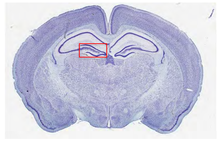
# Sex differences in microglia in the hippocampus of California mice (*Peromyscus californicus*) exposed to early paternal deprivation

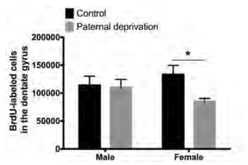
Kenneth D. James Jr[2]., Gregory F. Ball[1], Erica R. Glasper[1], Farrah N. Madison[1]

Department of Psychology, University of Maryland, College Park, MD 20742[1]

Morgan State University, Baltimore, MD, 21251[2]

## INTRODUCTION






- In mammals, male and female parental strategies typically vary in effort, with the female providing the most direct parental care.
- The California mouse is one of few monogamous rodent species that engages in biparental care.
- Much is known about the deleterious effects of early maternal deprivation on neuroplasticity in the hippocampus.
- Less is known about how paternal deprivation modulates neuroplasticity in the hippocampus of this biparental species.
- However, it has been shown that pup mortality rates increase in response to paternal deprivation.
- Of those that survive, female mice show a significant decrease in 1-week cell survival in the dentate gyrus compared to control females and both control and paternally deprived males.
- Microglia, the primary immune cell in the brain, have been shown to play a key role in the regulation of both neurodevelopment and adult neuroplasticity.
- It is possible that microglia may play a role in modulating neuroplasticity in response to early life stressors.

## PURPOSE

The purpose of this study is to investigate how paternal deprivation alters microglia in adult male and female offspring.

### *Animals:*

- Male and female California mice were bred in house at the University of Maryland. Animals had food and water access ad libitum and were housed on a 16:8 reversed light/dark cycle (lights off at 10:00).

### *Experimental Design:*

- Male and female offspring were reared by both their mother and father or by their mother alone. For the deprived groups, fathers were removed from the home cage on postnatal day (PND) 1. On PND 35, male and female offspring from both groups were weaned and paired housed with same sex conspecifics. On PND 68, male and female offspring were perfused with 4% PFA, brains were extracted and post-fixed for 24hrs in preparation for neural processing.

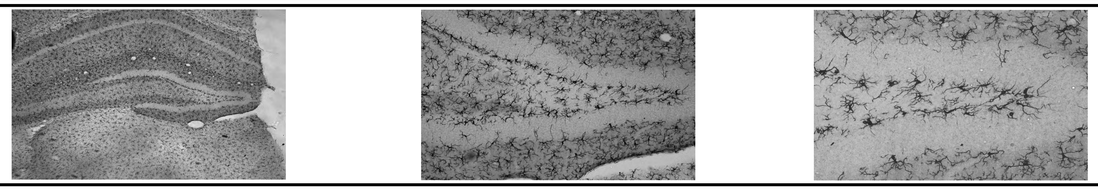
### *Histology:*

- Brains were sectioned at 40µm, and labeled via immunohistochemistry for the microglial specific marker Iba1 using a commercial polyclonal antibody raised in goat (1:1000; Abcam Inc.).

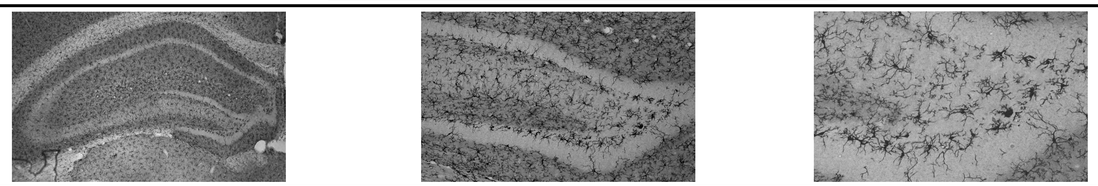
### *Statistics:*

- Our threshold for significant differences was a p value of ≤ 0.05. Total cell number was analyzed via two-way analysis of variance (ANOVA).

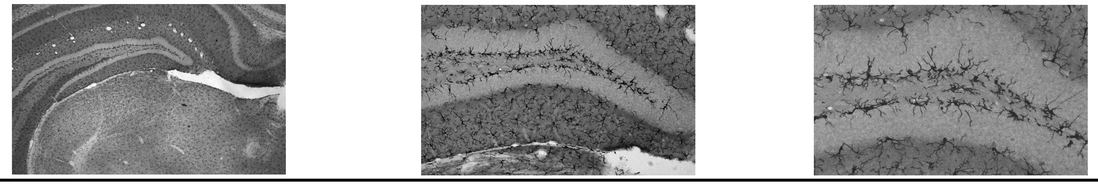
**Iba1 positive immunoreactivity in the dentate gyrus of PND68 male mice raised with both parents. Photomicrographs taken at 2.5, 10, and 20X.**



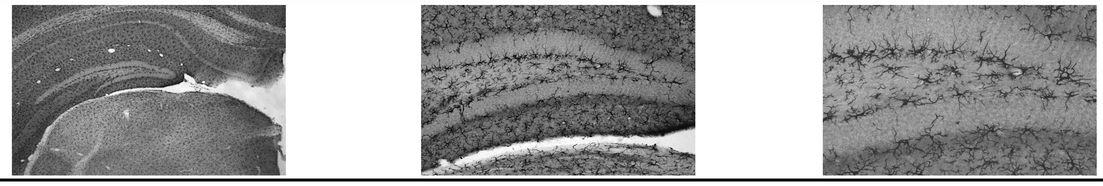
**Iba1 positive immunoreactivity in the dentate gyrus of PND68 female mice raised with both parents.**



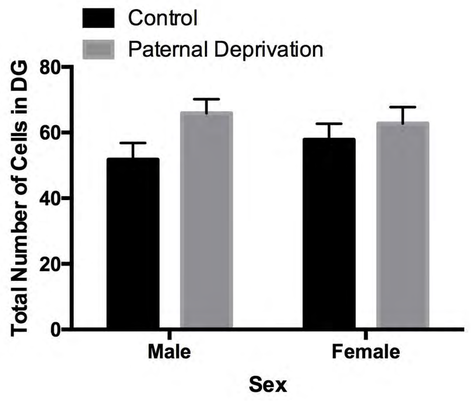
**Iba1 positive immunoreactivity in the dentate gyrus of PND68 male mice exposed to early paternal deprivation.**



**Iba1 positive immunoreactivity in the dentate gyrus of PND68 female mice exposed to early paternal deprivation.**



**Male mice exposed to paternal deprivation had more Iba1 positive cells in the subgranular zone and granule cell layer of the dentate gyrus.**




## CONCLUSION

- In the hippocampus, males show an increase in Iba1 positive immunoreactivity when exposed to early paternal deprivation.
- These data suggest that microglia may play a role in modulating sex-specific differences in adult neuroplasticity.