

Repeated blast exposures cause acute neuropathological underpinnings of CTE and Alzheimer's disease

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Blast-induced Neurotrauma branch

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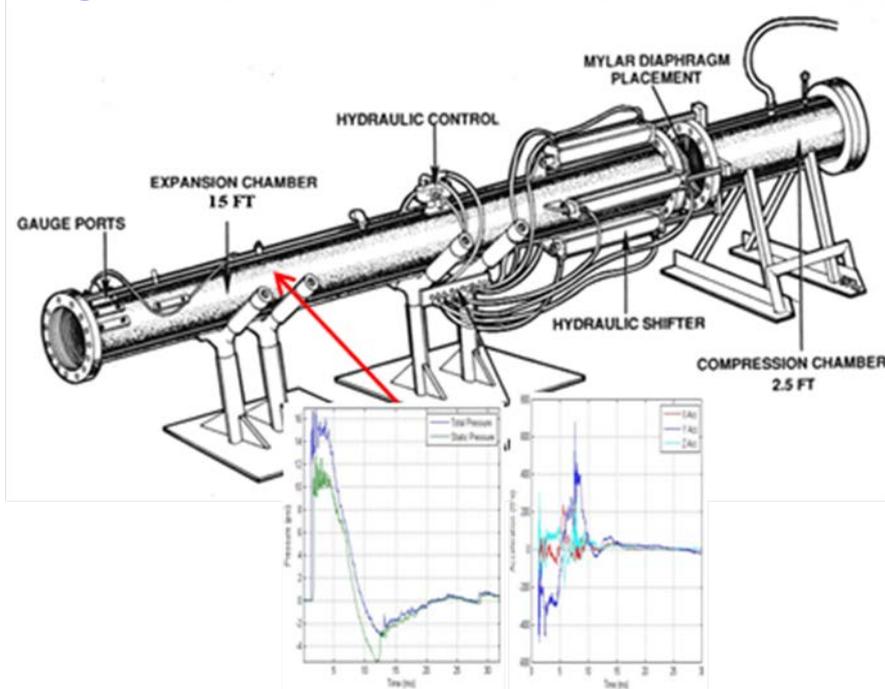


Background

- ***Blast victims, professional foot ball players, boxers etc., have all shown CTE neuropathology and behavioral deficits***
- ***Accumulation of pTau with perivascular neurofibrillary degeneration is a distinct feature of CTE***
- ***Increase in APP deposition and resultant amyloid plaque formation occurs in Alzheimer's disease***
- ***Amyloid β ($A\beta$) protein stimulates phosphorylation of Tau protein resulting in neurofibrillary tangle formation in Alzheimer's disease***
- ***Tau protein phosphorylated at serine 396 (S396) is rich in paired helical filaments which forms neurofibrillary tangles***

Rat models of brain injury

Single/repeated blast exposure



19 psi (131kPa)

