An Analysis of Microglia Morphology between the Amygdala and Thalamus

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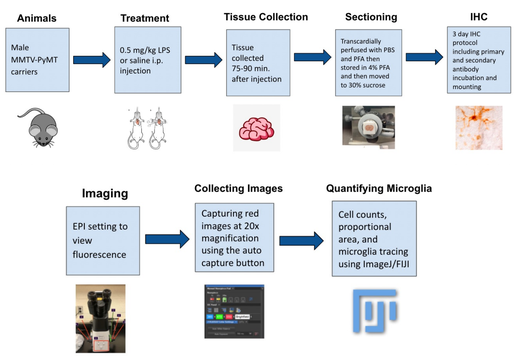
Introduction

- Microglia are the focal point of neuroimmunological mechanisms.
- Lipopolysaccharide (LPS) is used to model neuroinflammatory processes as it alters the expression of microglia through a change in morphology.[1]
- Male MMTV- PyMT carriers, which are genetically modified mice that are prone to develop breast cancer, are used to evaluate the microglial to an immune challenge.[2]
- Our aims include:
  1. **Examine the effects of an LPS induced acute inflammatory response in two regions of interest (ROI).**
  2. **Compare the morphological differences in the ROIs via quantification of the microglia cell counts, proportional areas of Iba-1, and tracing data from IHC stained images.**
- We hypothesized that the BLA compared to the thalamus would have an increase in cell count and cell body area, and a decrease in branch length after LPS administration.

Methodology



Quantification of Microglia found in the BLA and Thalamus

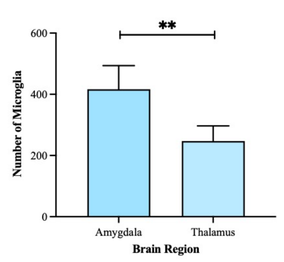
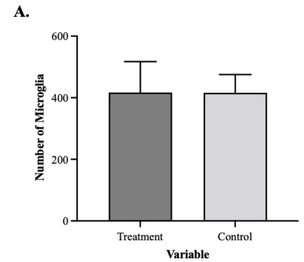


Figure 1. The number of stained microglia were compared between both regions of interest.



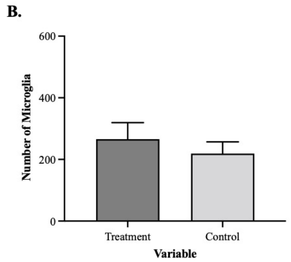


Figure 2. The number of stained microglia were compared between variable conditions within the amygdala (A) and variable conditions within the thalamus (B).

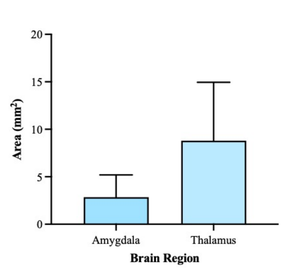
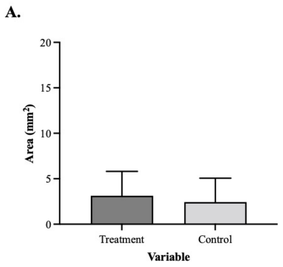


Figure 3. The proportional area of the Iba-1 staining was compared between both regions of interest.



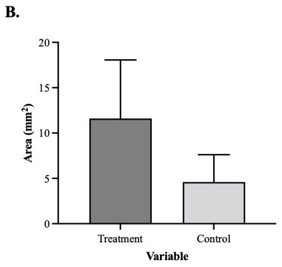
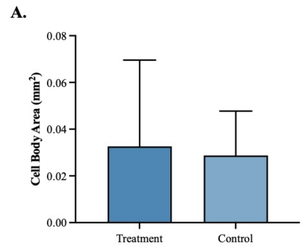


Figure 4. The proportional area of the Iba-1 staining was compared between variable conditions within the amygdala (A) and variable conditions within the thalamus (B).



