



Acute social defeat-induced neuroinflammation in the vmPFC of Syrian hamsters via microglial activation

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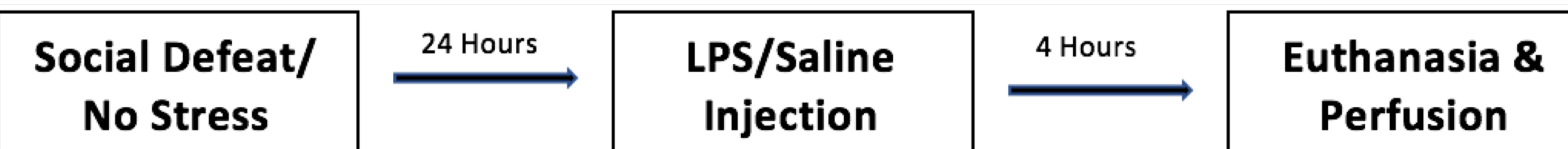
Introduction

- Psychological stress is known to increase neuroinflammation.
- Neuroinflammatory pathways are contributing factors to various stress-related psychopathologies.
- Exposure to chronic stress in rodents results in elevated markers of immune activity, such as activation of microglia, as measured by ionized calcium binding adaptor protein-1 (Iba-1) expression.
- There has been little research investigating the effects of acute social defeat stress on central immune activity.
- Acute stress can prime microglia to exhibit an enhanced proinflammatory response to a subsequent immune challenge (i.e. Lipopolysaccharide)¹.
- The prefrontal cortex (PFC) is a critical brain region for coping with stress. Chronic stress significantly alters neuronal morphology in the medial PFC².

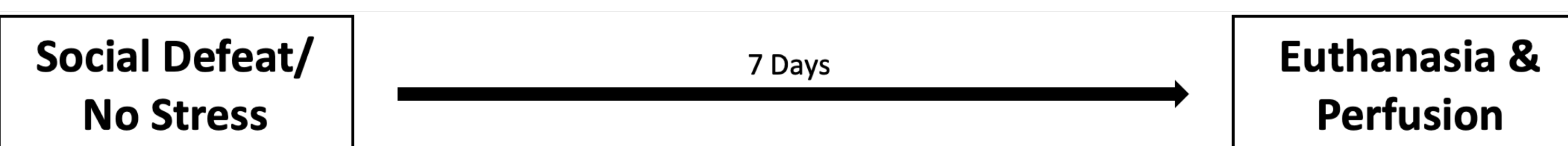
Methods

Animals: Adult Male Syrian hamsters (*Mesocricetus auratus*)

Experiment 1:



Experiment 2:



- Acute Social Defeat:** Subjects were exposed to three, 5-minute aggressive encounters in the home cage of three, separate, larger, aggressive hamsters. Encounters occurred at 5-minute intervals. Control animals were exposed to an empty aggressor's cage.
- LPS Injection:** 24-hours following social defeat, the effects of stress-induced priming of microglia was assessed by exposure to an endotoxin immune challenge via intraperitoneal (i.p.) injection of 0, 20, 100, and 500 μ g/kg lipopolysaccharide (LPS).
- Euthanasia:** 4-hours following LPS injection (Exp. 1) or 7 days following defeat (Exp. 2), hamsters were euthanized and transcardially perfused and brains extracted.
- Immunolabeling:** Microglial activation was measured by immunolabeling of *ionized calcium binding adaptor protein-1* (Iba-1) through immunohistochemistry in the prefrontal cortex (PFC) using Rabbit monoclonal anti-Iba-1 antibody (1:10,000; ab178846).

