

Accumulation of Axonal Injury and Neurodegenerative Changes Associated With Repetitive Subconcussive Head Acceleration Exposures in a Biofidelic Preclinical Model

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Introduction

- Contact sport athletes experience subconcussive head impacts during routine practice
- This subconcussive Head Impact Exposure (sHIE) can lead to a decreased concussion threshold and an increased concussion risk
- Blood biomarkers correlated with this sHIE would help identify at risk athletes ahead of concussions

Goal

This analysis was conducted to determine which blood serum biomarkers correlated with different head impact exposures.

Methods

- Rats experienced head accelerations scaled from our study on contact sport athletes
- Blood was drawn at different time points to track various biomarkers

Blood Serum Biomarkers:

- Neurofilament light (NFL): axonal damage
- Glial Fibrillary Acidic Protein (GFAP): astrocyte damage
- Total Tau (t-tau): neuron death
- Neuron Specific Enolase (NSE): neuron injury

High Exposure (HE): 30 head accelerations/day, 5 days a week, for 4 weeks
Moderate Exposure (ME): 8 head accelerations/day, 5 days a week, for 4 weeks
Single Impact (SI): 1 high magnitude head acceleration
Sham: No head accelerations

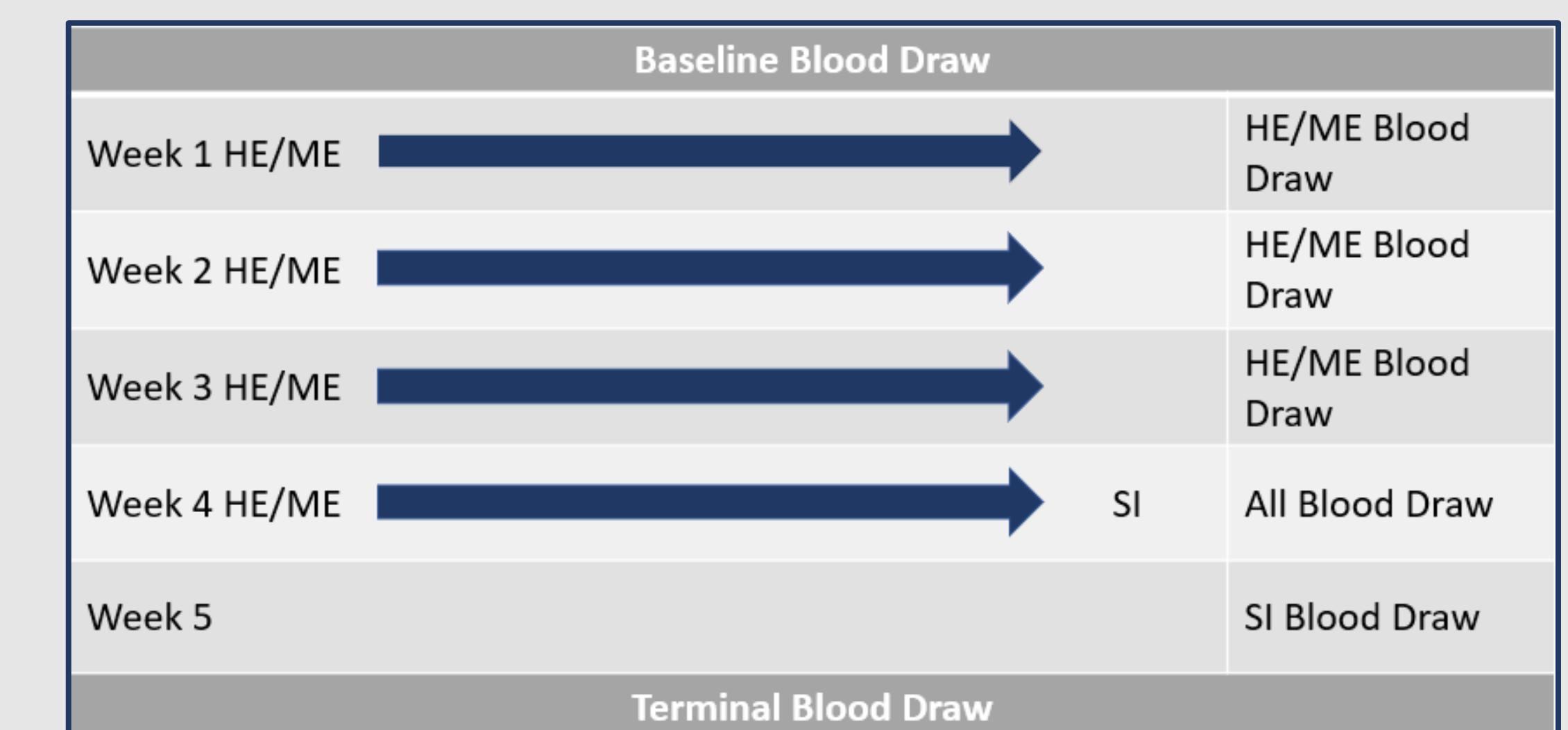
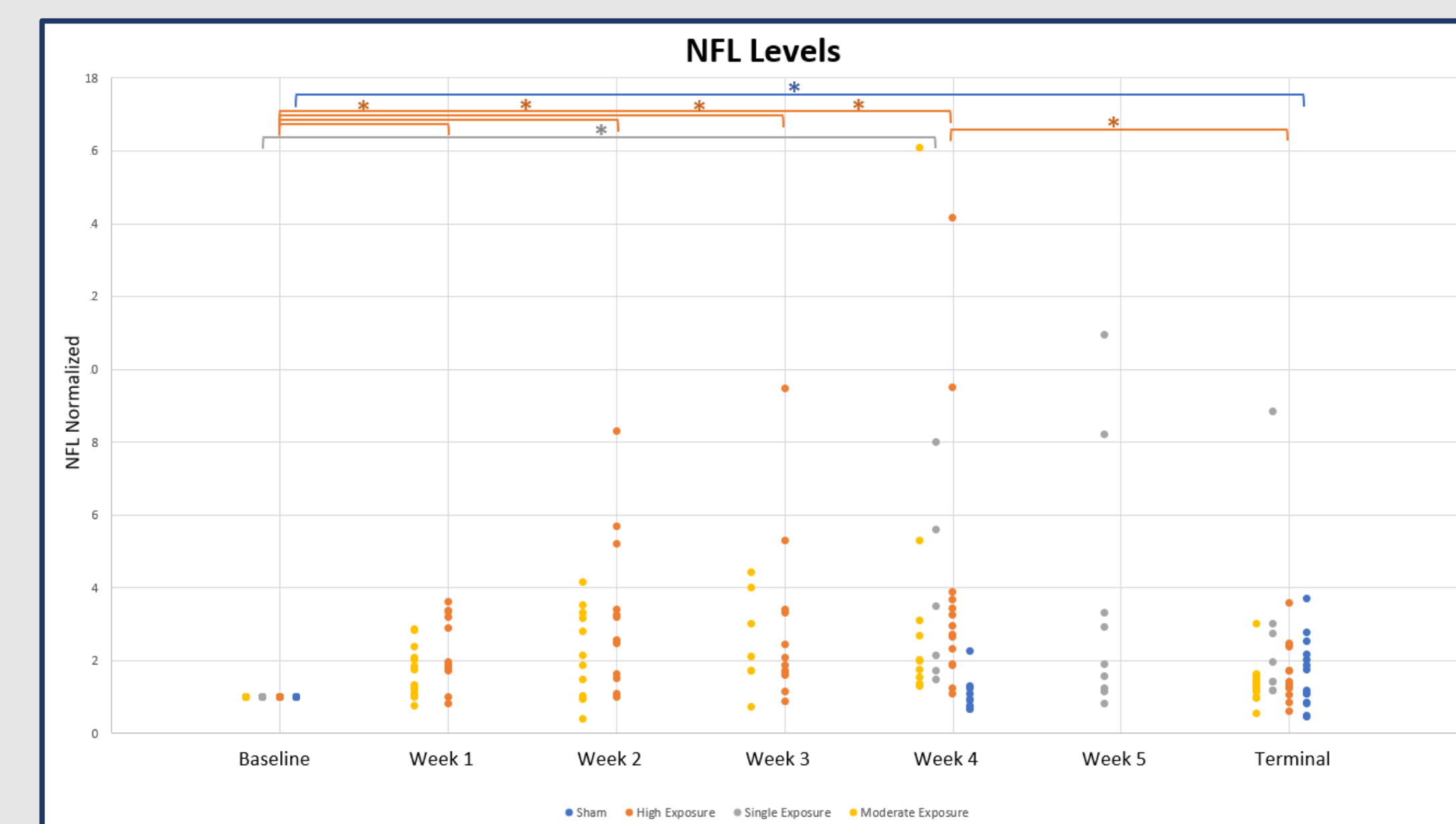