Head impact/acceleration

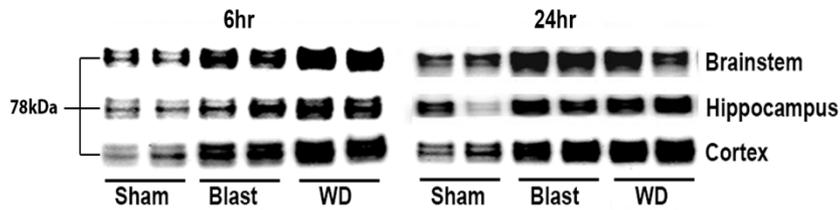


**500gm
150cm**

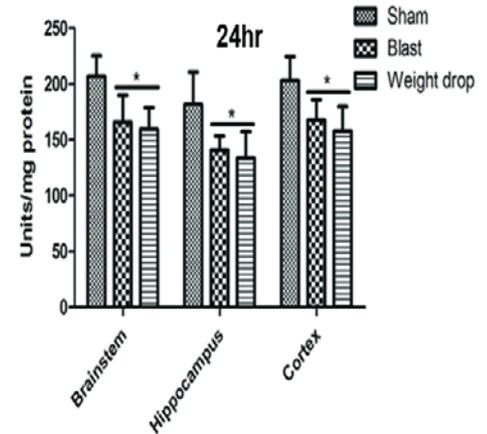
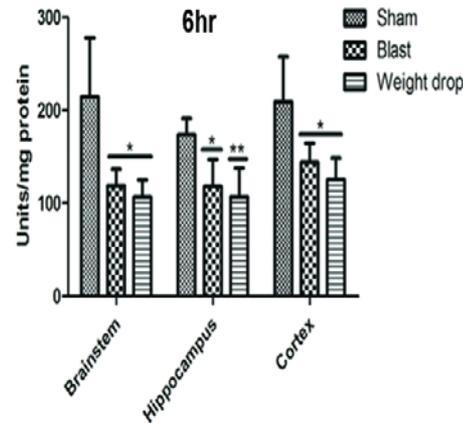
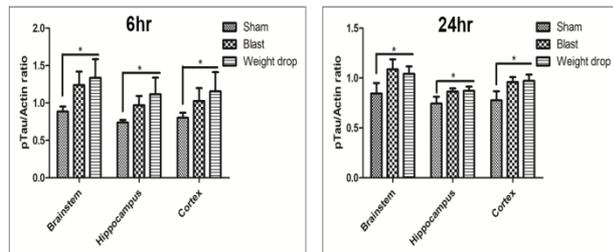
TNAP activity and *pTau* deposition

pTau (S396)

TNAP activity

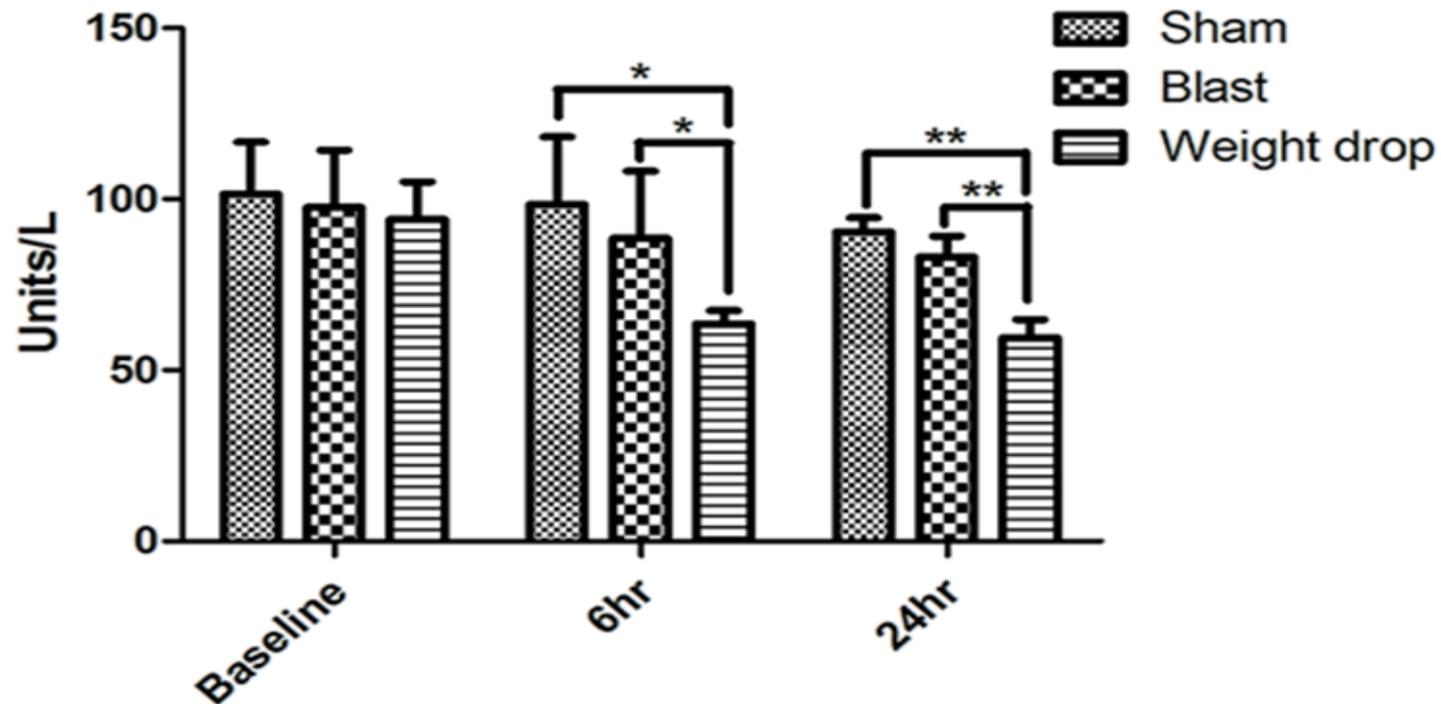


(B)



