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## **Analysis of Lactobacillus spp Isolates from Human Urinary Bladder**

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# RCEU 2022 Project Proposal

## Project Title

Analysis of *Lactobacilli spp* isolates from human urinary bladder

## Faculty Information

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# RCEU 2022 Project Proposal

## I. Project Description

Lactobacilli are known commensals in the human urogenital tract and important for prevention of urinary tract infections (UTIs). Lactobacilli have innate defense factors that enable them to outcompete other bacteria, including uropathogenic *E. coli* through production of toxic components: bacteriocins, peroxide, surfactants, lactic acid. In an earlier project we isolated a set of 29 commensal lactobacillus species from the human urinary bladder and performed whole genome sequencing on 3 of those isolates. Preliminary analysis of the sequenced lactobacilli genomes shows presence of several bacteriocin genes. Urinary lactobacilli inhibit growth of model uropathogens *in vitro* in artificial media. It is unknown whether lactobacilli can survive in urine, what carbon sources they use, and how they adhere to bladder surfaces, while in the urinary microbiome. Therefore, the goal of this project is to analyze growth requirements and regulation of the collection of urinary lactobacilli. We also plan to sequence representative lactobacilli isolates, proceed with the bioinformatic analyses and attempt to do genetic modifications of the strains. Overall, we will use a combination of bioinformatic analyses, sequencing, and microbiological techniques such as anaerobic growth, well diffusion assay, CFU counting, and others.

## II. Student Duties, Contributions, and Outcomes

### a. *Specific Student Duties*

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 procedures and several functional assays. In particular, this project will entail preparing solutions and plates; working with anaerobic bacteria. The student will keep detailed laboratory notebook. At the end, the student researcher will be required to write a report with suggestions for future development of the project and analyses of the obtained results that can be used in a future publication. This report will be presented at a lab meeting to share the results and experiences with the whole group.

### b. *Tangible Contributions by the Student to the Project* (10% of Review)

The preliminary data obtained by the student will be summarize in poster and report. This will serve as basis for follow-up experiments on this topic. Sequencing data will be deposited to public databases and will be used in later peer-reviewed publications.

### c. *Specific Outcomes Provided by the Project to the Student* (30% of Review)

In addition to gaining practical experience in microbiological work and research, the student will read the peer-reviewed scientific articles that is required for understanding and developing of the project at hand. The student will also learn how to document the experimental work and keep

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laboratory notebook with the detailed description of the performed experiments. The student will be encouraged to prepare a poster for consecutive presentation at a scientific conference.

### **III. Student Selection Criteria**

The student (from freshman to junior) should have completed some basic biology courses 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 understanding the implication of microbiome on human health in particular.

### **IV. Project Mentorship**

*(30% of Review)*

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, including safety training and microbiological work. Dr. Sysoeva will guide the student researcher in writing up the report of the obtained results and preparing for the final presentation.

In addition, two MS students and an experienced undergraduate researcher working on related projects will be conducting their research in the laboratory and assist with microbiological work, such as media preparation, autoclaving, inoculations.