**Food Safety Track**

**Mini-Challenge: How to ensure the pre-packaged micro-green salad’s food safety**

**Background:**

One in six Americans (appx. 48 million) are affected by foodborne illness with a resulting economic burden estimate of $51.0 to $77.7 billion. Foodborne pathogens were found in various foods including fresh produce and ready-to-eat products. It is important to detect foodborne pathogens to provide safe food supply and to prevent foodborne illness. Shiga toxin producing *Escherichia coli* (STEC), one of the foodborne pathogens, poses a serious public health risk. In a recent CDC report, 16% of the foodborne outbreaks were associated with STEC, which exceed other common foodborne pathogens, like *Listeria* and *Salmonella*. In 2018, the Romaine Lettuce outbreak associated with *Escherichia coli* O157:H7, made 210 people sick with 96 hospitalizations and 5 death.

**Lesson 1: Hazards to food safety**

This lesson will provide teachers background information to teach students foodborne illness caused by bacteria, viruses, parasites, and chemicals.

**Lesson 2: Factors that affect foodborne illness**

This lesson will provide materials for teachers to teach factors that contribute to foodborne illness, including time and temperature control, sanitation, and personal hygiene.

**Lesson 3: The Hazard Analysis Critical Control Point System (HACCP)**

This lesson will cover the seven steps in a HACCP system. A sample company producing pre-packaged micro-green salad will be introduced. The teachers will learn how to facilitate student-driven independent research on developing a HACCP plan for that sample company.

**Lesson 4: Food safety enhancing technologies**

This lesson will introduce some food safety enhancing technologies, including irradiation, UV treatment, high pressure process. Pathogen rapid detection methods will also be covered in this lesson.

**Lesson 5: Data science in food safety**

This lesson will highlight the effort scientists, engineers, and regulators have made to use big data to help solve food safety issues. A case study of the use of Yelp data to identify foodborne outbreak will be discussed at the module.

**Objective:**

* Improve students’ knowledge of food processing and food safety enhancing systems by “career-ready” programs.
* Effective food safety education for students will allow more students to be reached with food safety and Agriculture-STEM career education crucial for student, and ultimately public, health and well-being.

**Rationale:**

Foodborne illnesses in the United States contribute to human suffering, loss of productivity, and economic burden. The CDC estimates that one in six Americans suffers from foodborne illness annually. Foodborne illnesses can be reduced by better risk-control production and handling from farm to fork. The application of digital agriculture is an opportunity to connect the food system and enhance food safety. Previous research showed that youth lacked knowledge of food and agriculture science and motivation to pursue a career in the agricultural industry. Educational intervention is needed to improve youth knowledge of food system and food safety.

**Activities:**

Students will directly use or discuss examples of food safety enhancing system in each lesson. (1) Students will learn to use an ATP monitoring system with corresponding software to track the differences between different cleaning methods. Students will be able to produce graphical data from ATP swabbing to justify their choice of cleaning methods. (2) Temperature monitoring systems will be used to teach students how surface area to volume ratios in foods relates to cook and chill times. (3) Students will learn about cross-contact using milk chocolate and allergen swabs in conjunction with the aforementioned monitoring system and software. (4) Food packaging like Barilla pasta with QR codes that allow consumers to track the product from farm to store will be analyzed by students to understand food safety through the supply chain. Concepts including sourcing ingredients from reputable suppliers and use of processing methods to improve food safety will be discussed. (5) Students will be introduced to different electronic tracking systems that can be used to maintain food safety documentation, like documentation of CCP checks and ingredient specifications.

**Approach:**

**For Teacher:**

High school teachers will be recruited to participate in a #-day in-person training course. The training will include modeling how to teach the activities, use the aforementioned sensors, and provide examples of how each sensor can be used in various agriculture career settings to improve food safety and quality. Reference materials will be provided to the teachers for the concepts covered and for troubleshooting and general use of the sensors. Upon training completion, teachers will be able to provide “career ready” education to students that includes theoretical and applied food science, microbiology, and food safety concepts used in agriculture industries, use of sensors to collect data, and analysis of sensor data to make decisions in real-life scenarios like industry professionals.

**For Students:**

Trained teachers will deliver the curriculum content as well as facilitate activities. The effectiveness of the curriculum will be measured using a pre- and post- survey. Knowledge and self-efficacy change, aptitude for analyzing data, and interest in Agriculture-based careers will be assessed. To test student aptitude for analyzing data commonly found in food safety systems, the survey will ask students to interpret data seen in various food processing industries and determine which actions should be taken based on the presented data.

**Expected outcomes:**

1. Increase students’ knowledge of food system and food safety
2. Develop and evaluate the effectiveness of the food safety education for high school students
3. Provide teachers with the knowledge and resources needed to teach current and future students food safety.

**Qualification:**

Co-I Feng, an Assistant Professor and Food Safety Extension Specialist at Purdue University, is dedicated to the research and extension of behavioral change model of consumers and risk assessment on food safety. Feng is the Project Director (PD) on an Indiana specialty crop block grant and a food safety outreach project targeting veteran farmers food safety education which is funded by the USDA NIFA, as well as a Co-PD on a Local Food Promotion Program to develop education programs for local farmers to scale up and value adding. She had multiple publications on food safety education for youth. Integrating experiential learning, PhotoVoice, and other novel educational interventions, food safety and food science curriculum developed by her group was adopted by multiple high schools.