Maya Fitriyanti graduated from Institut Teknologi Bandung, Indonesia with a background in Microbiology. She was awarded a Fulbright Fellowship to pursue a Ph.D degree at Purdue University in Fall 2015. She joined Prof. Narsimhan's research group focusing on the synergistic effect of ultrasonication and antimicrobial action of antimicrobial peptide for bacterial cell inactivation. She has served as a committee for the 4th Purdue ABE Graduate Industrial Research Symposium. She is also a member of the Purdue Graduate School Global Ambassadors. She has been an active member of Purdue Fulbright Student Association that provide an educational and culturally integrating network between the international Fulbright Scholars at Purdue. During her time at Purdue, she enjoys working with different groups of students on community service projects organized by the Purdue Boiler Out Organization. Upon graduation, Maya is interested to work in research and development area related to health and food preservation.

Agricultural & Biological ENGINEERING

Dissertation Defense

Speaker: **Maya Fitriyanti**

Title: **Synergistic Effect of Ultrasonication on Antimicrobial Action of Cecropin P1 against Escherichia coli.**

Major Professor(s): **Ganesan Narsimhan**

Date: **Friday, June 14, 2019**

Time: **09.30 AM**

Location: **NLSN 2187 (Morgan Room)**

Abstract:

Ultrasound is simply defined as sound wave that generally has a frequency of 20 kHz or more, beyond human hearing range. Cavitation due to ultrasound has been studied in the food industry to develop various effective processing such as extraction of intracellular material and food preservation. Ultrasound assisted technology has the advantage of inactivating pathogens with no adverse effect on food quality compared to conventional heat treatment. On the other hand, with emerging case of antibiotic resistance, antimicrobial peptide has become one of the most promising alternatives to antibiotics for targeting pathogens. In this study we investigate the synergistic effect of low frequency (14, 22, and 47 kHz) ultrasonication with antimicrobial peptide of Cecropin P1 against Escherichia coli . The hypothesis was tested by comparing three different treatments: (1) ultrasound only using a conventional and non-conventional type, (2) Cecropin P1 only, and (3) combination of both. The results showed that the combined treatment deactivate E.coli more efficiently by six order of magnitude for the same treatment time. The mechanism of membrane cell permeabilization due to Cecropin P1 is also investigated, indicating a pore formation and carpet mechanism at different concentration of the peptide. Finally, a mathematical modelling is proposed to explain the phenomena, allowing us to make better prediction for cell deactivation.

Application:

This thesis investigates and develops methods to deactivate microorganism using combinations of ultrasonication and antimicrobial peptide with different configurations. The results offer a more efficient alternative to preserve food quality and safety. This work hopefully sheds new light on the field of food sterilization and processing.