UCH-L1 and s100B in Saliva as Novel Biomarkers for Severe Traumatic Brain Injury

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Hypothesis: CT scans are used to determine extent of traumatic brain injury (TBI), but are costly and have radiation exposure. Recently, the FDA approved the use of serum biomarkers in TBI, but biomarkers in saliva remain unexplored. We hypothesize that salivary s100B and UCH-L1 will be elevated in TBI. Methods: Saliva was collected from 52 adult ER TBI patients and 14 controls. ER doctors categorized TBI severity. Samples were processed using ELISA kits and absorbance was measured by spectral analysis. Results: In mild, moderate, and severe TBI, post-injury biomarker levels (pg/mL) were: mean s100B at 0-3 h: 57.1, 37.0, 80.9; at 4-18 h: 47.3, 24.0, 43.7; and at 19-48 h: 55.2, 22.9, 0. Mean UCH-L1 at 0-3 h: 54.6, 54.7, 71.1; at 4-18 h: 54.6, 33.5, 44.8; and at 19-48 h: 43.5, 37.2, 0. Both biomarkers differentiated severe from mild/moderate TBI. Discussion: This is the first study to show increased salivary s100B and UCH-L1 levels in severe TBI in the first 3 hours after injury. Peak elevation in the first 3 hours was followed by a rapid decline, underscoring need to test soon rapidly. By showing higher levels of UCH-L1 in saliva over a larger sample size than in a published serum study, we propose that saliva is a better alternative to blood. Last year we showed salivary Occludin separated mild TBI from moderate/severe TBI. This year we found UCH-L1 and sB100 separate severe from mild/moderate TBI. By combining these two tests, we believe a multiplex test fitted into a mouth guard may estimate extent of injury even before medical personnel see the patient, thus saving time, reducing cost and exposure to radiation. Saliva testing is easier than testing blood, can be repeated more often and in the field, and use of biomarkers may reduce overuse of CT scans.

Awards Won:
Fourth Award of $500
Air Force Research Laboratory on behalf of the United States Air Force: First Award of $750 in each Intel ISEF Category