ANNOUNCEMENT

Interested Members of the University community are invited to attend the Final Oral Examination for the degree of Master of Science of

**Eric Lawton**

of the Department of Biomedical Sciences (Ontario Veterinary College) on Thursday, October 4th at 9:00am in Biomedical Sciences Room 1642 (Seminar); and OVC Main Building 3648 (Examination)

**Gonadectomy Rapidly Alters the Morphology of Pyramidal Neurons in the Hippocampus and Medial Prefrontal Cortex of Male Rats**

Examination Committee
- Dr. Neil MacLusky, Advisor
- Dr. Bettina Kalisch, Committee Member
- Dr. Elena Choleris, Graduate Faculty
- Dr. Matthew Vickaryous, Exam Chair

Advisory Committee
- Dr. Neil MacLusky
- Dr. Bettina Kalisch
- Dr. Craig Bailey
ABSTRACT

Gonadal steroid hormones are powerful modulators of hippocampal plasticity. Androgen manipulation has been shown to influence hippocampal neuron morphology and neurotrophic peptide levels in the rat hippocampus, which may help to explain the variation in androgen-dependent behavioural effects observed in both rodents and humans. Previous work in our lab has shown that two months after gonadectomy (GDX), the apical trees of pyramidal neurons within the hippocampal CA3 subfield undergo a robust expansion compared to sham-operated controls (SHAM) in male rats. However, it remained unknown how rapidly the effects of GDX occur, whether testosterone replacement reverses these effects, if surgical stress may contribute to the observed changes in morphology, or if other areas of the brain involved in memory and cognition are similarly affected.

Here, we examined the effects of GDX and testosterone replacement on dendritic branching patterns and spine density in CA1, CA3 and medial prefrontal cortex (mPFC) layer II/III pyramidal neurons, as well as subfield specific brain-derived neurotrophic factor (BDNF) expression in the adult rat brain at 10 days after GDX. At 10 days post-surgery, dendritic branching in CA1 was relatively unaffected by either surgical stress or GDX. Apical dendritic branching of both CA3 and mPFC neurons was significantly greater in GDX rats compared to either GDX/T replaced or unoperated male controls. The lowest level of branching was observed in the SHAM group. SHAM surgery and GDX slightly increased spine density in layer II/III of the mPFC, but no effects were observed in CA1 and CA3. An increase in total BDNF was also apparent following SHAM surgery.

In this thesis I demonstrate a complex interaction between stress and testosterone in the regulation of pyramidal cell morphology in areas of the brain critical for cognition and memory. These findings could help to explain the mixed and sometimes conflicting effects of stress and androgen deprivation on cognitive function, in both man and animals.

PRESENTATIONS

Lawton EML, Mendell ALM, Isaacs LKI, MacLusky NJM (2017) Gonadectomy rapidly alters the morphology of pyramidal neurons in the hippocampus and medial prefrontal cortex. Canadian Association For Neuroscience (National)

Lawton EML, Mendell ALM, Isaacs LKI, MacLusky NJM (2017) Gonadectomy rapidly alters the morphology of pyramidal neurons in the hippocampus and medial prefrontal cortex. Southern Ontario Neuroscience Association (Provincial)
Lawton EML, Mendell ALM, Isaacs LKI, MacLusky NJM (2017) Gonadectomy rapidly alters the morphology of pyramidal neurons in the hippocampus and medial prefrontal cortex. University of Guelph (Institutional)

BIOGRAPHICAL DATA

Eric Lawton graduated from the University of Guelph in 2016 with a Bachelor of Science Honours degree in Nutrition and Nutraceutical Sciences. His interest in research developed after working in the biotechnology industry as a technology development assistant during the summer from 2012-2015. His interest in neuroscience began after enrolling in pharmacology courses offered at Guelph. Eric enrolled in the Master’s program in Biomedical Sciences and Neuroscience with Dr. Neil MacLusky in September of 2016. His research focuses on the effects of short-term androgen deprivation on neurotrophic peptide levels and pyramidal neuron morphology in the hippocampus and medial prefrontal cortex.

AWARDS RECEIVED

Ontario Graduate Scholarship (OGS) 2016-2017

Ontario Veterinary College Scholarship 2016