

## PhenoScreen: Development of a Systems Biology Tool for Decision Making in Recurrent Urinary Tract Infections

**Authors :** Jonathan Josephs-Spaulling, Hannah Rettig, Simon Graspenter, Jan Rupp, Christoph Kaleta

**Abstract :** Background: Recurrent urinary tract infections (rUTIs) are a global cause of emergency room visits and represent a significant burden for public health systems. Therefore, metatranscriptomic approaches to investigate metabolic exchange and crosstalk between uropathogenic *Escherichia coli* (UPEC), which is responsible for 90% of UTIs, and collaborating pathogens of the urogenital microbiome is necessary to better understand the pathogenetic processes underlying rUTIs. Objectives: This study aims to determine the level in which uropathogens optimize the host urinary metabolic environment to succeed during invasion. By developing patient-specific metabolic models of infection, these observations can be taken advantage of for the precision treatment of human disease. Methods: To date, we have set up an rUTI patient cohort and observed various urine-associated pathogens. From this cohort, we developed patient-specific metabolic models to predict bladder microbiome metabolism during rUTIs. This was done by creating an in silico metabolomic urine environment, which is representative of human urine. Metabolic models of uptake and cross-feeding of rUTI pathogens were created from genomes in relation to the artificial urine environment. Finally, microbial interactions were constrained by metatranscriptomics to indicate patient-specific metabolic requirements of pathogenic communities. Results: Metabolite uptake and cross-feeding are essential for strain growth; therefore, we plan to design patient-specific treatments by adjusting urinary metabolites through nutritional regimens to counteract uropathogens by depleting essential growth metabolites. These methods will provide mechanistic insights into the metabolic components of rUTI pathogenesis to provide an evidence-based tool for infection treatment.

**Keywords :** recurrent urinary tract infections, human microbiome, uropathogenic *Escherichia coli*, UPEC, microbial ecology

**Conference Title :** ICCID 2020 : International Conference on Clinical Infectious Diseases

**Conference Location :** Dubrovnik, Croatia

**Conference Dates :** October 01-02, 2020