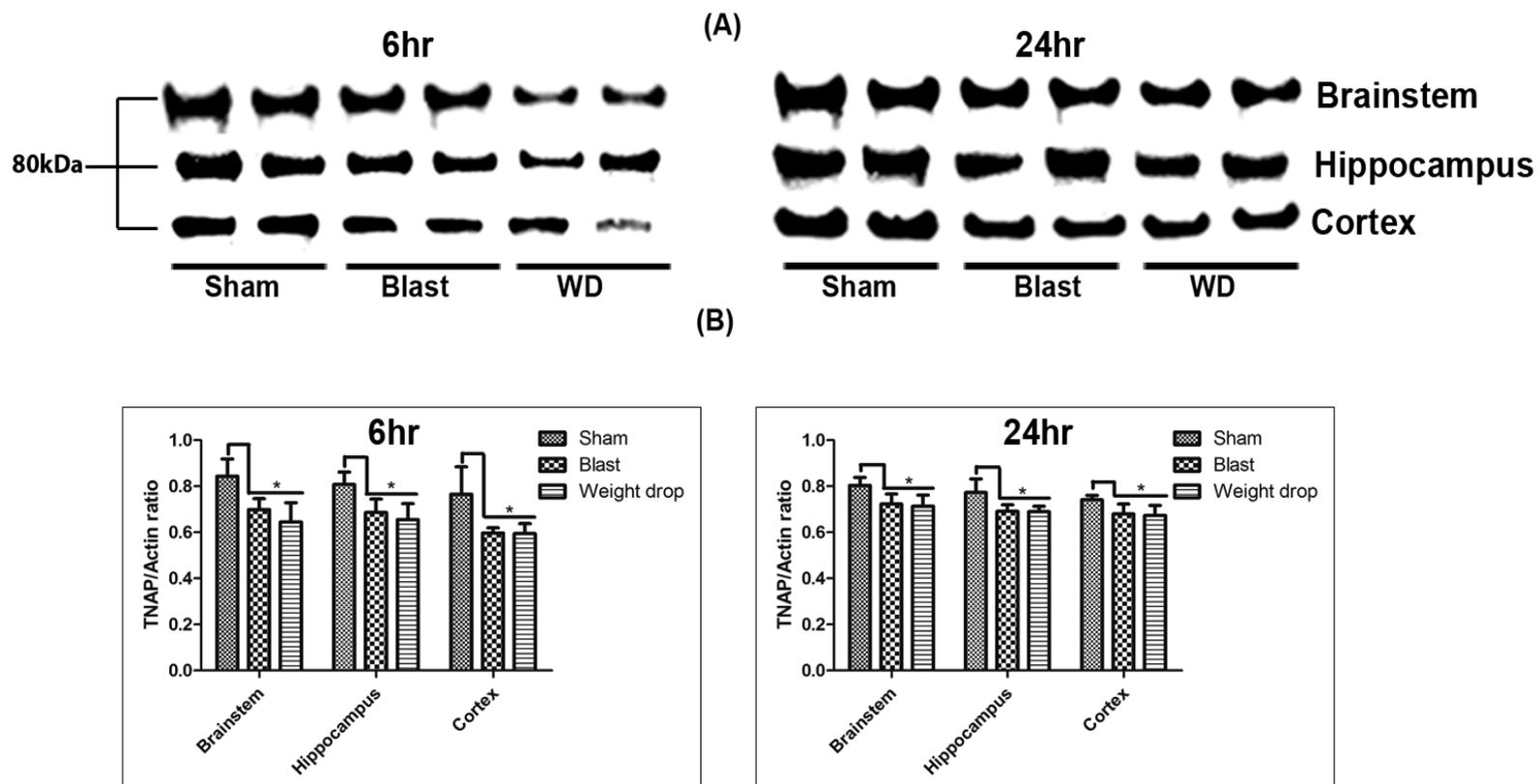
P. Arun et al. Neuroscience Letters, in press

