

University of Alabama in Huntsville

LOUIS

RCEU Project Proposals

Faculty Scholarship

1-1-2019

Regulation of Plasmid Conjugation in Uropathogenic *Escherichia coli*

Tanya Sysoeva
University of Alabama in Huntsville

Follow this and additional works at: <https://louis.uah.edu/rceu-proposals>

Recommended Citation

Sysoeva, Tanya, "Regulation of Plasmid Conjugation in Uropathogenic *Escherichia coli*" (2019). *RCEU Project Proposals*. 131.
<https://louis.uah.edu/rceu-proposals/131>

This Proposal is brought to you for free and open access by the Faculty Scholarship at LOUIS. It has been accepted for inclusion in RCEU Project Proposals by an authorized administrator of LOUIS.

Project Title - Regulation of plasmid conjugation in uropathogenic *Escherichia coli*

Faculty - Tatyana (Tanya) Sysoeva, Assistant Professor, Department of Biological Sciences, Shelby Center room 369M, University of Alabama in Huntsville, 256-824-6371, tatyana.sysoeva@uah.edu.

Project Identifier - RCEU19-BYS-TS-02

Project Description - The rapid and global spread of drug resistance genes amongst bacteria is largely attributed to horizontal gene transfer through conjugative transfer of resistance plasmids. Increasing prevalence of multidrug resistant *Enterobacteriaceae* such as uropathogenic *Escherichia coli* (MDR UPEC) makes even uncomplicated lower urinary tract infections harder to treat. Human microbiome analyses made significant advances in characterizing several microbial niches with which UPEC interacts during the course of the infection, including intestinal, skin, vaginal, and lower urinary tract communities. Some of these microbiomes were already shown to serve as hot spots for gene exchange suggesting that UPEC strains will be able to acquire and donate resistance genes by interacting with the commensal microorganisms.

While a breadth of sequencing data for UPEC is available, the plasmid presence and qualities are often not considered or are impossible to analyze with the used sequencing technology. Moreover, the sequencing analyses are rarely being connected with qualitative functional conjugation studies and almost never with quantitative assessment of the plasmid conjugation and its regulation.

To assess the contribution of the MDR UPEC strains in spreading of antibiotic resistance genes, we will analyze plasmid composition of the contemporary *E. coli* pathogenic strains and measure their ability to donate their resistance plasmid(s) through conjugation. We will also investigate whether the pathogenic background plays a significant role in conjugative transfer of resistance plasmids.

Student Duties, Contributions, and Outcomes - This project will require full time presence in the lab for 32-40 hours per week, for 10-12 weeks. During this time the student

will learn basic microbiological and molecular biology procedures. In particular, this project will entail preparing solutions and plates; working with model and clinical strains of *Escherichia coli*; conjugation assays; DNA manipulation protocols (PCR, qPCR, agarose gel electrophoresis, total and plasmid DNA extraction, molecular cloning). Based on the student's preferences, s/he can choose to learn basic and advanced bioinformatic analyses, that can include genome mapping, assembly, and annotation components. The student will learn how to document the experimental work and keep laboratory notebook with the detailed description of the performed experiments. At the end, the student researcher will write a report with suggestions for future development of the project and analyses of obtained results that can be used in a future publication; this will be presented at a lab meeting to share the results and experiences with the whole group.

Faculty Requirements and Mentorship - The student (from freshman to senior) should have completed some courses in Molecular Biology, Biochemistry or Microbiology at UAH or as an AP course. While a good academic standing is not a requirement, the applicant has to have a sincere interest in the topic of microbiology in general or antibiotic resistance.

Dr. Sysoeva will provide one-on-one meetings to introduce to the project, supervise literature review, discussions and analyses of the experimental results. In addition, weekly group meetings will be held to share the results and solve any ongoing issues. She will ensure close daily supervision and training in the laboratory setting for the hands-on work at the bench. Dr. Sysoeva will guide the student researcher in writing up the report of the obtained results and preparing for the final presentation.

Prior Awardees - Dr. Sysoeva is new to the University and the RCEU program.