

# 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

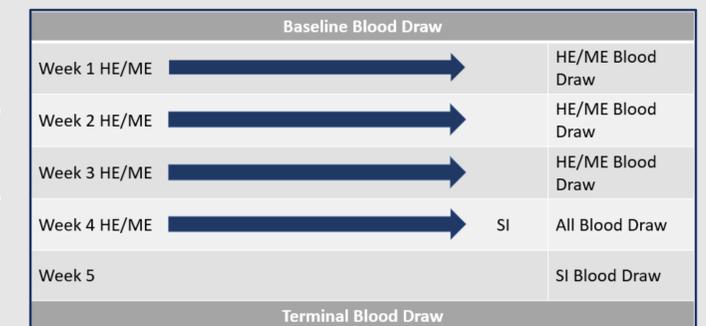
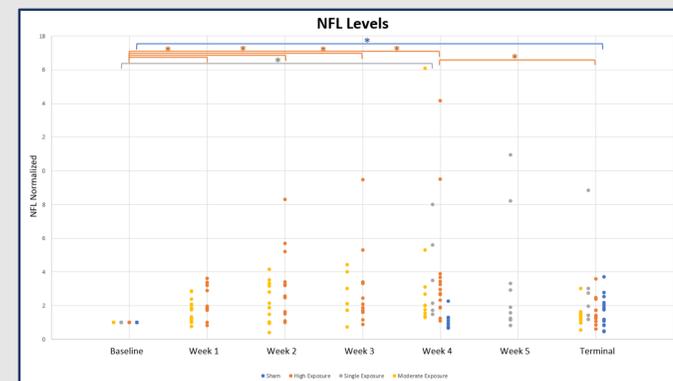


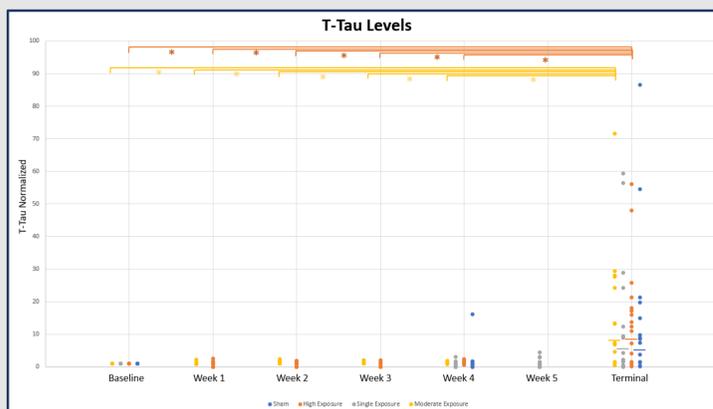
Figure 1: Timeline of all exposures and blood draws for all experimental groups.

## 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.