Brain injury decreases plasma alkaline phosphatase activity



P. Arun et al. Neuroscience Letters, in press

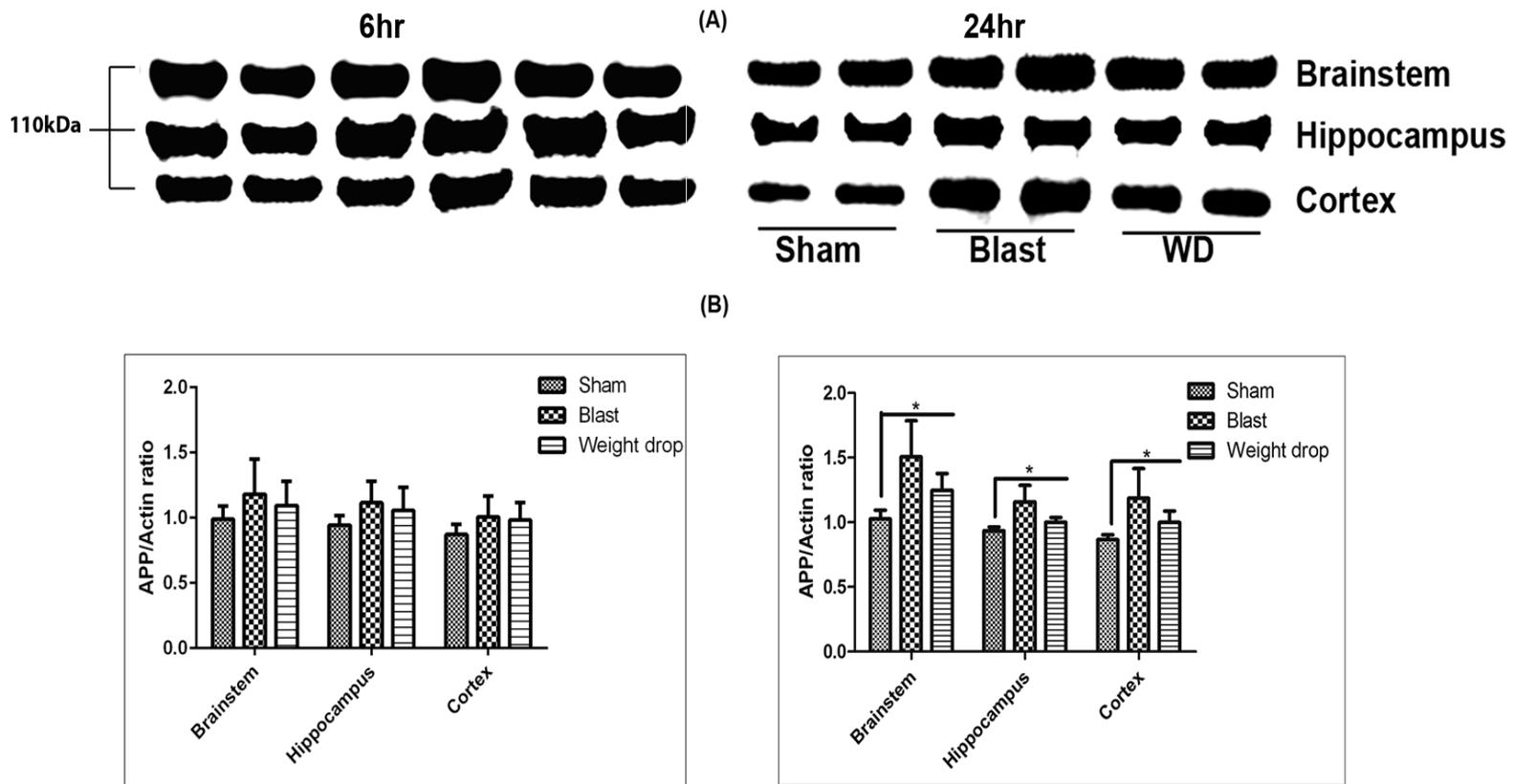
Brain injury decreases TNAP expression in brain



