

Detecting Chemical Contaminants and Residues in Food

In recent years, the news media have reported a number of food product recalls after consumption of these products resulted in illnesses and in some cases, fatalities. The most publicized recalls were those attributed to bacterial contamination, such as *E. coli* in spinach and peppers, and salmonella in peanuts and peanut butter. Other large recalls have involved chemical contaminants, most notably melamine, normally used in the manufacture of plastics; this compound was added to pet food and dairy products to make them appear higher in protein. Recalls have also been prompted by the presence of undeclared ingredients, or higher than permitted levels of pesticide residues. Collectively, these recalls have resulted in heightened consumer concern over the safety of our food supply. This has prompted food suppliers to spend millions of dollars testing their products to assure consumers that the products are safe.

Food Quality and Safety Services

Southwest Research Institute® (SwRI®) chemists and scientists provide services to clients in food quality and safety, ranging across the food industry spectrum from the farm to the fork, including:

- Farmers
- Manufacturers
- Retailers
- Distributors
- Wholesalers

Most projects are initiated to solve a specific concern, such as:

- Evaluation of flavor components through the determination of volatile organics
- Determination of ethylene exposure of produce stored under a variety of conditions
- Analysis of volatile organic compounds to predict shelf life of milk and cereal products
- Kinetic studies to determine the effectiveness of bags in protecting produce from the effect of ethylene gas
- Determination of the source of food contamination from the storage environment
- Investigation of suspected intentional and unintentional food contamination
- Evaluation of the effectiveness of common household washing and food preparation methods in reducing the levels of pesticide residues in produce
- Monitoring of levels of potentially harmful compounds created in the production of food products
- Determination of 4-methylimidazole (4-MEI), found in caramel color, beverages and seasonings
- Determination of the leaching of potentially harmful chemicals in food products from packaging and shipping materials and containers
- Determination of mycotoxins by LC/MS/MS

SwRI also conducts routine analysis in food products for:

- 200+ pesticide residues for same-day or 24-hour turnaround of data
- Common food allergens by ELISA
- Total fatty acid profiles including omega-3 and omega-6 fatty acids
- Determination of amino acids
- Determination of vitamins and other nutrients
- Determination of acrylamide in ingredients, flavors, finished products and beverages



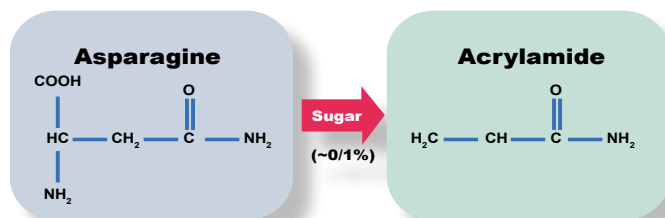
Chemical analysis of food samples begins with the use of household blenders to reduce foods to fine particles whose chemical components can be extracted for quick and consistent screening and analysis.



The SwRI food chemistry laboratory uses solid-phase extraction techniques that allow for sample extraction and interferent clean-up in fewer steps and with shorter turnaround times.

Food can be a single commodity, such as fruits and vegetables, or it can be very complex as are most processed foods, presenting many challenges to those who perform chemical analyses. Keys to the success of these analyses include sophisticated sample preparation and analytical techniques that aim to reduce interferences caused by natural and artificial colors, sugars, starches and preservatives. Because of the shelf-life constraints of most foods, these analyses must be performed in a short period. Turnaround of data to the client typically ranges from a few hours to a few days from the time samples are received in the lab.

Over the past 20 years, food chemists and scientists at SwRI have analyzed more than 40,000 produce samples for approximately 150 pesticide residues. During that time, the food chemistry laboratory has stayed abreast of changes in regulations and tolerances for specific compounds and commodities. Additionally, many compounds have been banned and newer pesticides put into use. The SwRI team has adapted its analyses in response to these changes and maintains a same-day turnaround for samples received at the lab, while continuing to improve standard sample preparation and evaluation techniques.



Some common food preparation practices can result in conversion of the naturally occurring amino acid asparagine into acrylamide, a potential cancer-causing compound, when heated to high temperatures in the presence of certain sugars.



Southwest Research Institute is an independent, nonprofit, applied engineering and physical sciences research and development organization using multidisciplinary approaches to problem solving. The Institute occupies 1,200 acres in San Antonio, Texas, and provides more than 2 million square feet of laboratories, test facilities, workshops, and offices for nearly 3,000 employees who perform contract work for industry and government clients.

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