



# The Inflammatory Response After Blunt Traumatic Brain Injury is Aggravated by Hypobaric Hypoxia in Mice

Michael D. Goodman MD, Eric M. Campion MD, Amy T. Makley MD, Nathan L. Huber MD, Callisia N. Clarke MD, Lou Ann W. Friend RVT, Rebecca M. Schuster, Stephanie R. Bailey, Alex B. Lentsch PhD, Warren C. Dorlac MD, Jay A. Johannigman MD, Timothy A. Pritts MD PhD  
 Institute for Military Medicine, Department of Surgery, University of Cincinnati College of Medicine



## BACKGROUND

- Blunt traumatic brain injury (TBI) is extremely common in military and civilian trauma
- The neuroinflammatory response to TBI includes release of the cytokines IL-6 and MIP-1 $\alpha$
- Neuron Specific Enolase (NSE) is a biomarker released from the cytosol of neurons into the serum. NSE release correlates with head injury severity
- The effect of hypobaric conditions on TBI-induced neuroinflammation are unknown

## METHODS

- Anesthetized mice underwent a moderate TBI or sham injury by weight drop device
- At 3 or 24 hours after injury the animals were subjected to simulated flight at 8800 feet (Fly) or ground-level (No Fly) for 5 hours
- Cerebral samples were analyzed by multiplex ELISA for inflammatory cytokines and serum was analyzed for biomarkers at intervals post flight

## RESULTS

Brain MIP-1 $\alpha$  After Early Flight

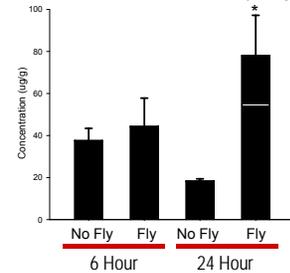


Figure 1. Mice were flown 3 hours after TBI. MIP-1 $\alpha$  levels were drawn at 6 and 24 hours after flight. \*p<0.05 vs No Fly

Brain MIP-1 $\alpha$  After Late Flight

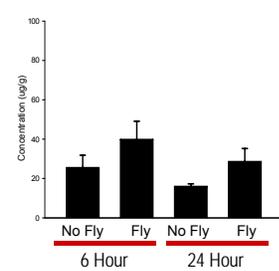


Figure 2. Mice were flown 24 hours after TBI. MIP-1 $\alpha$  levels were drawn at 6 and 24 hours after flight. There was no significant difference between MIP-1 $\alpha$  levels.

Brain IL-6 After Early Flight

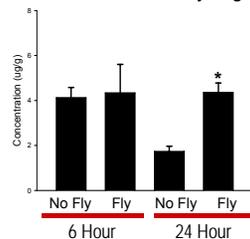


Figure 3. Mice were flown 3 hours after TBI. IL-6 levels were drawn at 6 and 24 hours after flight. \*p<0.05 vs No Fly

IL-6 After Late Flight

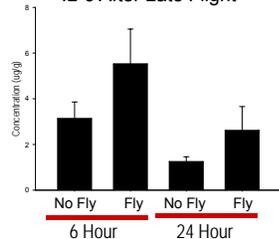


Figure 4. Mice were flown 24 hours after TBI. IL-6 levels were drawn at 6 and 24 hours after flight. There was no significant difference between IL-6 levels.

NSE After Early Flight

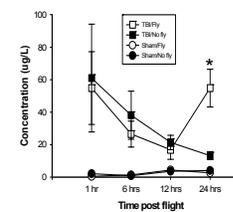


Figure 5. Mice were flown 3 hours after TBI or sham injury. Serum NSE levels were drawn at intervals post flight. \* p<0.01 vs TBI/No Fly

NSE After Late Flight

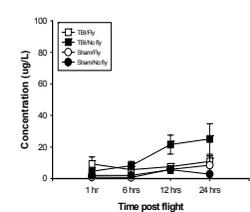


Figure 6. Mice were flown 24 hours after TBI or sham injury. Serum NSE levels were drawn at intervals post flight. Serum NSE was not significantly different between groups.

## CONCLUSIONS

- Hypobaric conditions during the early post injury period (3 hours) increased brain levels of IL-6 and MIP-1 $\alpha$
- Early, but not late, exposure to hypobaric hypoxia increased NSE release from the brain into the blood, indicating increased neuronal damage
- Optimization of post-injury "time to fly" may reduce secondary cerebral injury

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