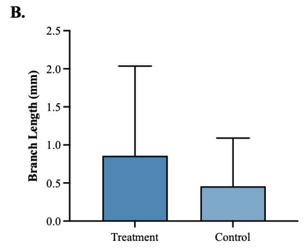


Figure 5. Confocal images taken of the amygdala were used to determine the cell body area of individual cells (A), as well as the length of their branches (B).

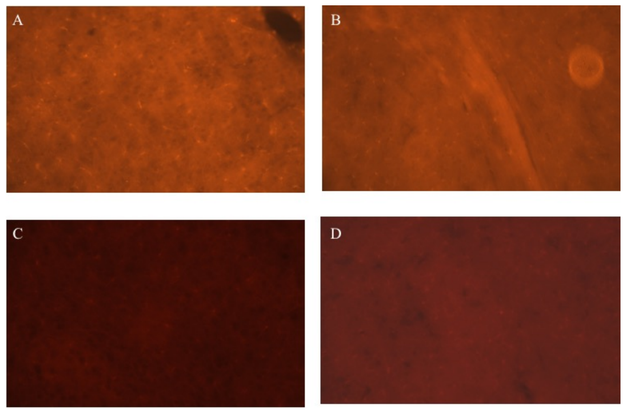


Figure 6. Representative fluorescence microscope images of the broad cell counts. The images show:
A. The thalamus in Mouse 1
B. The amygdala in Mouse 1
C. The thalamus in Mouse 8
D. The amygdala in Mouse 8

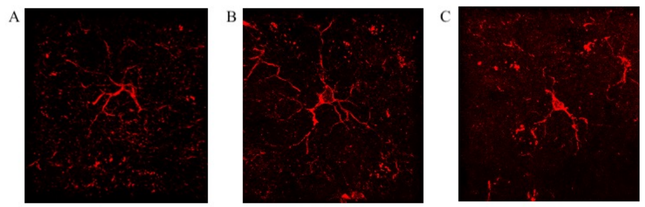


Figure 7. Representative confocal microscope images of individual microglia. The images show:
A. The thalamus in Mouse 1
B. The amygdala in Mouse 1
C. The amygdala in Mouse 8

References:

1. Norden, D. M., Trojanowski, P. J., Villanueva, E., Navarro, E., & Godbout, J. P. (2015). Sequential activation of microglia and astrocyte cytokine expression precedes increased IBA-1 or GFAP immunoreactivity following Systemic Immune Challenge. *Glia*, 64(2), 300–316. https://doi.org/10.1002/glia.22930

2. Gaudier-Diaz, M. (2022, March 7). *Examining Morphology and Cytokines*. University of North Carolina at Chapel Hill.

Results

- Microglia cell count is significantly larger in the amygdala relative to the thalamus, $p < 0.05$; $p = 0.0032$.
- Due to a lack of images taken of cells in the thalamus, data could only be quantified and compared between variable conditions in the amygdala. Cell body area did not differ between exposure to LPS or saline within microglia found in the amygdala, $p > 0.05$; $p = 0.8819$. Branch length was also incomparable, with no significant difference in measurements between experimental conditions, $p > 0.05$; $p = 0.5408$.

Discussion

- Our hypothesis could not be fully supported due to lack of significance in data.
- Factors such as limited confocal images of the thalamus prevent a sufficient comparison to the amygdala.
- Broken tissue during the mounting process created blurry images, which made it difficult to quantify microglia under the microscope.
- Lack of a control group prevented a meaningful conclusion as there can be no further comparison to mice that are not genetically modified.
- Future studies should make changes in experimentation to aid in the understanding the relationship between both ROIs during an inflammatory response.

Acknowledgements

We would like to thank Dr. Jeremy Borniger at Cold Spring Harbor Laboratory for donating the mice tissue. We would also like to thank the Graduate Research Consultant Program funded by OUR, Research and Discovery Course Development Grant funded by OUR, and the Psychology and Neuroscience Undergraduate Research Grant funded by Lindquist Undergraduate Research Award for funding. Additionally, we would like to thank the Center for Faculty of Excellence, the College of Arts and Sciences & the department of Psychology and Neuroscience for additional funding and support.