

**DEPARTMENT OF CHEMISTRY AND ENVIRONMENTAL SCIENCE**  
**SEMINAR SERIES**  
**FALL 2019**

**DATE:** WEDNESDAY, SEPTEMBER 25, 2019

**LOCATION:** TIERNAN HALL LECTURE 1

**TIME:** 1:00-2:20PM

**GUEST SPEAKER**

Liping Zhao

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**TOPIC**

Foundation species and essential guilds:

Ecological Understanding of the Causative Role of Gut Microbiota in Human Health

**ABSTRACT**

Gut microbiota is a complex ecosystem. Many functions that are required for keeping us healthy are not encoded in our own genome but may have been “out-sourced” during evolution to the gut microbiota, e.g. producing butyrate as energy substrates for colonocytes and hydrogen as anti-oxidants for protecting human cells against oxidative stress. It remains elusive what kind of structural features a healthy gut microbiota should have. In macro-ecosystems, members are not equally important. “Foundation species” such as tall trees in rain forests are crucial to establish and maintain the entire ecosystem. Members are also not independent from each other, they form functional groups-“guilds” to adapt environmental changes. Data from our clinical trials on dietary modulation of gut microbiota in obese and type 2 diabetic participants suggest that gut bacteria that provide essential functions to human may survive, adapt and decline together as co-abundance groups, i.e. the “guilds”, in an ecosystem. Some guild(s) may function as the foundation of a healthy gut microbiota by rendering the gut environment such that it supports the growth of functionally essential bacteria and suppresses those that are potentially pathogenic and detrimental. Loss of these foundation species would inevitably lead to a sub-optimal gut ecosystem, which opens niches for pathogenic bacteria to overgrow and causatively contribute to diseases. The goal of human microbiome research should be to help each individual to identify their own “foundation species” and “essential guilds” to maintain a healthy gut microbiota throughout the lifespan.

**BIO**

Liping Zhao is currently the Eveleigh-Fenton Chair of Applied Microbiology at Rutgers University. He is a senior editor of the ISME Journal and associate editor of the journal Microbiome. He is a fellow of American Academy of Microbiology. He is a senior fellow of Canadian Institute for Advanced Research (CIFAR). He serves on Scientific Advisory Board for the Center for Microbiome Research and Education of American Gastroenterology Association (AGA).

His team has pioneered the approach of applying metagenomics-metabolomics integrated tools and dietary intervention for systems understanding and predictive manipulation of gut microbiota

to improve human metabolic health. Following the logic of Koch's postulates, Liping has found that endotoxin-producing opportunistic pathogens isolated from obese human gut can induce obesity in germfree mice. Their clinical trials showed that dietary modulation of gut microbiota can significantly alleviate metabolic diseases including a genetic form of obesity in children and type 2 diabetes. He has published more than 70 papers in Science, PNAS, Nature Communications, ISMEJ and Nature Reviews Microbiology etc. The SCIENCE magazine featured a story on how he combines traditional Chinese medicine and gut microbiota study to understand and fight obesity (Science 336: 1248).

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