

FDA uses the BAX® System to Analyze Prevalance of Harmful Bacteria in Multi-State Produce Study

Introduction

A five-year, multi-state study by the US Food and Drug Administration on leafy greens, sprouts and melons showed lower levels of key foodborne pathogens than observed in previous studies, but did not negate the health risks related to consuming fresh produce. The study, published in the March 2018 issue of the Journal of Food Protection, analyzed 14,183 samples of leafy greens (spinach, iceberg lettuce and romaine lettuce), 2,652 samples of sprouts (alfalfa, soybean, mung bean and other) and 3,411 samples of melons (mangoes, cucumbers and cantaloupes) collected from up to 20 states, following the FDA's preferred laboratory procedures for detecting the presence of *Salmonella*, *Shigella*, *Listeria monocytogenes*, and Shiga toxin-producing *E. coli* (STEC). The USDA used Hygiena's BAX® System PCR Assays for *Salmonella* and *Listeria monocytogenes* to complete this study.



BAX® System Methodology

The prevalence of foodborne pathogens in the samples analyzed ranged from 0.01-0.23%. For many types of produce, no pathogens were detected. For leafy greens, no *E. coli* O157:H7 or non-O157 STEC was found in iceberg lettuce, no *Salmonella* or *E. coli* O157:H7 was found among sprouts, no *Salmonella* was found in cucumbers and no *L. monocytogenes* was found in cantaloupes.

Among all the pathogens tested, *L. mono* was recovered most frequently, with samples containing up to 1,470 most probable number (MPN)/g in leafy greens, up to 1,100 MPN/g in sprouts, and up to 150 MPN/g in melons. *L. monocytogenes* is typically associated with processed, ready-to-eat (RTE) foods, meats and dairy products, but an increasing number of recent outbreaks have involved fresh produce. Unlike other foodborne pathogens, *L. monocytogenes* can grow at refrigerated temperatures, making it particularly difficult to control in foods. Furthermore, there is no “kill step” to eliminate pathogens in fresh produce. *L. mono* is a particularly serious problem in food safety because very small amounts can cause illness, and the organism can live under temperature extremes that kill other bacteria species. Listeriosis can cause serious illness in persons with heightened susceptibility, especially in pregnant women and immunocompromised people.

These figures bolster earlier FDA studies based on the FoodNet database, a collection of food safety reporting data from the FDA, US Department of Agriculture (USDA) and other agencies, which showed an overall decrease in *Listeria* in food since 1996. FoodNet data showed a decline in *Listeria* reports of 45% from 1996 to 1998, but a less dramatic decrease of 5% from 2012 to 2014, indicating significant variation in incidences of *Listeria* in food. The researchers also found a large genetic diversity among *Salmonella* and *L. monocytogenes* isolated from the produce tested. These results should not be surprising since a wide variety of fruits and vegetables are imported into the United States year-round. As a result, the global trade of fresh produce from the different geographic regions may have contributed to a more diverse pathogen population.

How the BAX® System was used

Today, researchers rely on PCR-based technology for its ability to produce precise, reliable results in less time than other traditional methods. In this study, the BAX® System PCR Assay for *Salmonella* was used according to the USDA method for screening *Salmonella* in 375g samples of leafy greens and 50g samples of sprouts, and the BAX® System PCR Assay for *L. mono* was used according to AOAC-RI PTMSM method 2013.12 to screen for the pathogen in 250g samples of leafy greens and 25g samples of sprouts.

The study “has highlighted the potential public health risk associated with the consumption of certain types of fresh leafy greens, sprouts and melons contaminated with *Salmonella*, *L. monocytogenes*, *E. coli* O157:H7 and STEC,” the authors wrote. “Regardless of how low the pathogen prevalence is, pathogen-positive produce can cause illness in consumers, especially because most produce is eaten raw.”

In this study, negative samples needed to be quickly identified given the perishable nature of fresh produce. Compared to traditional culture methods that can take four days or more to get results, Hygiena’s genetic-based BAX® System can provide accurate and reliable results in about one to four hours after enrichment, meaning it is possible to obtain same- or next-day results.



Reference

Zhang, G., et al. 2018. Survey of Foodborne Pathogens, Aerobic Plate Counts, Total Coliform Counts, and *Escherichia coli* Counts in Leafy Greens, Sprouts, and Melons Marketed in the United States. *Journal of Food Protection*, 81(3), 400–411.