Figure 1

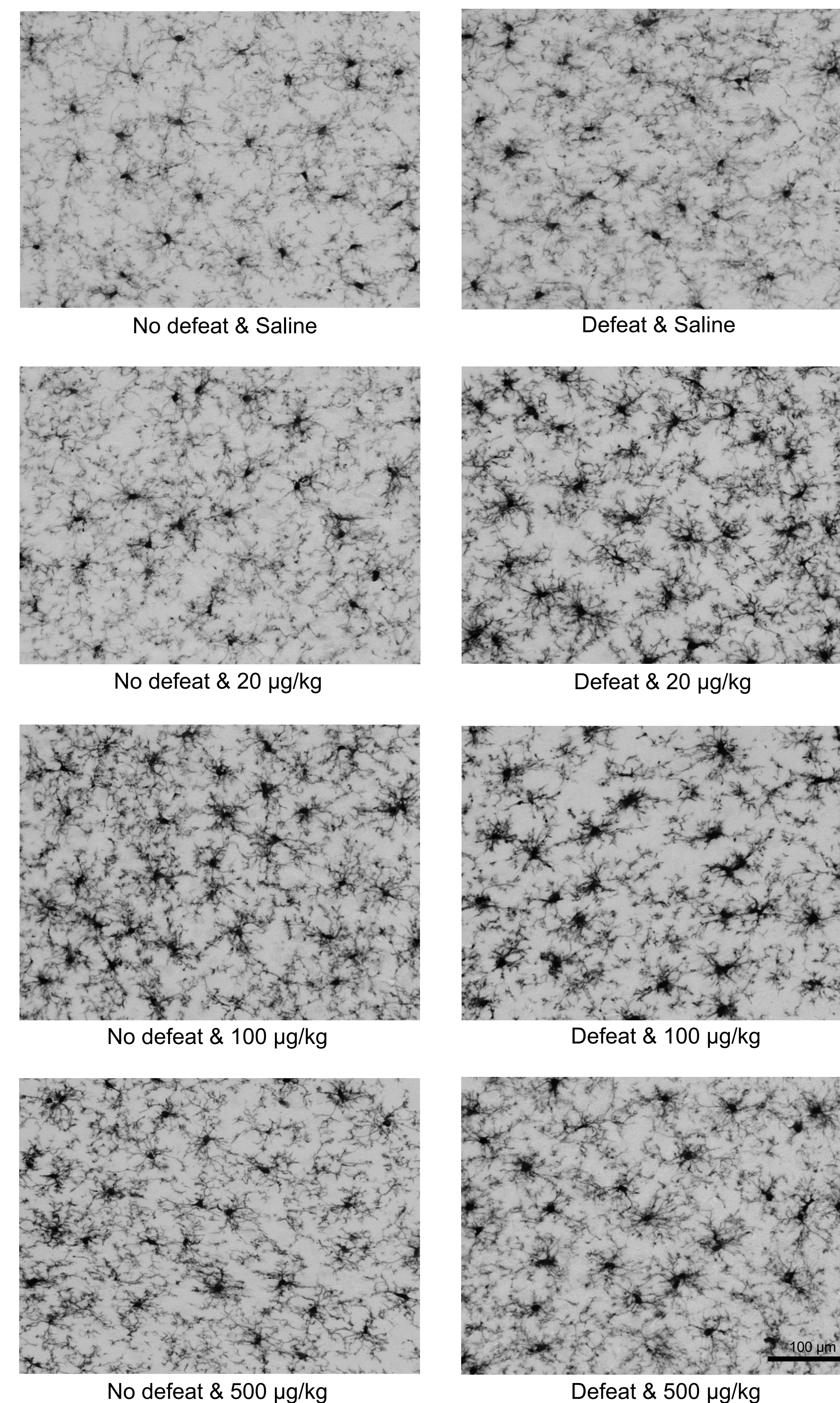
