



Superheated steam can nix pathogens in dry food processing

By Blaine Friedlander February 3, 2022

A new tool to thwart deadly pathogens in commercial dry food processing plants may soon pick up steam – superheated, dry steam – to keep consumers safe.

In the arid world of processing flour and powders, where hosing down equipment to sanitize it with water is impossible, Abigail Snyder, Ph.D. '17, assistant professor of food science, is now testing the viability of superheated steam to clean these manufacturing environments.

“Cleaning and sanitation in dry food processing and produce packing is a challenge because you can’t use soap or water,” Snyder said. “We’re seeing how well superheated steam works to prevent contamination and to keep food safe.”

The work is relevant to the milk powder and powdered infant formula industry, bakery and snack foods, spices, nuts and nut butters, produce industry, as well as chocolate and other confections, she said.

Snyder received a \$400,000 grant Jan. 1 from the Center for Produce Safety, as the grant’s primary investigator. It will help the produce industry ensure microbial safety in spaces where the use of traditional wet sanitation is limited. She will partner with co-investigators V.M. (Bala) Balasubramaniam, professor of food science and technology at Ohio State University. They will examine produce-processing pack houses to understand how best to apply this technology.

In 2020, Snyder (PI) and Balasubramaniam received a four-year, \$1 million grant from National Institute of Food and Agriculture/U.S. Department of Agriculture to research sanitation strategies in the dry food manufacturing environment.

Maintaining safe processing production areas for dry foods is a serious task. The pathogen *Escherichia coli* has been found in low-moisture foods. From 2016 to 2019 approximately 100 multistate *E. coli* cases were linked to flour and related products, according to the U.S. Centers for Disease Control and Prevention.

Salmonella is a pathogen of concern, as it accounts for 94% of all U.S.-based recalls of low-moisture foods and 53% of food outbreaks worldwide, she said.

“A lot of food products require no refrigeration,” Snyder said. “Historically, people believed that low-moisture foods were safe since they don’t support microbial growth. But in the past 15 years, there have been big outbreaks and recalls associated with dry food, not because microbes or pathogens grow in the food, but because they can survive for a long time.”

Superheated steam is far different the steam made on the stovetop. When water boils in a tea kettle, it has reached 212 degrees Fahrenheit – and the cloud-like visible steam is released. For dry or superheated steam, the steam vapor is heated beyond the tea kettle to more than 250 degrees F, in the case of Snyder’s treatment unit. It becomes invisible and acts like a hot gas. As the dry steam is applied to production surfaces, where it can kill pathogens and microbes, it leaves no moisture or condensation to harbor further pathogens.

“Our results will be compared to the efficacy of conventional scraping, vacuuming and brushing methods now commonly applied,” Snyder said, adding that this work will establish best practices in these food processing environments. “We hope new tools like superheated steam will reduce the demand on water, sanitizers and waste-stream management in food manufacturing, aligning with consumer preferences and sustainability goals.”