

Tetrahydrocannabinol Compromises Maternal Nest Maintenance and Nursing Behaviors in the Long-Evans Rat

Lindsey Toole, Danielle Roemer, Lauren Mac Taggart, Alana Ága and Vincent Markowski

Departments of Psychology and Neuroscience, SUNY Geneseo



Background

Marijuana has become the topic of many research projects more recently since the numerous legalizations in many different states across the country. Barry et al. (2014) stated that policymakers and public health advocates are facing challenges in reducing the harms of an ineffective, costly, and discriminatory “war on drugs”, which is directed at cannabis, while trying to prevent another worldwide public health emergency, like the tobacco use in cigarettes, which kills 6 million people worldwide each year. The rapid legalization of marijuana is of major concern due to the fact that people may get the impression that marijuana is a safe drug, like what happened with tobacco use in cigarettes. Marijuana might be detrimental to pregnant mothers and their children. Our project is seeking to determine if there is a dose-response relationship when THC is administered to lactating female rats. It is hypothesized that the higher the THC concentration administered, the more pronounced the maladaptive maternal behaviors.

Methods

- Eight female Long-Evans rats were randomly assigned to one of five dosing groups: 0 (control oil), 1.25, 2, 5, or 10mg/kg THC
- Dosing via gavage needle took place seven days a week upon becoming sperm positive between the hours of 9AM and 1PM; dosing continued after they gave birth
- Pups that were born were weighed, measured from crown to rump, and had their “righting reflexes” tested; all of this data was subsequently recorded into a lab notebook
- On postnatal days 1, 3, and 5, mothers and pups were removed from the housing room to perform a pup retrieval test
- Mothers and pups were recorded continuously 7 days a week using a Reolink security camera. Specific behaviors like tail-chasing and litter destruction were especially of interest

Results



Figure 1.



Figure 2.

Figures 1. and 2. Reolink footage analysis of subject 428 exposed to 10 mg/kg of THC.

Subject 428 was randomly assigned to the 10 mg/kg THC dosing group. She was an exposed lactating female rat that exhibited frantic bed pushing behavior on PND 0. Her estimated dosing time was 11:15 AM. The observed behavior was recorded for a one minute duration on 24-06-2021 at 13:38:00 PM.