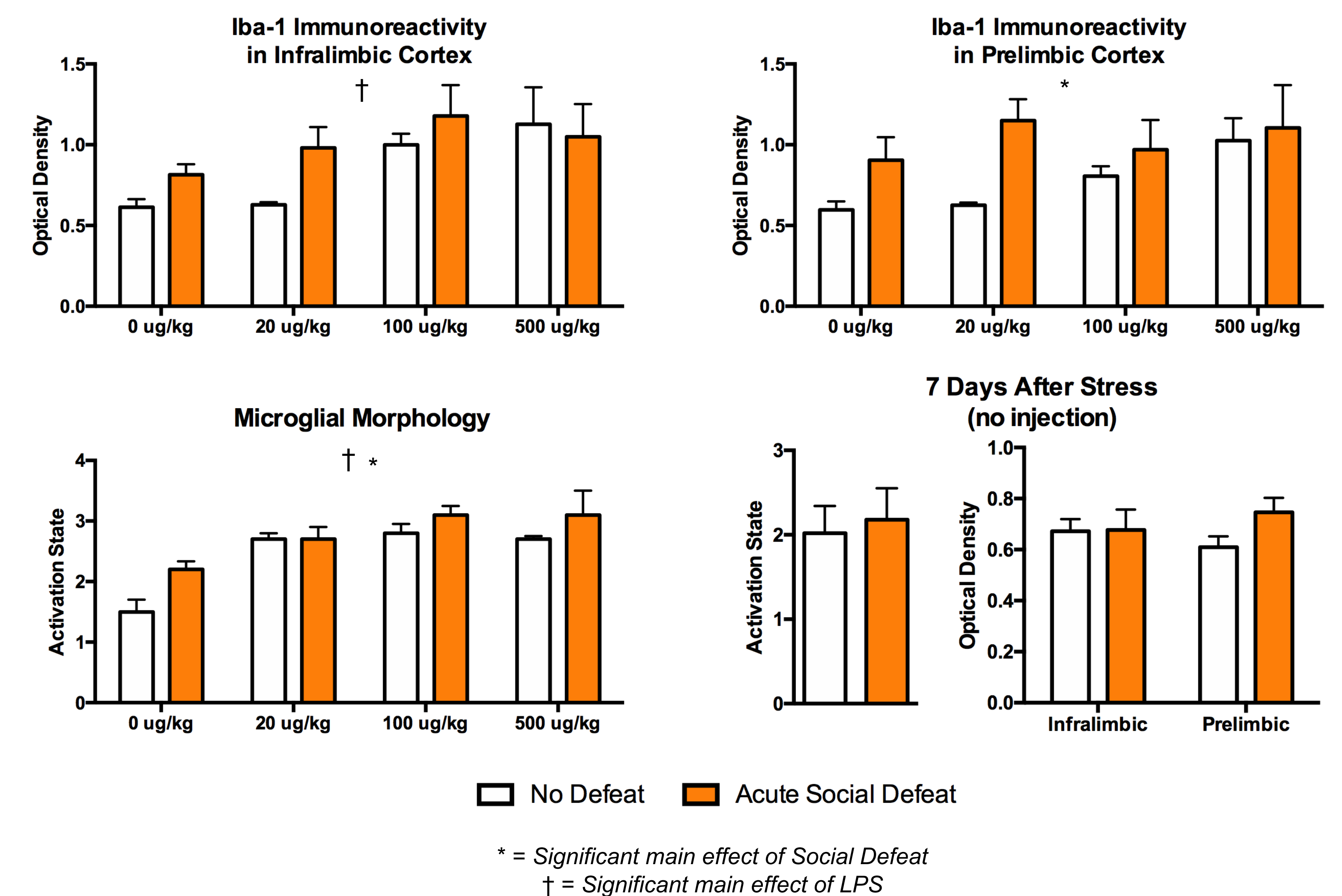