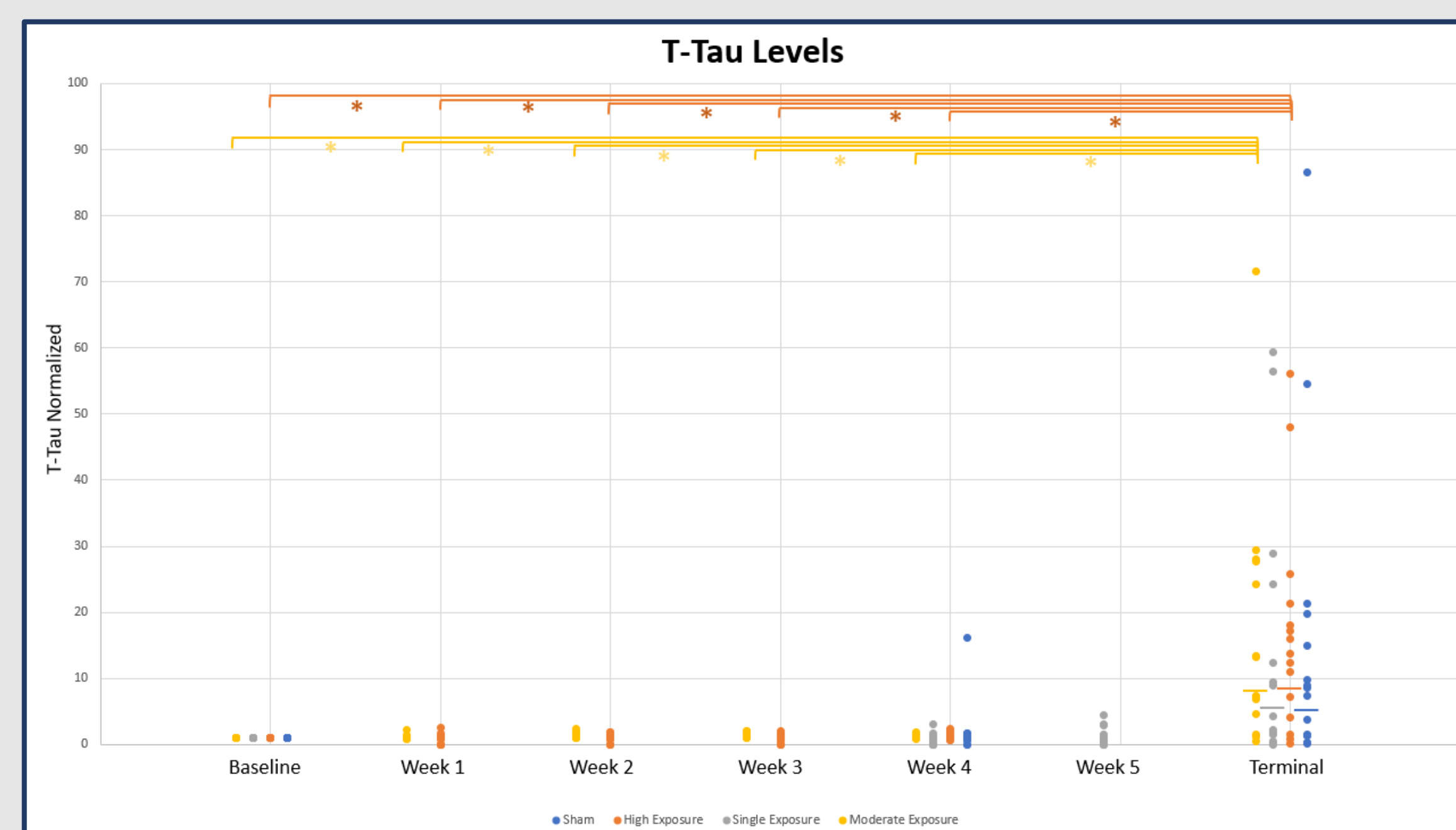
Figure 1: Timeline of all exposures and blood draws for all experimental groups.

NFL

- At week 4, SI, ME, and HE all saw significantly increased levels compared to sham



T-Tau



GFAP/NSE

- No significant results

Acknowledgements

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Discussion

- This analysis showed a dose dependent response between sHIE and certain blood serum biomarkers
- HE rats saw significantly elevated NFL levels which may indicate significant axonal damage while ME rats did not.
 - This finding supports the idea that limiting excessive sHIE may be protective.
- The peaks of T-tau at the terminal measurement may be indicative of a chronic injury.
 - Future areas of study could include further exploring this phenomenon.