Notice of the Final Oral Examination for the Degree of Doctor of Philosophy of

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MSc (Universitat de Barcelona, 2014)  
BSc (Universitat de Barcelona, 2013)

“Repeated mild traumatic brain injury is associated with acute microvascular damage in juvenile male and female rats”

Division of Medical Sciences

Thursday, June 10, 2021  
9:00 A.M.  
Conducted Virtually

Supervisory Committee:
Dr. Brian Christie, Division of Medical Sciences, University of Victoria (Co-Supervisor)  
Dr. Patrick Nahirney, Division of Medical Sciences, UVic (Co-Supervisor)  
Dr. Craig Brown, Division of Medical Sciences, UVic (Member)  
Dr. Hector Caruncho, Division of Medical Sciences, UVic (Member)  
Dr. Jodie Gawryluk, Division of Medical Sciences, UVic (Member)

External Examiner:  
Dr. Katerina Akassoglou, Department of Neurology, University of California, San Francisco

Chair of Oral Examination:  
Dr. Irina Paci, Department of Chemistry, UVic

Dr. Stephen Evans, Acting Dean, Faculty of Graduate Studies
Abstract

Traumatic Brain Injury (TBI) is a growing global health problem. Mild forms of TBI (mTBI) such as concussions, represent the most common manifestation of this type of injury with children and youth (< 20 years old) among the most likely to sustain mTBI. There is growing evidence for the cumulative effects of repeated mTBI (rmTBI) suggesting that while a single concussion may not cause evident or long-lasting brain alterations, the summation of multiple mTBI may lead to more severe consequences. In contrast to severe TBI, lesions in mTBI patients are challenging to detect. Despite this, mTBI patients may still present with cognitive and emotional deficits. Cerebral microbleeds (CMBS), a subtle form of vascular damage, have been identified as an early hallmark in brain trauma and several neurodegenerative diseases. The cumulative effects of subtle but sustained microvascular damage could explain the persistent long-term functional deficits observed in mTBI. In this study, the awake closed-head injury (ACHI) model was used to investigate the association between rmTBI and microvascular damage in different brain regions in both male and female juvenile rats at one and seven days after the last injury. The results indicate that the injury paradigm used in this study (i.e. 8 impacts over 4 days) using the ACHI model is associated with an acute increase in sings of microvascular damage in both sexes that is no longer evident at a longer time point. These study is the first to describe the negative impact of rmTBI on CMBS in the juvenile using an awake animal model, and provides evidence for the potential involvement of this subtle form of vascular damage in the development of neurological deficits after rmTBI.