



COLLEGE of
BIOLOGICAL SCIENCE

DEPARTMENT OF MOLECULAR
AND CELLULAR BIOLOGY

Announcement:

All interested members of the university community are invited to attend the Final Oral Examination for the degree of **Master of Science** of

MADISON TURNER

on Thursday, May 14, 2020 at 1:30 p.m.

Thesis Title: Characterization of virulence factors targeting *Apis mellifera*: *Varroa* Toxic Protein and LarvinA

Examination Committee:

Dr. R. Lu, Dept. of Molecular and Cellular Biology (Exam Chair)

Dr. R. Merrill, Dept. of Molecular and Cellular Biology

Dr. G. Cox, Dept. of Molecular and Cellular Biology

Dr. J. Dawson, Dept. of Molecular and Cellular Biology

Advisory Committee:

Dr. R. Merrill (Co-Advisor)

Dr. E. Guzman (Co-Advisor)

Dr. G. Cox

Abstract: *Apis mellifera* populations are declining due to a variety of factors, including the parasitic mite, *Varroa destructor*, and the bacterial disease, American foulbrood (AFB). This thesis describes the biochemical characterization of two important virulence factors: LarvinA from AFB, and *Varroa* Toxic Protein (VTP) from the mite. LarvinA was kinetically characterized and confirmed to be a functional C3-like mono-ADP-ribosyltransferase toxin. N-terminal deletions and single-residue variants led to the identification of novel interactions between the α 1-helix and the active-site of LarvinA, including the role of net charge in cell entry. Next, VTP was purified using glutathione-based affinity and size-exclusion chromatography. Analysis of the primary sequence and circular dichroism spectra revealed that VTP is primarily an α -helical protein; however, it is thermally labile based on the temperature analysis of the protein. These findings can be combined with future studies to elucidate novel therapeutics.

Curriculum Vitae: Madison completed her Bachelor of Science (Hons.) at the University of Guelph in the summer of 2017, and then began her M.Sc. in the lab of Dr. Rod Merrill in the fall of the same year.

Publication: Turner, M., Tremblay, O., Heney, K. A., Lugo, M. R., Ebeling, J., Genersch, E., and Merrill, A. R. (2020) Characterization of C3larvinA, a novel RhoA-targeting ADP-ribosyltransferase toxin produced by the honey bee pathogen, *Paenibacillus larvae*. *Biosci Rep* 40, BSR20193405.