

## Sustainable and safe production of food ingredients through metabolic engineering

by **Dr. Yong-Su Jin**

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**Host:** Dr. Yang Hongshun  
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### Abstract

In order to accommodate rapidly increasing population and ensure high quality of living, the sustainable, economic, and safe production of food is an important yet challenging task for food scientists. While biotechnology has been considered radical or unsafe for food applications, rapid advances in molecular biology and its subsequent technologies, such as systems and synthetic biology, have enabled sustainable and safe production of food ingredients by engineered microorganisms.

Using microbial host strains which are Generally Recognised As Safe (GRAS) and precise genetic perturbation tools, microbially derived ingredients can be used in food. To this end, we have demonstrated production of various food ingredients using engineered microorganisms and developed efficient genetic engineering tools for GRAS host strains. Specifically, we have constructed various engineered microorganisms capable of overproducing sugar alcohol (xylitol), human milk oligosaccharide (2-fucosyllactose), isoprenoid (squalene), and carotenoid (lycopene), respectively. Also, we developed genetic tools for engineering polyploidy yeast strains which can be exploited for the production of wine, bread, and beer with designed properties.

In addition to sustainable and safe production of food ingredients, these engineered microorganisms can be employed for (1) discovering novel food functional molecules, (2) understanding relationships of structure and function in a food functional molecule, and (3) designing structural changes of a target food functional molecule. With these impressive advances, we envision that more and more applications of genetically modified microorganisms for the production of food ingredients will be observed in the near future.

### About the speaker



Yong-Su Jin is an Associate Professor in the Department of Food Science and Human Nutrition and a faculty member of the Institute for Genomic Biology (IGB), University of Illinois at Urbana-Champaign.

Dr. Jin received B.S. and M. Sc. degrees in Food Science and Technology from Seoul National University and Ph. D. degree (2002, advisor: Prof. Thomas Jeffries) in Food Science and Bacteriology (minor) from the University of Wisconsin-Madison. He did a post-doctoral training at MIT and served as an Assistant Professor at the Sungkyunkwan University in Korea before he joined UIUC. Dr. Jin's research is centred on metabolic engineering of microorganisms to produce biofuels and chemicals from renewable biomass. In addition, his group performs food safety related research: rapid methods for food pathogen detection, elucidation of bactericidal mechanisms by antimicrobial compounds, and investigation of cellular toxicity caused by nanomaterials. Dr. Jin received the ACES College Faculty Awards for Excellence in Research.

