioning of neuroendocrine systems when introduced during development.
- These same systems influence social behaviors and are also subject to external stressors such as sociosexual stress.
- Previous models have seen altered anxiety and sociosexual behaviors from exposure to polychlorinated biphenyls (PCBs)[1]
- This study uses a crossed model of gestational PCB exposure and/or sexual aggression during adolescence (SCAR)[2] to understand behavioral changes in anxiety and mate preference.

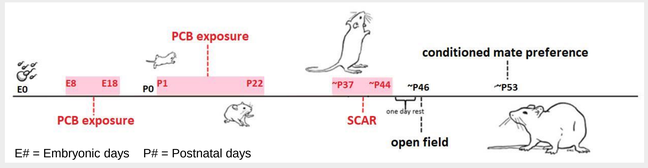
Hypothesis

- Higher anxiety and a lower preference for male aggressors in females exposed to SCAR.
- Exacerbated anxiety in females exposed to EDC.

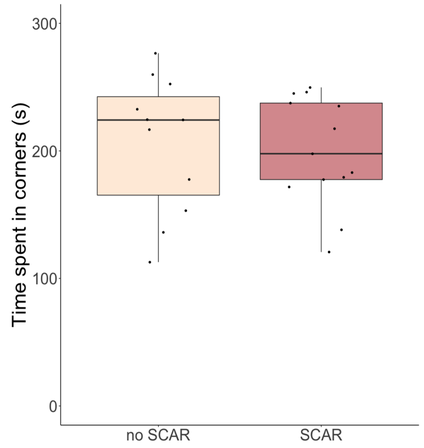
Methods

- Female Sprague-Dawley rats ingested PCBs (1 mg/kg) or vehicle during and after pregnancy (E8-E18, P1-21).
- SCAR: The F1 female offspring were placed in chambers with sexually experienced adult males marked by odor cues. Control females had same conditions without stimulus male.
- Open field: Females roamed freely in large chambers for 5 min.
- Conditioned mate preference: In a three-sectioned chamber, females freely roamed and interacted with two novel males for 10 min. One male was marked by the odor cue from SCAR and the other remained unscented.

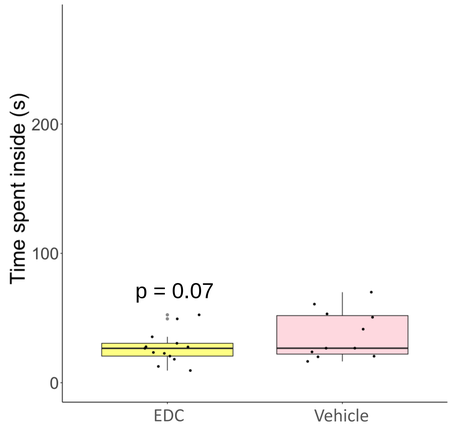
Design Overview



Anxious Behaviors



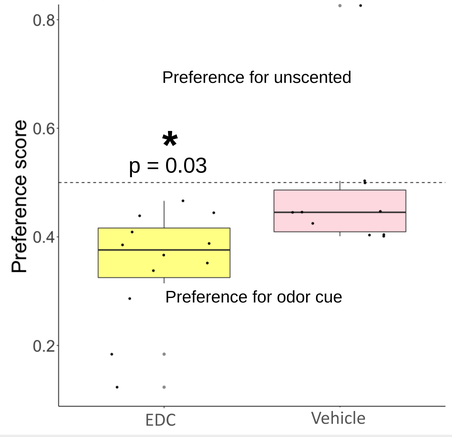
- No main effects of SCAR on anxiety



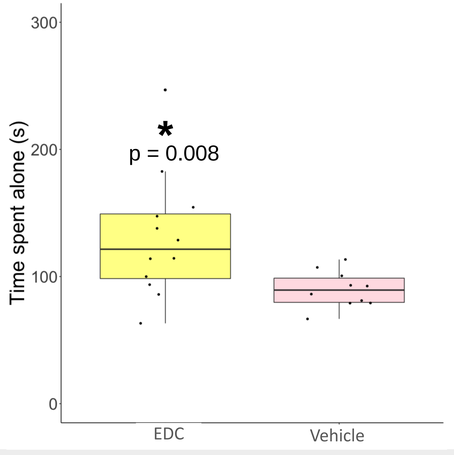
- EDC group spent less time inside of the open field than vehicle group
- Difference not significant

Mate Preference

- EDC group significantly preferred males with odor cue



- EDC group spent significantly more time alone in the center chamber



- No significant main effect of SCAR on preference
- Females exposed to SCAR and EDCs had higher preference for males with odor cue, but not significant.

Summary

- Anxiety: EDC treatment decreased time spent inside open field, indicating lower/higher anxiety
- No significant differences in anxiety observed across treatments
- Mate preference: Females exposed to EDCs spent significantly more time with males marked by odor cue
- Same group spent significantly more time alone than control females
- SCAR females did not demonstrate altered anxious behaviors or aversion to males with odor cue

Conclusion

- SCAR exposure did not produce expected results as it did not appear to induce anxiety or learned aversion to male aggressors.
- Potential for implications in depressive behaviors not measured.
- EDCs inhibited exploratory behaviors but did not influence anxiety as deeply as expected.
- Pre and postnatal EDC exposure significantly influenced mate preference and decreased sociability during adolescence in female rats.
- Interactions between pre and postnatal EDC exposure and sexual trauma in adolescence produced greater preference for male aggressors but did not attain significance.

References

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[2]Shors, T., Tobón, K., DiFeo, G., Durham, D., & Chang, H. (2016). Sexual Conspecific Aggressive Response (SCAR): A Model of Sexual Trauma that Disrupts Maternal Learning and Plasticity in the Female Brain. *Scientific Reports*, *6*(1).

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