



# CAIRIBU UROBIOME RESEARCH INTEREST GROUP (U-RIG)

## CAIRIBU U-RIG RESEARCH HOURS

### EXECUTIVE SUMMARY 3/01/2024 U-RIG RESEARCH HOUR

**Goal:** Facilitate knowledge exchange and spur collaborations in the urobiome and adjacent fields

#### DR. SYSOEVA

*Urinary Tract Infections and Antimicrobial Resistance*

- Discussed the motivation behind researching microbiome interactions in the niche of the urinary microbiome.
- Highlighted the significance of UTIs, including high prevalence, drug resistance, and hospital-acquired infections.
- Cited millions of deaths annually due to antimicrobial resistance by 2050 per Lancet study.
- Highlighted the importance of addressing antimicrobial resistance through awareness and education.

#### Urinary tract microbiome in children and adults

- Studying the urinary microbiome in children reveals how it develops and affects recurrent UTIs.
- Urinary microbiome differences between boys and girls are observed, with higher diversity in girls and age-related changes in both sexes.

#### The role of Lactobacillus in urinary tract infections


- Study found association between urinary microbiome and recurrent UTIs in postmenopausal women.
- Discussed the benefits of lactobacilli, including their ability to acidify the environment and inhibit the growth of other microbes, while also considering their potential as colonization-resistant bacteria in the urinary tract.
- Presented research investigating the genotype and phenotype of these bacteria, as well as their interactions with other urinary commensal inhabitants, in order to better understand their role in protecting against pathogens.

#### Testing interactions between uropathogens and bacteria in bladders

- Bacterial growth inhibition was observed in experiments using well diffusion assays to study clinical isolates from patients.


#### The inhibitory effects of lactobacillus on urinary tract pathogens

- Most strains of lactobacillus inhibited multiple pathogens, including both gram-negative and gram-positive bacteria.
- Expanding the screen to all 19 species of lactobacillus showed variable inhibition strengths, with no significant correlations between cohorts.
- Discussed the potential of lactobacillus to inhibit the growth of uropathogens in the urinary microbiome, highlighting the complexity of the human microbiome and the need for further research to modulate it.
- The study suggested that the lactobacilli in the urinary microbiome can resist the growth of uropathogens, providing hope for the development of therapies to modulate the microbiome and potentially treat infections.





### CAIRIBU U-RIG RESEARCH HOUR

BRIDGING KNOWLEDGE GAPS IN THE UROBIOME

**TANYA SYSOEVA, PHD**


Assistant Professor of Microbiology at the University of Alabama in Huntsville's College of Science





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**FRIDAY, MARCH 1**  
**3:00 PM ET**  
2 PM CENTRAL | 12 PM PACIFIC



## Inhibition mechanisms

- Discussed student's work conducting an inter-bacterial screen to assess inhibition, finding that some species are more sensitive to oxygen and have minimal but measurable effect on the inhibition of other species.
- Discussed the unique inhibition mechanism of a particular strain of bacteria, which is cell-dependent and requires interaction with two microbes.
- Preliminary analysis of swabs from four species showed a variety of plasmids in the strains, which could be used for better transformation and toxin identification.

## Bacteriophage and probiotics in urinary tract infections

- Study found that bacteriophages in bladder microbiome may play role in UTIs.
- Discussed the challenges of creating a good probiotic, including the need for a specific strain to survive in a particular niche and deliver to that niche.

## Growing and studying bacteria in microbiology research

- Discussed the challenges of growing certain bacteria, including *Lacobacillus crispatus*, in the lab.
- Funding is a continued challenge
- Collaboration with other researchers is necessary to exchange materials and expertise; growing microorganisms is tricky.
- Addressed challenges in studying bacterial strains and pros and cons of creating standards and continuity amongst researchers.

**\*\*BELOW are recent publications from Dr. Sysoeva\*\***

### **Recent publications Dr. Sysoeva:**

1. Castro CL, Velez-Justiniano, YA, Stahl-Rommel S, Nguyen HN, Almengor A, Dunbar B, McLean RJ, Sysoeva TA, Castro-Wallace SL. Genome sequences of bacteria isolated from the international space station water systems. *Microbiol Resour Announc* 2023;12(7):e00158-23; doi: 10.1128/mra.00158-23.
2. Justiniano YV, Goeres DM, Sandvik EL, Kjellerup BV, Sysoeva TA, Harris JS, Warnat S, McGlennen M, Foreman CM, Yang J, Li W, Cassilly CD, Lott K, HerrNeckar LE. Mitigation and use of biofilms in space for the benefit of human space exploration. *Biofilm* 2023;5:100-102; doi: 10.1016/j.biofilm.2022.100102.
3. London LY, Lim CH, Modliszewski JL, Siddiqui NY, Sysoeva TA. Draft genomes of *Lactobacillus delbrueckii* and *Klebsiella pneumoniae* coexisting within a female urinary bladder. *Microbiol Resour Announc* 2023;12(10):e00305-23; doi: 10.1128/MRA.00305-23.
4. Johnson JA, Delaney LF, Ojha V, Rudraraju M, Hintze KR, Siddiqui NY, Sysoeva TA. Commensal urinary lactobacilli inhibit major uropathogens in vitro with heterogeneity at species and strain level. *Front Cell Infect Microbiol* 2022;12:870603; doi: 10.3389/fcimb.2022.870603.