

BACKGROUND

- Military service members (SMs) deployed into combat zones are at significant risk of diverse traumatic injuries (blunt force, explosion, gunshot) and development of critical illness and multi-organ dysfunction.
- Compared to EMS-mediated patient stabilization (~14 minutes) and transport (~11 minutes), combat response times vary significantly based on the tactical environment.

PROJECT OBJECTIVES

- Identify combat induced polytrauma biomarkers.
- Assess value of biomarkers in determining patient resource utilization and outcome.

METHODS

Serum biomarkers analyzed via MSD ELISA platform:

- TLR4 DAMPs:** eNAMPT, S100A8
- Inflammatory cytokines:** Interleukin(IL)-1b, IL-6, IL-1RA, Tumor Necrosis Factor(TNF)-a
- Neurotrauma-associated biomarkers:** Glial Fibrillary Acidic Protein (GFAP), Neurofilament Light Chain (NFL), total tau
- Vascular markers:** Angiopoietin-2 (Ang-2), P-selectin glycoprotein ligand-1 (PSGL-1)
- Outliers removed via ROUT analysis, Q of 1%
- Kruskal-Wallis w/ Dunn or Mann-Whitney 2 Tailed.

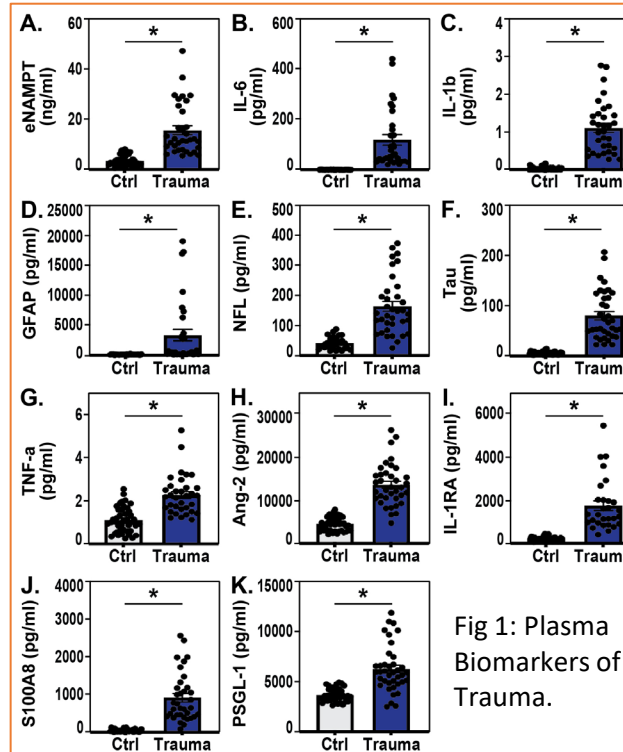


Fig 1: Plasma Biomarkers of Trauma.