Figure 3



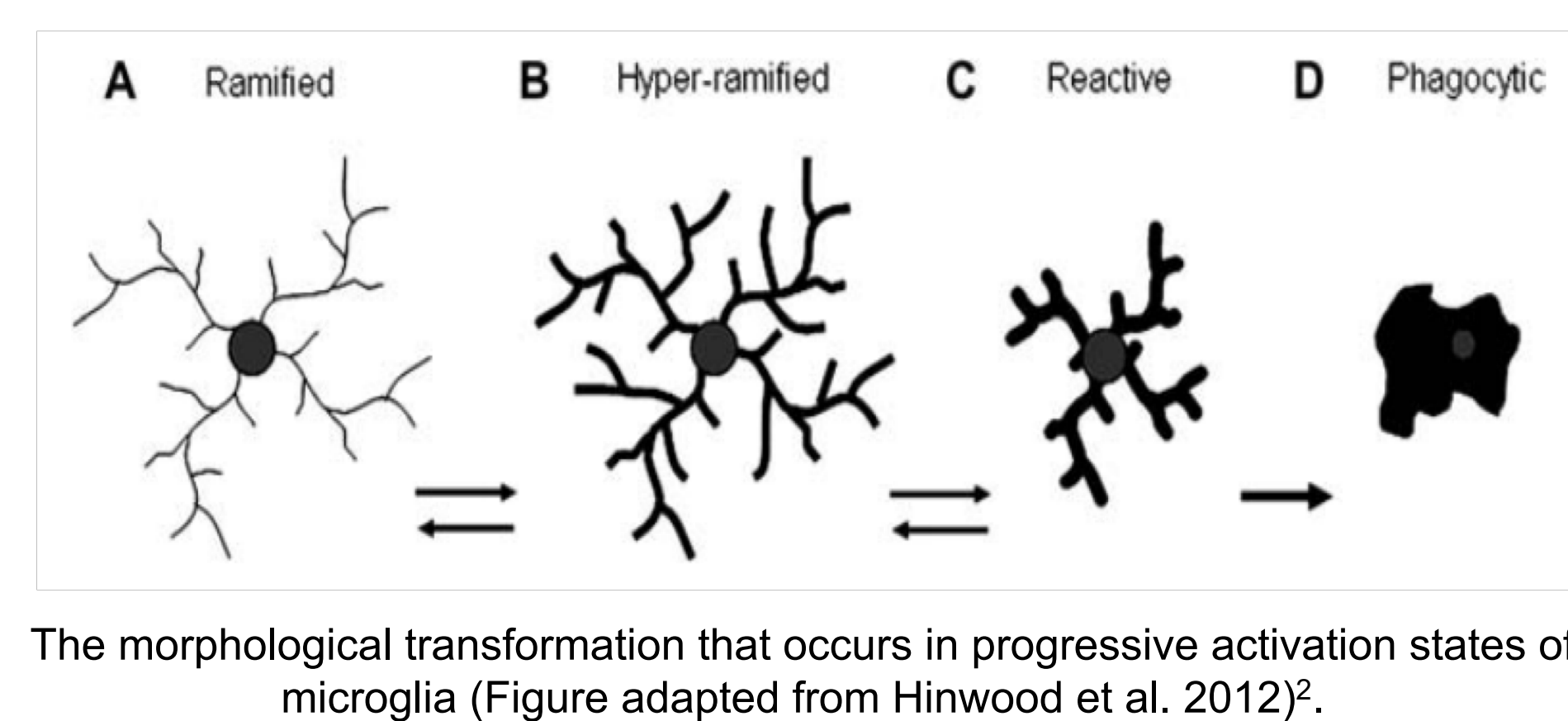
Conclusions

- These findings indicate that acute social defeat primes microglial activity in the vmPFC following subsequent LPS exposure.
- Acute social defeat appears to “activate” microglia in the vmPFC, as indicated by increased Iba-1 expression and acute changes in morphology.
- Acute social defeat does not appear to contribute to an *arrested hyper-ramified* state, as discussed in Hinwood et al., 2012.

Discussion & Future Directions

- The greatest differences were observed at 20 μ g/kg, which may indicate a point at which a greater percentage of cells display hyper-ramification.
- The disparity between OD and morphology data at 20 μ g/kg may be due to low sample size (n=4/group); current efforts are increasing the power of these samples.
- Future work will stain for phagocytic microglial activation state marker, CD68.
- Determine the effects of an antibiotic, minocycline, that selectively inactivates microglia on defeat-induced changes in behavior.

Figure 2



Acknowledgements and References

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