Vita

Candidate's name: ZiYu Kuang

Universities Attended: University of Ottawa (2017)

University of New Brunswick (2021)
Bachelors of Science

University of New Brunswick (2024)
Masters of Science

Publications / Posters:

Freire I.R., Bensig E.O., Kuang Z.Y., and MacLellan S.R. (2024). Analysis of CenKR essentiality in *Sinorhizobium meliloti* and its activity at a target gene promoter *in vivo*. *FEMS Microbiol Lett.* 371: fnae061

Bensig E.O., Valadez-Cano C., Kuang Z.Y., Freire I.R., Reyes-Prieto A., and MacLellan S.R. (2022). The two-component regulatory system CenK-CenR regulates expression of a previously uncharacterized protein required for salinity and oxidative stress tolerance in *Sinorhizobium meliloti*. *Front Microbiol.* 13: 1020932.

Kuang Z.Y., Freire I., Bensig E.O., and MacLellan S.R. (2023). Investigating the molecular basis for autorepression of a gene promoter in *Sinorhizobium meliloti*. Poster presentation at the 72nd Annual Conference of the *Canadian Society of Microbiologists*. Halifax, NS.

Kuang Z.Y., Freire I., Bensig E.O., and MacLellan S.R. (2023). Characterization of autorepression mechanism of the *srlA* promoter in *Sinorhizobium meliloti*. Poster presentation at the 2nd Annual *Conference of the Biological Sciences*. Fredericton, NB.

Investigating the Molecular Basis for Autorepression of a Gene Promoter From the α-Proteobacterium *Sinorhizobium meliloti*

UNIVERSITY OF NEW BRUNSWICK

THESIS DEFENCE AND EXAMINATION

in Partial Fulfillment

of the Requirement for the Degree of
Master of Science

by

ZiYu Kuang

in the Department of Biology

U.N.B., Fredericton, N.B.

Thursday, August 29th, 2024
10:00 a.m.

Via MS TEAMs

Examining Committee

Dr. Shawn MacLellan	Supervisor
Dr. Mike Duffy	Internal Examiner
Dr. Allison Enright	External Examiner
Dr. Adrian Reyes-Prieto	Chair of Oral Examination

Abstract

Autorepression is an intrinsic pathway of autoregulation developed to maintain homeostasis in biological systems. The *srlA* gene encodes a predicted thioredoxin-like protein and deletion of *srlA* results in increased sensitivity to salt and oxidizing agents in the nitrogen-fixing facultative endosymbiont, *Sinorhizobium meliloti*. The *srlA* promoter is autorepressed by an unknown mechanism. In my thesis, I investigate the mechanism of the autorepression phenotype. Chapter 1 is a literature review and provides an overview of the *srlA* promoter and gene, the autorepression phenotype observed, as well as possible autorepression mechanisms. Chapter 2 documents a bioinformatic analysis of SrlA protein structure and possible subcellular location, and an experimental analysis of whether the thioredoxin-like C-X-X-C motif of SrlA is required for the autorepression phenotype. Chapter 3 details the use of transposon mutagenesis and a promoter activation screen to investigate the possibility that other *S. meliloti* genes play a role in the autorepression of *srlA*. Chapter 4 investigates whether gene *srlA* is required for effective nodulation and growth stimulation of the *S. meliloti* plant host, alfalfa (*Medicago sativa*). Finally, Chapter 5 includes a summary of the thesis and concluding statements.