VARIATION IN MITOCHONDRIAL FUNCTIONS ACROSS VITAL ORGANS AND BRAIN SUB-REGIONS IN A SWINE MODEL: A NOVEL REFERENCE TARGETS FOR TBI AND POLYTRAUMA

SCULTETUS Anke H[1], MUSYAJU Sudeep[1], MODI Hiren R[1], PANDYA Jignesh D[1]
[1]BTN, CMPN, Walter Reed Army Institute of Research, Silver Spring, MD, USA
jignesh.d.pandya.civ@health.mil

Introduction: In potential future combat situations, US forces may encounter systemic injuries affecting multiple organs, often resulting from a combination of mechanical trauma, thermal injury, and/or exposure to chemical, biological, radiological, and nuclear elements. It is crucial to comprehend the post-injury mechanisms and identify treatments for delayed secondary injuries. Our study focused on understanding post-injury mechanisms following TBI by examining organ-specific mitochondrial differences in swine. The aim is to establish reference values for assessing TBI and polytrauma and for evaluating future therapies in combat and field care environments. The swine model has recently come to the forefront due to its large brain mass and mammalian-specific architecture, which are key features in replicating the TBI and polytrauma pathophysiology in humans.

Material & Methods: This study used Yorkshire Swine to create initial baseline data for potential future TBI/polytrauma injury in a swine model. It examined mitochondrial function in various organs (heart, kidneys, liver, lungs) and brain regions of uninjured control Swine, including real-time respirometry, Ca^{2+} buffering capacity, and redox profile. Statistical comparisons were conducted using ANOVA ($N=6$, $^*p < 0.05$)

Results: In comparison to other organs, the brain and heart exhibited the highest levels of bioenergetics and Ca^{2+} buffering capacity. Additionally, both organs demonstrated increased expression of membrane proteins such as Cytochrome C and VDAC. The expression of antioxidants also varied across different organs.

Conclusion: The vital organs are equipped with unique profiles to combat pathological insults. Establishing organ-specific reference values may offer valuable insights for the development of mitochondria-targeted therapeutic interventions for TBI and polytrauma.

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