Gabriella Mendes Candido de Oliveira was born in Minas Gerais (Brazil) to parents whose farm roots reflect her passion for food and agriculture. She obtained her B.S. in Food Engineering from the University of São Paulo (USP). After working as a trainee in quality assurance at Anheuser-Busch InBev (AMBEV, Brazil) her passion for food safety really increased. This experience made her more curious about biological hazards, the importance of the preventive, and process controls. This curiosity instilled her desire to pursue a Ph.D. degree in Biological and Food Process Engineering. At Purdue, Gabriella is the recipient of the 2019 Outstanding Ph.D. Student Award, a consequence of Gabriella's commitment to her academic performance. She contributed to the ABE department as the recruitment chair (ABE-GSA 2016/17), and by serving in several other roles. After the conclusion of her Ph.D., she will move to Washington, D.C. area as she has accepted a postdoctoral position with the USDA-ARS.

Agricultural & Biological ENGINEERING

Dissertation Defense

Speaker: Gabriella Mendes Candido de Oliveira

Title: Modeling Microbial Inactivation Subjected to Nonisothermal and Non-Thermal Food Processing Technologies

Major Professor(s): Dr. Osvaldo Campanella

Date: Friday, July 26, 2019

Time: 10:00 AM

Location: PFEN 120

Abstract:

Modeling microbial inactivation has a great influence on the optimization, control, and design of food processes. Current models use simple approaches that do not capture the realistic behavior of microbial inactivation. This oversimplification brings several problems such as either excessive or insufficient processing of foods. The *objective of this dissertation* was to develop a flexible modeling approach capable of incorporating process variables into the calculation of microbial inactivation in nonisothermal and non-thermal food processes. Modeling approaches were developed for Microwave heating, and for emerging non-thermal processes such as Cold Plasma and Pulsed Electric Fields (PEF). By developing the models, the result was a non-linear ordinary differential equation describing the inactivation kinetics of targeted microorganisms reached in the different processes. The hypothesis was that the momentary inactivation rate depends on the instantaneous processing conditions. Thus, the complete inactivation between initial and final conditions is estimated by integrating that momentary rate over time and by considering the time dependent variation of the inactivation agent (e.g. temperature, reactive ions or electrical fields in the microwave, cold plasma and PEF, respectively). The differential equation was solved numerically using the Runge-Kutta method (*ode45* in MATLAB ®) whereas the *lsqcurvefit* function was used to estimate the kinetic parameters. The modeling approach prediction capability was experimentally validated using other samples and treatment conditions, and also with data published in the literature.

Application:

This research has a key impact on the food industry as it is expected to assist the development and validation process to achieve the level of microbial reduction required by the U.S. FDA regulation.