



How ARS Does It: Prioritizing Animal, Human, Plant, and Environmental Health

Food safety research investigates options for assessing, controlling, or eliminating potentially harmful food contaminants, such as introduced and naturally occurring pathogenic bacteria, viruses, parasites, toxins, non-biological-based chemical contaminants, mycotoxins, and plant toxins. Food safety is a global issue; thus, the research program involves both national and international collaborations through formal and informal partnerships.



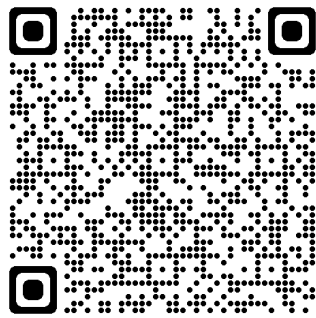
Because poor food management and storage systems can cause widespread illnesses, it is necessary to study food production as an integrated system. For example, ARS is researching storage conditions in international egg transport and documenting farm location and salmonella prevalence to prevent the disease in pastured poultry. The following accomplishments highlight a few of the ARS advances in food safety and quality assurance in 2022.

Seasonality of *E. coli* O157:H7 survival and microbiome in cold-stored fresh-cut lettuce. Outbreaks of *Escherichia coli* O157:H7 (*E. coli* O157) foodborne illness linked to romaine lettuce grown on California's Central West Coast are more prevalent in the Fall season. The cause of this seasonal trend is unknown and is of critical concern to regulatory agencies, public health agencies, and the produce industry. These outbreaks have greatly impacted the California lettuce industry, which is valued at more than \$2 billion annually. ARS researchers in Albany and Salinas, California, collaborated with FDA scientists and found two factors associated with the outbreaks: *E. coli* O157 survives better on cold-stored fresh-cut romaine harvested in the Fall rather than in the Spring, and the lettuce microbiome itself has seasonal characteristics. It is not clear how the seasonal properties of lettuce and/or its microbiome factor into the seasonal behavior of *E. coli* O157 in lettuce, but the results indicate that producers should be more cautious in the Fall season. These findings also open a new branch of study for identifying plant traits and microbiome components that might be used in plant breeding or manipulated to suppress enhanced *E. coli* O157 survival. [\(NP 108\)](#)

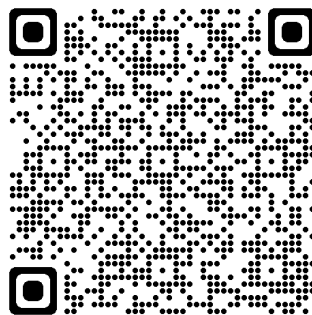
A farm-to-fork perspective of *Salmonella* in pastured poultry management systems. Greater consumer demand for all-natural, antibiotic-free poultry products has led to an increase in pastured poultry operations. This, in turn, has increased the level of interactions poultry have with outdoor environments and potentially increased their exposure to foodborne pathogens. ARS researchers in Athens, Georgia, are researching the prevalence and diversity of *Salmonella* populations inherent within pastured poultry flocks. *Salmonella* was isolated and characterized from preharvest, postharvest, and final product samples obtained from flocks raised without antibiotics, and the bacterium was recovered from ~18 percent of more than 2,300 samples. Even in the antibiotic-free pastured management system, approximately two-thirds of the *Salmonella* isolates exhibited resistances to tetracycline, streptomycin, and other clinically important antibiotics. *Salmonella* prevalence and diversity were related more to farm location than to sample type, indicating the need for more tailored intervention strategies that continue to enhance the safety of these products. [\(NP 108\)](#)

How extended egg storage conditions affect egg microbial and quality factors. ARS scientists in Athens, Georgia, completed a 6-month study to determine the impact of egg handling practices and egg storage conditions on the microbial and physical quality of shell eggs. Egg practices included washing, washing and oiling, storing 21 days and then washing, and no washing, while storage included refrigerated and room temperature conditions. For the first time, typical egg handling practices used throughout the world were compared over a prolonged period of egg storage at both refrigerated and room temperatures, and results indicated that refrigeration has a greater impact on the microbial and physical quality of eggs than egg handling practices. These results provide a complete and direct comparison of egg handling and storage practices that can be utilized internationally when assessing egg import and export standards. [\(NP 108\)](#)

Elucidating the origin and diversity of fungi causing tar spot disease of corn. The fungal pathogen *Phyllachora maydis* causes the disease tar spot on corn, which has recently emerged as a major threat to U.S. corn production's \$53 billion annual farmgate value. The origin of this disease is still unclear, and there might be multiple pathogens causing the disease. An ARS researcher in Peoria, Illinois, collaborated with researchers at the University of Illinois and several other U.S. universities to sample tar spot disease from across Central America, North America, and South America (including the Caribbean) to understand the origin and diversity of the pathogen causing tar spot disease. DNA data analyses determined there are three species of *Phyllachora* that cause tar spot of corn in the United States. It is likely these three species originated in Mexico, Central America, and the Caribbean. These results indicate the pathogens are native to North America and the emergence of the disease is likely due to a combination of climate changes that favored the spread of the fungus in U.S. corn production regions and a shift in corn genetics that resulted in a lack of resistance to the three *Phyllachora* species that cause this disease. These results can assist corn breeders, pathologists, agronomists, and corn growers as they try to better understand the biology of this fungus and develop resistant varieties and crop management strategies to reduce yield losses. [\(NP 301\)](#)



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