Kupats *et al.: Intrinsic Activity*, 2017; **5**(Suppl.2):A2.22
doi:10.25006/IA.5.S2-A2.22
published online: 16 October 2017

2nd International Conference in Pharmacology: From Cellular Processes to Drug Targets

Rīga, Latvia, 19–20 October 2017

MEETING ABSTRACT

A2.22

Differences between open and closed head injury: evaluation of weight-drop model in experimental traumatic brain injury

Einars KUPATS[1,*], Edijs VAVERS[1,2], Janis KUKA[2], Baiba SVALBE[2], Baiba ZVEJNIECE[2], Liga ZVEJNIECE[2] and Maija DAMBROVA[1,2]

[1]*Rīga Stradiņš University, Riga, Latvia;* [2]*Latvian Institute of Organic Synthesis, Riga, Latvia*

Background: Traumatic brain injury (TBI) is one of the leading causes of mortality and morbidity in people under the age of 45 years and more than 75% of TBI cases are closed head injuries. To study closed head injury one of the most used experimental models is the weight-drop model. The incidence of skull fractures in the weight-drop model is more than 30%. We hypothesize that the heterogeneity of initial injury induces different pathophysiological mechanisms and neurological outcomes following TBI.

Objectives: The aim of the present study was to evaluate and compare potential risk factors of skull fractures and aspects of neuro-inflammation between closed and open weight-drop induced TBI model.

Methods: The weight-drop TBI model was used to induce head injury in male SW mice. Interleukin (IL)-6, IL-1β and tumor necrosis factor alpha (TNFα) were measured by quantitative real-time PCR analysis in the hippocampus 12 h and 1 and 3 days after TBI with and without fracture. The neurobehavioral status of SW mice was assessed by the neurological severity score (NSS). To ensure exact anatomical reference and correlate skull thickness and respective force required to induce sufficient TBI, computed tomography scans were performed (30 keV, 0.95 mA, 250 ms at 720 projections). 2-mm and 5-mm cone tips were used in the weight-drop model to compare the impact difference on NSS and skull fracture incidence.

Results: Weight-drop impact with fracture induced a 3- to 10-fold difference in the expression levels of inflammatory genes IL-6, IL-1β and TNFα compared to animals without fracture. The average SW mice parietal bone thickness varied from 0.22 to 0.30 mm. Decreased parietal bone thickness was associated with an increased risk of fractures. Parietal bone fractures occurred in 10% using a 5-mm-diameter teflon-tipped cone, while a 2-mm-diameter cone induced fractures in 33% of cases. In addition, NSS was significantly higher in animals after TBI using a 5-mm cone.

Conclusions: To produce a homogenous type of injury and more reproducible NSS results, a 5-mm-diameter cone should be used in the weight-drop TBI model.

Acknowledgements: This study was supported by the framework of EU-ERA-NET NEURON CnsAFlame and RSU/RTU-18 collaborative research project funding.

Keywords: traumatic brain injury – weight-drop model – skull fracture – neuroinflammation

**Corresponding author: Einars Kupats, Rīga Stradiņš University, Riga, Latvia.*
E-mail: einarskupats@gmail.com