SAFEGUARDING THE FOOD SUPPLY

The ARS food safety research program ensures a safe food supply that meets foreign and domestic regulatory requirements. Emerging research areas focus on metagenomics, climate change and mycotoxin contamination, food adulteration and fraud, reduction of foodborne pathogens during animal and produce production and food processing, and contamination of ready-to-eat foods. The following accomplishments highlight ARS advances in food safety research in FY 2019.

***E. coli* transmission by cattle pest flies in leafy greens.** Leafy greens are a leading source of the *Escherichia coli* bacteria that cause human foodborne illness. Cattle pest flies can carry this pathogen and may transmit it to leafy greens and other fresh produce. ARS scientists in Clay Center, Nebraska, determined that flies carrying the pathogenic *E. coli* strain can transmit it from a cattle feedlot to leafy greens planted 600 feet away. This work has informed new industry recommendations to increase the setback distance between leafy greens fields and concentrated animal feeding operations.

Imagery from drones for microbial water quality assessment in irrigation ponds. ARS scientists from Beltsville, Maryland, proposed and tested a method of using drone-based imagery and artificial intelligence to obtain representative water samples for *E. coli* enumeration across irrigation ponds. Results of this work provide the knowledge base for efficient microbial water quality sampling and indicate a new direction for monitoring microbial water quality, thus improving food safety.

New metagenomics pipeline for pathogen detection. ARS scientists in Albany, California, in collaboration with scientists at the Georgia Institute of Technology, developed and validated an approach called imGLAD (in-silico-metagenomics for genome low-abundance detection) to detect human foodborne pathogens in mixed DNA samples extracted from the environment. Metagenomics-based detection of pathogens is much faster than current culture-based methods and can be used for source-tracking foodborne outbreaks.

Global and regional contributors to mycotoxin contamination of wheat and barley. Fusarium head blight (FHB) is a destructive disease of cereal crops worldwide that can contaminate grain with toxins, a major food safety concern. ARS scientists in Peoria, Illinois, collaborated with scientists in Brazil and Uruguay to characterize FHB pathogens from their countries. The most common FHB pathogen of wheat and barley in Brazil, Uruguay, and the United States is *Fusarium graminearum*, which can make a form of vomitoxin. A new species, *F.subtropicale*, was found in Brazil that produces a related mycotoxin with greater toxicity for humans and animals. These results will inform mycotoxin control programs.

Factors affecting pathogen survival in manure-amended soils. ARS researchers in Beltsville, Maryland, and university collaborators showed that site, year, and season affect survival durations of *E. coli* in manure-amended soils more than weather, manure type, depth of application, or organic vs. conventional management. These results will inform the U.S. Food and Drug Administration's food safety standards for controlling bacterial contamination of fresh produce from soil.