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Characterization and Correlation of Neurodegeneration and Biological Markers of Model Mice with Traumatic Brain Injury and Alzheimer's Disease

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Abstract : Alzheimer's disease (AD) is a predominant type of dementia and is likely a major cause of neural network impairment. The pathogenesis of this neurodegenerative disorder has yet to be fully elucidated. There are currently no known cures for the disease, and the best hope is to be able to detect it early enough to impede its progress. Beyond age and genetics, another prevalent risk factor for AD might be traumatic brain injury (TBI), which has similar neurodegenerative hallmarks. Our research focuses on obtaining information and methods to be able to predict when neurodegenerative effects might occur at a clinical level by observation of events at a cellular and molecular level in model mice. First, we wish to introduce our evidence that brain damage can be observed via brain imaging prior to the noticeable loss of neuromuscular control in model mice of AD. We then show our evidence that some blood biomarkers might be able to be early predictors of AD in the same model mice. Thus, we were interested to see if we might be able to predict which mice might show long-term neurodegenerative effects due to differing degrees of TBI and what level of TBI causes further damage and earlier death to the AD model mice. Upon application of TBIs via an apparatus to effectively induce extremely mild to mild TBIs, wild-type (WT) mice and AD mouse models were tested for cognition, neuromuscular control, olfactory ability, blood biomarkers, and brain imaging. Experiments are currently still in process, and more results are therefore forthcoming. Preliminary data suggest that neuromotor control diminishes as well as olfactory function for both AD and WT mice after the administration of five consecutive mild TBIs. Also, seizure activity increases significantly for both AD and WT after the administration of the five TBI treatment. If future data supports these findings, important implications about the effect of TBI on those at risk for AD might be possible.

Keywords : Alzheimer's disease, blood biomarker, neurodegeneration, neuromuscular control, olfaction, traumatic brain injury
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