University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Science

of

MELISSA CLARKSON

BSc (University of British Columbia, 2012)

"Acute Astrogliosis and Neurological Deficits Following Repeated Mild Traumatic Brain Injury"

Division of Medical Sciences

Wednesday, August 22, 2018
10:30am
Medical Sciences Building
Room 210

Supervisory Committee:
Dr. Patrick Nahirney, Division of Medical Sciences, University of Victoria (Co-Supervisor)
Dr. Brian Christie, Division of Medical Sciences, University of Victoria (Co-Supervisor)
Dr. Leigh Anne Swayne, Division of Medical Sciences, University of Victoria (Unit Member)

External Examiner:
Dr. Sandra Hundza, School of Exercise Science, Physical & Health Education, University of Victoria

Chair of Oral Examination:
Dr. Kwang Moo Yi, Department of Computer Science, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Mild traumatic brain injury (mTBI), often referred to as concussion, has become increasingly recognized as a serious health issue in the general population. The prevalence of mTBI in athletes, particularly repeated injuries in young athletes, is of great concern as injuries to the developing brain can have long-term detrimental effects. In this study we used a novel awake closed-head injury (ACHI) model in rodents to examine repeated mTBI (rmTBI), to determine if repeated injuries produced the neurological and molecular changes evident with human concussion. Animals were administered 4, 8, and 16 rmTBIs and acute neurological assessments were performed after the injuries. Changes in astrocyte and microglial cell reactivity were assessed using Western blot analysis at one day following rmTBI in the ipsilateral dentate gyrus (DG) and the cornu ammonis (CA) regions of the hippocampus and the cortex (CX). Results indicated that the ACHI model produces neurological deficits immediately after the injuries, with the most deficits arising in the rmTBI16 group. Despite deficits in all injury groups, histological staining with cresyl violet revealed no significant morphological tissue damage to the brain. Western blot analysis, however, showed a significant increase in DG and CX GFAP expression in the rmTBI16 group with no changes in Iba-1 levels. This suggests an immediate activation of astrocytes in response to injury, with a delay or absence of microglial activation. Our findings show that with repetitive concussions, we are able to detect acute neurological and molecular changes in the juvenile female brain. However, further investigation is necessary to determine if these are transient changes.