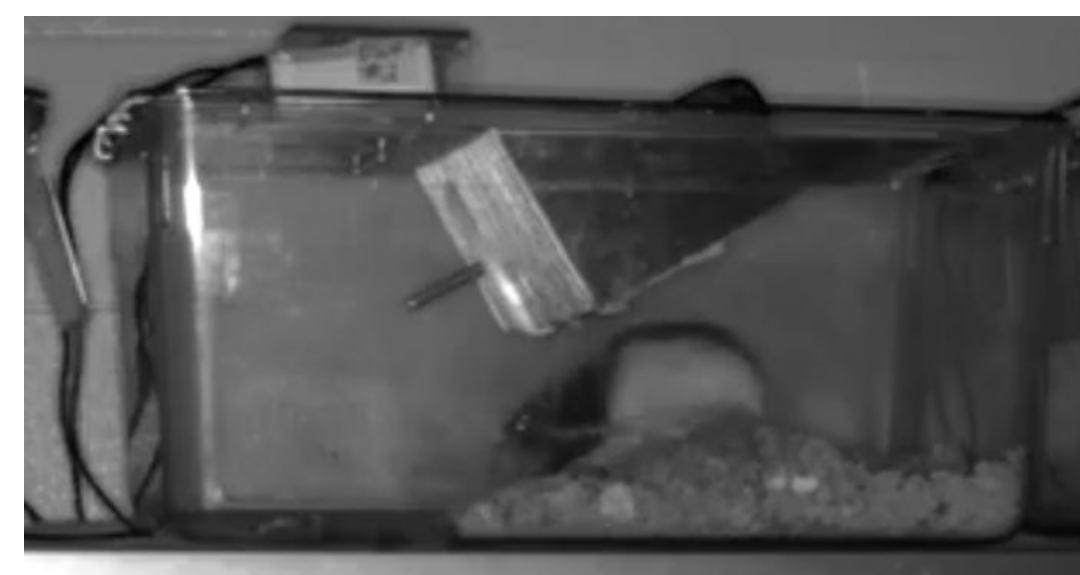


Figure 3

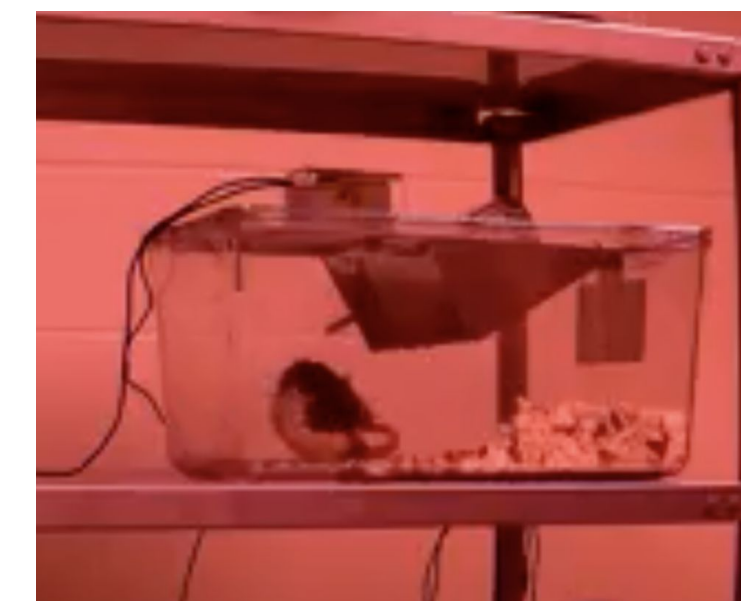


Figure 4

Figure 3. (subject 702 dosed with 1.25 mg/kg THC) and Figure 4 (subject 317 dosed with 5.0 mg/kg THC)

Subject 702 (Figure 3) and subject 317 (Figure 4) were assigned to the 1.25 mg/kg THC dosing group and 5.0 mg/kg THC dosing group respectively. 702 exhibited tail-chasing and bedding-pushing behavior on PND2; 317 exhibited tail-chasing behavior on PND0. Both were dosed around 10AM on the given PNDs. The observed behavior for 702 was recorded for a one minute duration on 20-08-2021 at 9:43:54 AM; The observed behavior was recorded for a one minute duration on 23-06-2021 at 12:16:39 PM.



Figure 5

Figure 5. Reolink surveillance footage analysis of subject exposed to 2.0 mg/kg of THC.

Subject 215 was a Long-Evans rat that was randomly assigned to the 2.0 mg/kg THC dosing group. She was an exposed lactating female rat that exhibited ‘bed pushing’ maladaptive maternal behavior on her second postnatal day. Her estimated dosing time was 10:30 AM. The observed behavior was recorded for a one minute duration on 22-06-2021 at 11:50:04 AM.