RESULTS

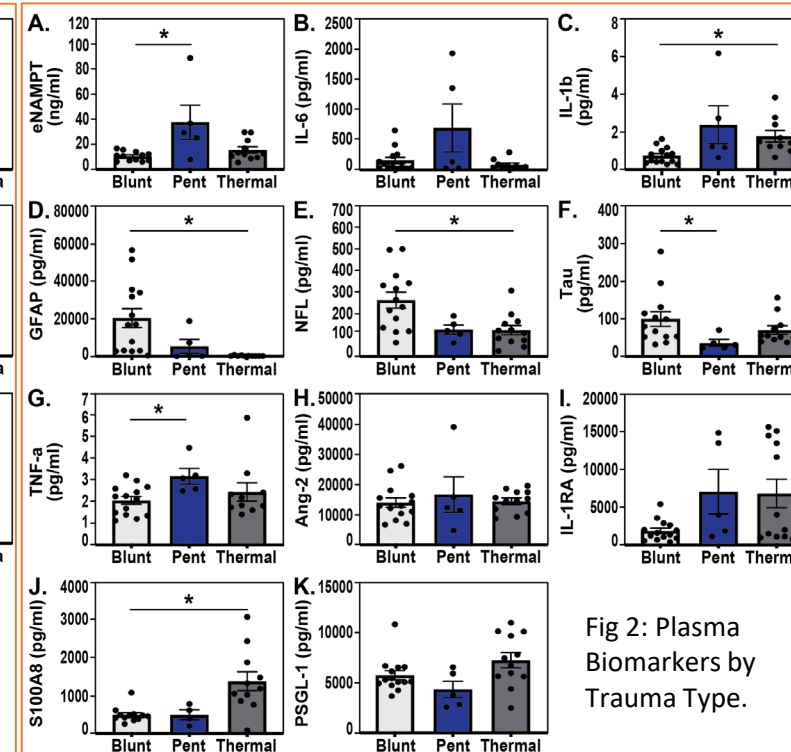
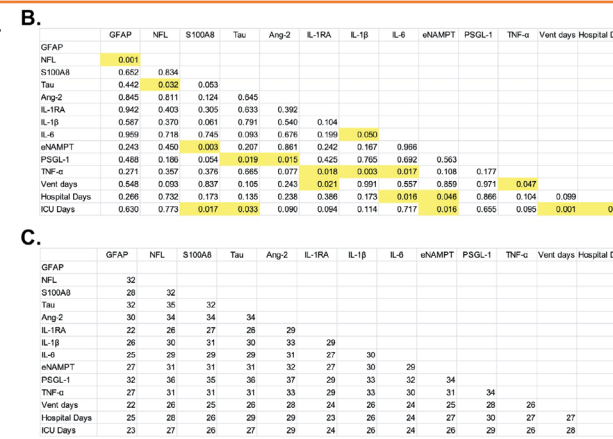
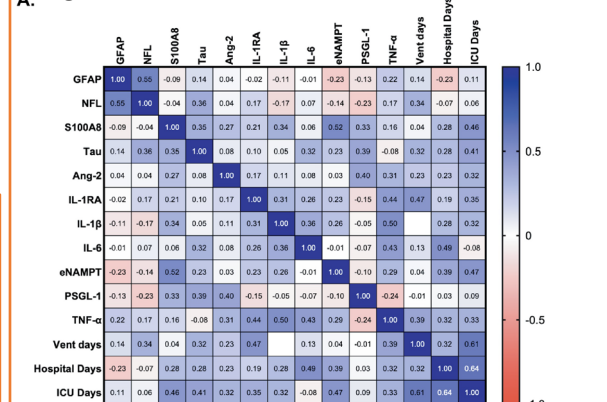


Fig 2: Plasma Biomarkers by Trauma Type.

Fig 3: Biomarker Correlations with Clinical Data.



CONCLUSIONS

- Each biomarkers was significantly elevated in combat casualties ($p < 0.0001$).
- eNAMPT ($p = 0.033$) and TNF-a ($p = 0.047$) were significantly higher in penetrating wounds compared to blunt trauma
- IL-1 β ($p = 0.005$) and S100A8 ($p = 0.005$) were significantly elevated in thermal injuries compared to blunt trauma
- GFAP ($p < 0.001$) and NFL ($p = 0.017$) were significantly elevated in blunt trauma compared to thermal injuries
- Levels of total tau elevated in blunt trauma compared to thermal injury.
- Mechanical ventilatory support correlated with IL-1RA levels ($p = 0.021$)

SUMMARY

- All tested biomarkers were significantly elevated in polytrauma combat casualties.
- Hospital stay correlated with IL-6 ($p = 0.016$) and eNAMPT levels ($p = 0.046$)
- ICU admission correlated with eNAMPT ($p = 0.016$) and S100A8 ($p = 0.017$) levels.

ACKNOWLEDGEMENTS

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Cohort Demographics

Type	n Value	Age	Sex
Healthy	46	~52	60% Male
Trauma	39	~39.2	90% Male

Injury Groups

Resource Utilization

Type	n Value	Type	Average Days
Blunt	14	Mechanical Ventilation	13
Penetration	5	Hospital	40
Thermal	12	ICU	20