

## ABSTRACT:

### *Microbiota in tissue engineering and targeted delivery of microbial metabolites*

Trillions of microbes reside in the gastrointestinal tract (gut microbiota), playing a crucial role in human health and influencing the risk of various diseases, including obesity, cardiovascular diseases, diabetes, colorectal cancer, inflammatory bowel disease (IBD), and depression. These microbes generate a diverse array of metabolites from dietary components, which significantly impact host health and physiological functions. In this seminar, I will explore the impact of gut microbiota and their metabolites on tissue engineering and the potential benefits of inflammation-targeted delivery of microbial metabolites for mitigating IBD. I will also discuss potential mechanisms of metabolites in regulating unwarranted inflammation during chronic inflammatory disorders.

Current IBD treatments primarily rely on systemic administration of anti-inflammatory drugs or biologics, such as anti-TNF- $\alpha$  antibodies. However, these therapies often suffer from limited efficacy due to patient unresponsiveness and adverse side effects. To address these challenges, we have developed inflammation-targeting nanoparticles (ITNPs) using biopolymers derived from the gum kondagogu (*Cochlospermum gossypium*) plant. These ITNPs enable selective drug delivery to inflamed regions, enhancing therapeutic outcomes. Oral administration of ITNPs loaded with urolithin A (UroA), a microbial metabolite, or its synthetic analogue UAS03, significantly reduces colitis induced by chemicals and immune checkpoint inhibitors in preclinical models. In conclusion, ITNPs represent a promising strategy for delivering UroA or its analogues, improving therapeutic efficacy at lower doses and reduced dosing frequency compared to free drug administration. This targeted approach offers a potential breakthrough in IBD treatment while minimizing systemic side effects.

## BIOGRAPHY:

Dr. Venkatakrisna R. Jala, Ph.D., is an Associate Professor in the Department of Microbiology and Immunology at the University of Louisville, as well as a member of the UofL-Brown Cancer Center and the Center for Microbiomics, Inflammation, and Pathogenicity in Louisville, KY, USA. He earned his Ph.D. in 2002 from the Indian Institute of Science, Bangalore, India.

Dr. Jala's research focuses on the regulation of inflammation, gut microbiota, and microbial metabolites, particularly their roles in maintaining gut barrier function. His laboratory investigates how microbial metabolites influence gut barrier integrity and contribute to the development of diseases such as colon cancer, inflammatory bowel disease (IBD), and alcoholic liver disease (ALD). Dr. Jala's group also focuses on inflammation-targeted delivery of microbial metabolites using nanoparticles to target IBD. His ongoing research is supported by funding from the NIH, JHFEREG, and Artus Therapeutics

DEPARTMENT OF BIOMEDICAL ENGINEERING

## 2025 SPRING SEMINAR SERIES

### Dr. Venkatakrisna R. Jala, Ph.D.

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Department of Microbiology and Immunology,  
UofL-Brown Cancer Center; Member, Immuno-  
Oncology Program  
University of Louisville**

THURSDAY March 6, 2025

11am-12pm

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