P. Arun et al. Neuroscience Letters, in press

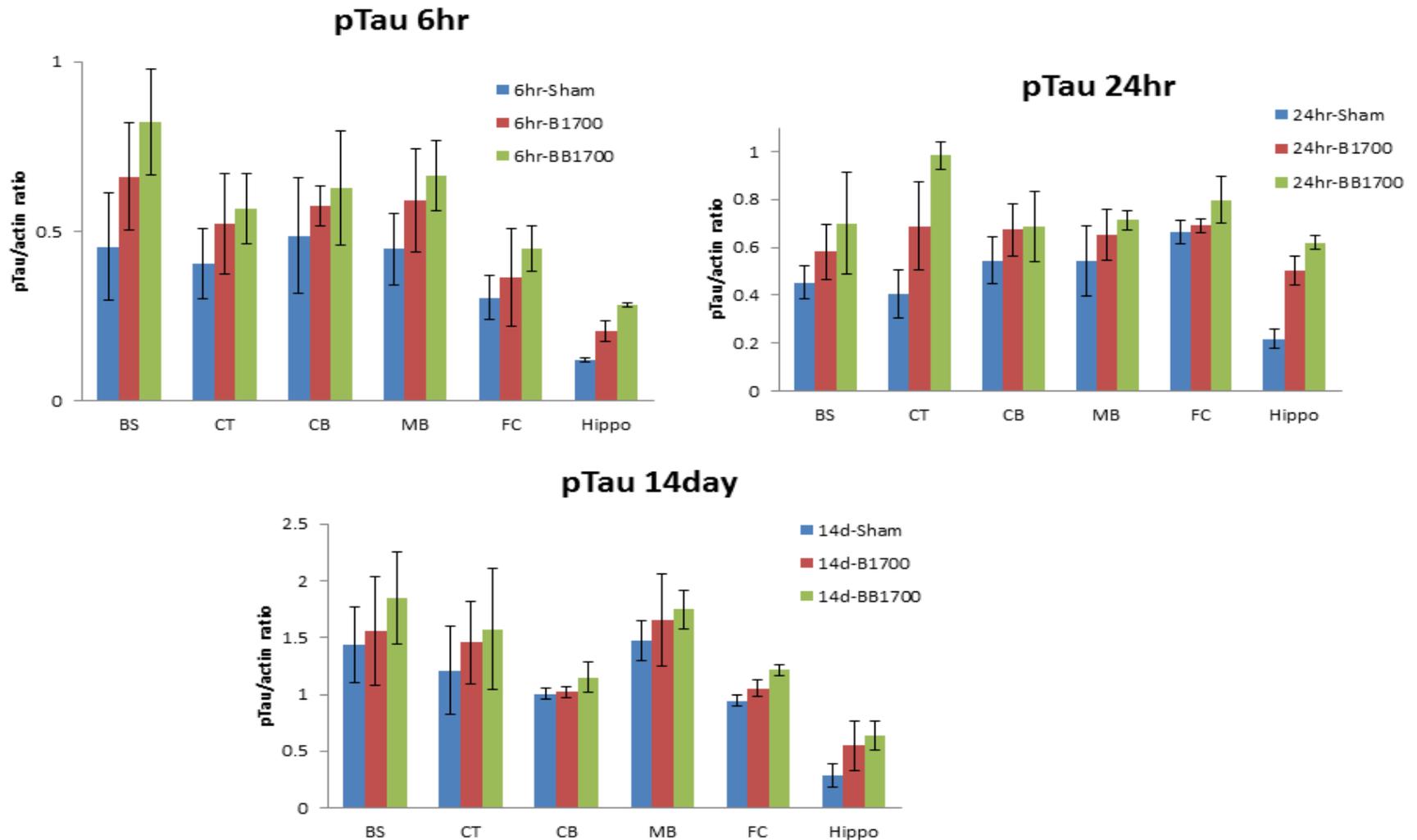
Brain injury increases deposition of APP

Fig.5

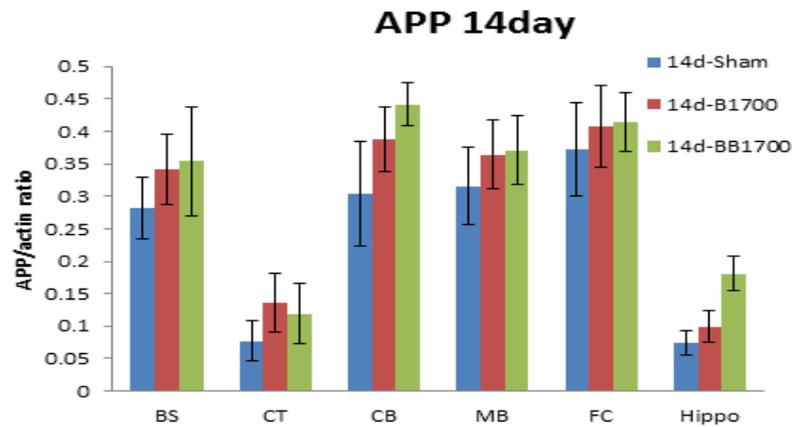
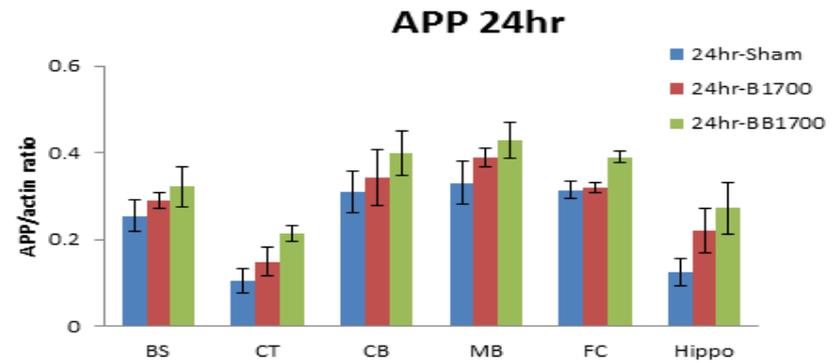
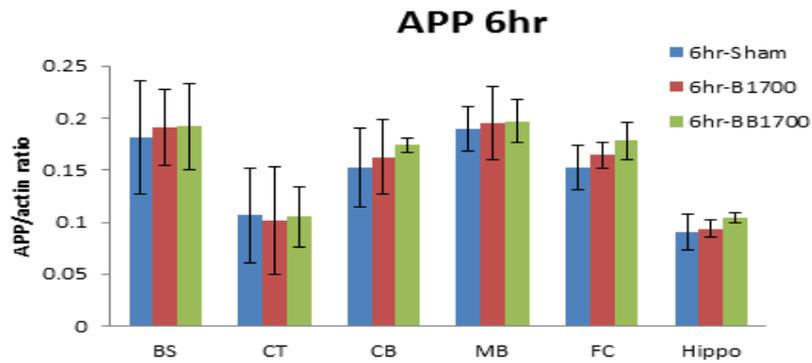


