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Peptide Targeting Ligands & Biomarkers of Acute Traumatic Brain Injury

According to the CDC, traumatic brain injury (TBI) is a major cause of death and disability in the united states, with about 2.87 million TBI-related healthcare visits in 2014 alone. With TBI, the primary insult initiates a complex sequence that leads to cell death and

cognitive impairments, with potential lifelong effects. The heterogeneity of TBI pathology creates a significant obstacle for accurate diagnosis and treatment. There are currently no treatments to directly address injury pathology. Biomarkers sensitive to distinct injury temporal conditions have the potential to significantly aid in targeting nuanced pathology of an injury. Furthermore, sensitive biomarkers would be particularly significant in development of prognostic tools. Thus, there is a critical need for a panel of biomarkers that recognize precise molecular temporal aspects of brain injury.

Researchers at Arizona State University have developed a novel screening technique as well as injury biomarkers and companion targeting ligands for TBI. Using domain antibody phage display (with rodent focal injury models), next generation sequencing (NGS) analysis and nanotechnology strategies, TBI biomarkers were identified and injury specific peptides were generated which recognize those biomarkers. The screening techniques could uncover and identify various characteristics of the heterogeneous neural injury environment, as well as potentially other diseases and conditions. These peptides could be used to detect biomarkers of acute TBI and enable the proper treatment in accordance with the stage of the injury. In animal studies, after injection, these peptides were shown to be non-toxic with no observed adverse events.

These biomarkers and injury specific peptides are sensitive to distinct injury temporal conditions and could aid in targeting nuanced pathology of a neural injury.

Potential Applications

- TBI diagnosis
  - Applicable to acute, subacute or chronic TBI

- Using injury specific peptides to detect TBI biomarkers for proper treatment based on stage of the injury

Benefits and Advantages

- Assays could be developed with high specificity and sensitivity to neural injury pathology
  - Could serve as a platform for both TBI diagnosis and treatment
- Injury specific biomarkers for acute, subacute or chronic TBI
- These peptides are reproducible and easy to create
  - Developed using biochemical conjugation technology
- The peptides, as visualized with IHC, demonstrate positive recognition of features within the cortical injury penumbra
  - No signal observed in sham tissue

For more information about this opportunity, please see

Martinez et al – Symposium Abstract - 2019

For more information about the inventor(s) and their research, please see

Dr. Stabenfeldt's laboratory webpage

Dr. Stephanopoulos' departmental webpage

Dr. Diehnelt's departmental webpage