Announcement:
All interested members of the university community are invited to attend
the Final Oral Examination for the degree of Doctor of Philosophy of

KELLY BODDINGTON
on Friday, April 12, 2019 at 9:30 a.m. in SSC 2315

Thesis Title: The role of a Vitis riparia dehydrin in protecting DNA from oxidative stress.

Examination Committee:
Dr. R. Lu, Dept. of Molecular and Cellular Biology (Exam Chair)
Dr. S. Graether, Dept. of Molecular and Cellular Biology
Dr. I. Tetlow, Dept. of Molecular and Cellular Biology
Dr. R. Merrill, Dept. of Molecular and Cellular Biology
Dr. D. Rose, Dept. of Biology, University of Waterloo

Advisory Committee:
Dr. S. Graether (Adv.)
Dr. I. Tetlow
Dr. G. Harauz
Dr. V. Ladizhansky

Abstract: Dehydrins are intrinsically-disordered proteins expressed during seed development and during abiotic stress. They have been shown to confer stress tolerance to plants, and many different methods of action have been proposed for these proteins. Here, I first show using both circular dichroism and NMR that the long-proposed nucleotide binding role of the Y-segment of dehydrins is incorrect. I then examine the expression, subcellular localization, and role of the YSK2-type Vitis riparia dehydrin, VrDHN1. Through phenol protein extraction studies, it was found that VrDHN1 was expressed during cold and dehydration stresses, as well as in response to the plant stress hormone ABA. Fluorescence-localization, confirmed by subcellular fractionation, revealed that VrDHN1 was found in the nucleus and in the cytoplasm of plant cells. The ability of VrDHN1 to bind to DNA in vitro was then investigated. VrDHN1 was shown to bind to DNA in a manner that was dependent on the sequence of VrDHN1, but not on the sequence of the DNA. This binding was not stimulated by metal ions, and was somewhat reduced by the pseudophosphorylation of the protein. Furthermore, the binding of VrDHN1 to DNA was shown to protect the DNA from oxidative damage caused by hydroxyl radicals, a function that was unhindered by the pseudophosphorylation of VrDHN1. In vivo experiments to confirm this protection of DNA were attempted, but were limited by difficulties in generating stable VrDHN1 transformants. I propose a model of DNA protection against oxidative damage, where VrDHN1 binds to DNA in a low-affinity and non-DNA sequence specific manner to reduce damage caused by an ROS attack.

Curriculum Vitae: Kelly obtained her Bachelor of Science (Honours) (MBG), at the University of Guelph in 2014. She began her M.Sc. that summer, and then later transferred to the Ph.D. program, where she continued her work with her advisor, Dr. Steffen Graether.

Awards:
NSERC Alexander Graham Bell Canada Graduate Scholarship $70,000 – Doctoral for May 2017 – April 2019
Ontario Graduate Scholarships $15,000 – Masters - May 2016 – April 2017 and May 2015 – April 2016
NSERC Canada Graduate Scholarship $17,500 – Masters for May 2014 – April 2015