



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

JESSICA WHITE

on Friday, May 11, 2018 at 9:30 a.m. in SSC 2315

Thesis Title: Development and characterization of branching enzymes for improving industrial starches

Examination Committee:

Dr. F. Brauer, Dept. of Molecular and Cellular Biology (Exam Chair)

Dr. I. Tetlow, Dept. of Molecular and Cellular Biology

Dr. S. Graether, Dept. of Molecular and Cellular Biology

Dr. A. Nassuth, Dept. of Molecular and Cellular Biology

Advisory Committee:

Dr. I. Tetlow (Adv)

Dr. M. Emes

Dr. S. Graether

Abstract: Starch is a plant-based polyglucan made of branched amylopectin and linear amylose, and is used in many food and non-food applications. The linear component forms undesirable gels during industrial processing at temperatures below 100°C. This thesis describes the development and characterization of branching enzymes with potential to minimize gelling by branching starch. Site-directed mutants of *Deinococcus radiodurans* glycogen branching enzyme (DrGBE) were made (Gln205His, Ala310Gln, Ala310Gly, Ala312Thr). Relative to wild-type, Ala312Thr exhibited increased activity with amylopectin and increased substrate-affinity for amylose and amylopectin, whereas the other mutants exhibited decreased activity with amylose and amylopectin, and Gln205His and Ala310Gln exhibited increased substrate-affinity for amylopectin. An attempt to study DrGBE activity with amylose and amylopectin within starch was unsuccessful, because changes in amylopectin masked changes in amylose. Unsuccessful attempts were made to improve activities of chimeric enzymes previously made with *Zea mays* and *Thermus thermophilus* branching enzyme domains by modifying protein expression/purification/refolding.

Curriculum Vitae: Jessica completed her Bachelor of Science (Hons.) in Biochemistry and Biotechnology at the Carleton University in April 2015. She began her M.Sc. in the lab of Dr. Ian Tetlow in September of the same year.

Awards: University of Guelph, Graduate Tuition Scholarship 2015 – 2016. Carleton University, Gordon Robertson Scholarship 2014 and Dean's Honour list 2013 – 2014.