P. Arun et al. Neuroscience Letters, in press

Blast exposure increases deposition of pTau



Brain injury increases deposition of APP



CONCLUSIONS

- ***Blast and head impact/acceleration decrease the level/activity of brain TNAP which may be responsible for the accumulation of pTau which can lead to chronic diseases like CTE***
- ***Blast and head impact/acceleration increase the accumulation of APP in the brain which can trigger Alzheimer's-like pathology***
- ***The accumulation of pTau after brain injury was not correlated with APP deposition, suggesting tauopathy after brain injury might be distinct from Alzheimer's disease***

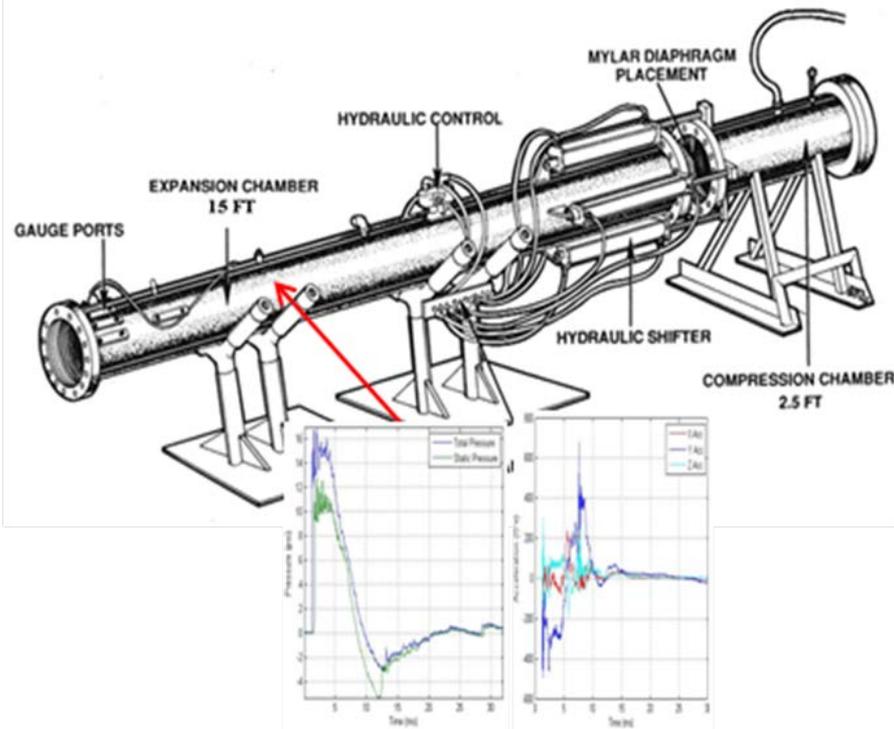
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MOMRP RADIII Task Area I project (No. 19210)

Cylindrical shock tube vs Advanced Blast Simulator



Cylindrical shock tube vs Advanced Blast Simulator

