

# Cross-Kingdom Approaches for Studying Bacterial Pathogenesis

## PROJECT DESCRIPTION

"Salmonella enterica is a significant microbial contributor to food-borne illness causing over 1 million infections per year in the United States. *S. enterica* encodes Type 3 secretion systems (T3SS) that are essential for pathogenesis and transport bacterial effector proteins into host cells. These effector proteins interface with, and subvert host processes to favour the pathogen. The highly conserved "novel E3 ubiquitin ligase" (NEL) effector proteins (SspH1, SspH2, SlrP) have been reported to subvert host immunity. Interestingly, some NEL effectors have been shown to elicit E3 ligase-dependent, functional phenotypes in "host" organisms from different kingdoms.

The cross-kingdom nature of this research project translates to a broad range of experimental avenues for investigation. Experiments in human cultured cells will focus on host protein interactions between SspH2 and host innate immune components. A candidate list of potential interactors will be investigated and alterations in immune signaling will be characterized as a consequence of potential interaction with SspH2. Experiments in plants will characterize innate immune responses induced by catalytically-activated SspH2; as well as characterizing the physiological consequence of long-term expression of SspH2 in planta. Experiments in yeast will focus on an in vivo screen that has been developed as a powerful selection for small molecule inhibitors of NELs. Chemical and genetic suppressors of the NEL-induced lethality phenotype will be pursued.

NEL inhibitors would be valuable probes for studying bacterial pathogenesis, and as potential anti-infectives, as these enzymes are proposed to primarily subvert immunity and have been identified in other globally important infectious bacteria including *Yersinia*, *Escherichia*, *Pseudomonas* and *Shigella*."

## FACULTY-DEPARTMENT

Medicine & Dentistry- Medical Microbiology and Immunology

## DESIRED FIELD OF (STUDENT) STUDY

The student should have a background in biological sciences and be familiar with microbiology, molecular biology and biochemical concepts. Experience with tissue culture, yeast, and/or plant molecular methods would be an asset. The student must be an effective communicator and well-organized. The student should be comfortable with, and have the ability to, work largely independently after initial training. A high degree of critical thinking skills is expected.

## INTERNSHIP LOCATION

University of Alberta Main Campus - Edmonton

Contact: Brendan Cavanagh, Internship Coordinator (Inbound)  
University of Alberta International  
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NUMBER OF INTERNSHIP POSITIONS

1

INTERNSHIP START DATE

July 4

INTERNSHIP END DATE

October 4

ARE THE DATES FLEXIBLE?

Yes, I am flexible regarding the internship dates. Selected students can contact me to request a date change.