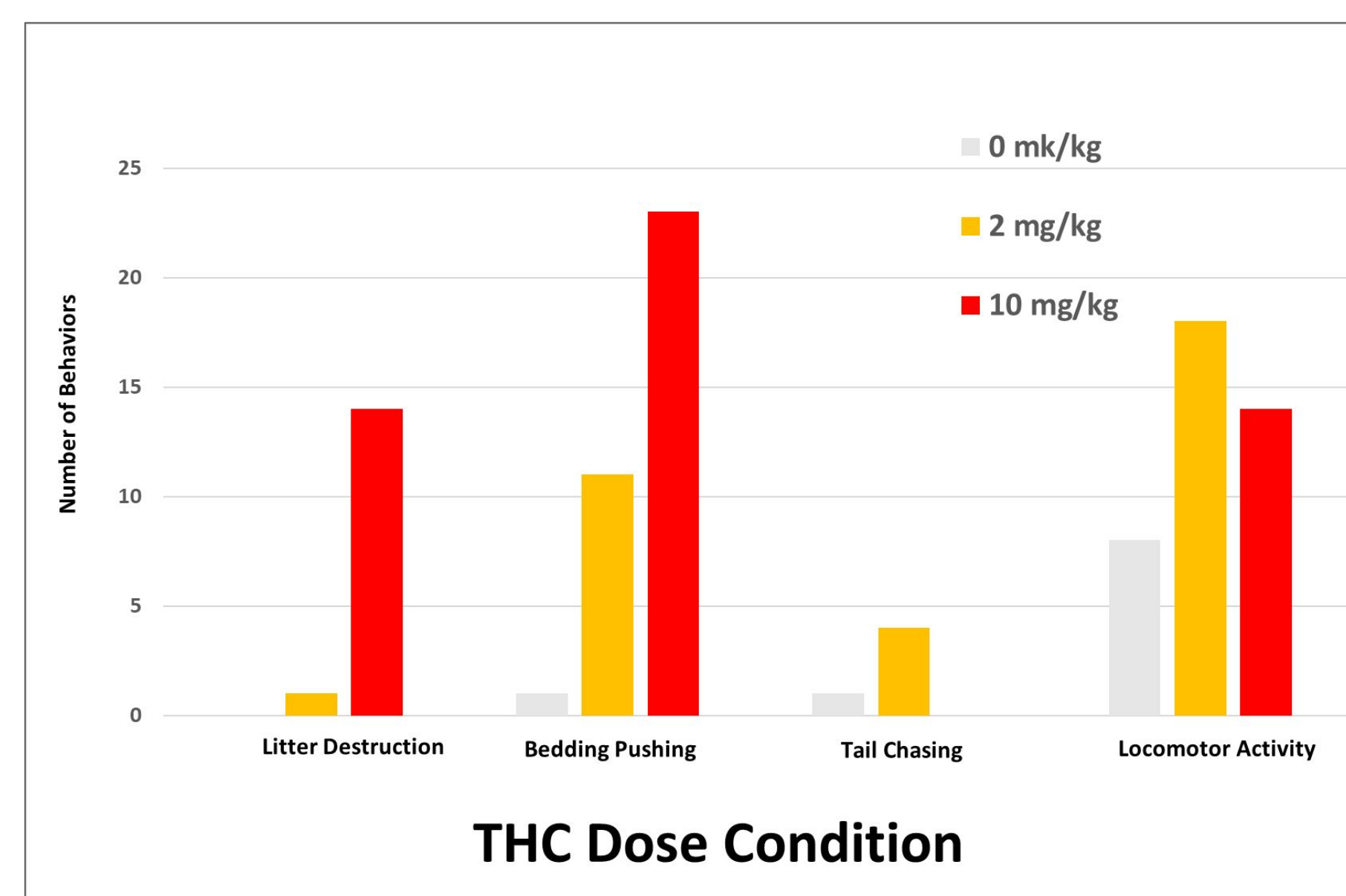


Figure 6

Bar graph representing the amount of four selected “maladaptive” behaviors including litter destruction, bedding pushing, tail chasing, and locomotor activity.

Discussion/Conclusion

- There appears to be a dose-response relationship between mothers being dosed with THC and their maternal behavior.
- The analysis of the video footage suggest that rats dosed with any amount of THC show maladaptive maternal behaviors, including tail chasing, litter destruction, and neglect towards their pups, suggesting that the pups suffer during this important time for development.
- With the ongoing study and the analysis of the data shown, this could apply to humans, suggesting potential risks of marijuana usage during pregnancy.

Limitations/Future Directions

The Reolink camera setup that was used to record the behavior presented some problems: sometimes, the camera wasn’t recording at all or the computer to which the camera was attached crashed, thereby stopping the recording the camera was doing. This study used a relatively small sample of dosed mothers, so for future studies we would look to either include dosed mothers from past cohorts in a future analysis or to dose more mothers.

References

Barry, R. A., Hiilamo, H., & Glantz, S. A. (2014, June). Waiting for the opportune moment: The Tobacco Industry and marijuana legalization. The Milbank quarterly. Retrieved April 1, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4089369/>