Position of the Academy of Nutrition and Dietetics: Food and Water Safety

ABSTRACT
It is the position of the Academy of Nutrition and Dietetics that all people should have access to a safe food and water supply. The Academy supports science-based food and water regulations and recommendations that are applied consistently across all foods and water regulated by all agencies and incorporate traceability and recall to limit food- and waterborne outbreaks. Registered dietitian nutritionists and dietetic technicians, registered, are encouraged to participate in policy decisions, program development, and implementation of a food safety culture. Food safety affects all segments of the population in a global society, and, although the United States food and water system has many protections in place, food safety continues to be a public health concern. The Centers for Disease Control and Prevention estimates that one in six Americans are sickened, 128,000 are hospitalized, and 3,000 die annually from foodborne disease. Using the Centers for Disease Control and Prevention estimates for foodborne illness, it is estimated that the basic cost-of-illness averages $1,068/episode with a total annual cost of $51 billion. The food safety system is challenged by changing demographics, consumer preferences for convenience and variety, and issues of concern in the commercial food chain and in regulatory systems. The 2011-enacted Food Safety Modernization Act is an extensive expansion of federal food regulatory authority that mandates a risk-based food safety system approach and focuses on comprehensive science-based preventive measures across the total food safety system. Registered dietitian nutritionists and dietetic technicians, registered, have unique roles in promoting and establishing food safety cultures in foodservice settings, clinical practices, community settings, and in public venues because their training integrates food, science, and health, both preventive and therapeutic.

THE UNITED STATES HAS ONE of the safest food supplies in the world. Still, foodborne illnesses impose an important public health problem. The Centers for Disease Control and Prevention (CDC) estimates that one in six Americans are sickened, 128,000 are hospitalized, and 3,000 die annually from foodborne disease. Using the CDC’s current estimates for foodborne illness, Scharff estimates that the basic cost-of-illness averages $1,068/episode with a total annual cost of $51 billion. These estimates do not include pain, suffering, and functional disability; including these considerations raises the estimates to $1,626/episode with an annual cost of $77.7 billion. Several trends and factors contribute to food safety concerns and include changing demographics, consumer preferences for convenience and variety, and challenges in the commercial food chain and in regulatory systems.

In 2010, the Academy of Nutrition and Dietetics (Academy) adopted the following food safety principles for federal food safety authority in the United States:

1. Food authority should be science-based and consistently applied to all food regulated by all agencies for domestic and imported foods. The Academy supports the concept of a single food safety agency to protect the public’s health.
2. Food authority should be collaborative across national, state, and local agencies and between government and industry partners to foster more robust, consistent, accurate, and timely communication and data sharing that leads to efficient and effective decision-making processes.
3. Food protection should include statutory authority by government regulatory agencies for traceability and recall, supported by research, epidemiology, and inspection programs.

Also, the Academy has included safety of the US food supply as a component of its public policy priorities.

Significant changes for products regulated by the US Food and Drug Administration (FDA) were signed into law in 2011 through the Food Safety Modernization Act (FSMA) (Public Law 111-353). This is the first extensive
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<th>FSMA mandate</th>
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<td>Mandatory preventive controls for food facilities</td>
<td>Food facilities are required to implement a written preventive controls plan. This involves evaluating the hazards that could affect food safety; specifying what preventive steps, or controls, will be put in place to significantly minimize or prevent the hazards; specifying how the facility will monitor these controls to ensure they are working; maintaining routine records of the monitoring; and specifying what actions the facility will take to correct problems that arise. <em>(Final rule due 18 months following enactment.)</em></td>
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<td>Mandatory produce safety standards</td>
<td>The FDA must establish science-based, minimum standards for the safe production and harvesting of fruits and vegetables. Those standards must consider naturally occurring hazards, as well as those that may be introduced either unintentionally or intentionally, and must address soil amendments (materials added to the soil such as compost), hygiene, packaging, temperature controls, animals in the growing area, and water. <em>(Final regulation due about 2 years following enactment.)</em></td>
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<td>Authority to prevent intentional contamination</td>
<td>The FDA must issue regulations to protect against the intentional adulteration of food, including the establishment of science-based mitigation strategies to prepare and protect the food supply chain at specific vulnerable points. <em>(Final rule due 18 months following enactment.)</em></td>
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<td>Mandated inspection frequency</td>
<td>The FSMA establishes a mandated inspection frequency, based on risk, for food facilities and requires the frequency of inspection to increase immediately. All high-risk domestic facilities must be inspected within 5 years of enactment and no less than every 3 years thereafter. Within 1 year of enactment, the law directs the FDA to inspect at least 600 foreign facilities and double those inspections every year for the next 5 years.</td>
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<td>Records access</td>
<td>The FDA will have access to records, including industry food safety plans, and the records firms will be required to keep documenting implementation of their plans.</td>
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<td>Testing by accredited laboratories</td>
<td>The FSMA requires certain food testing to be carried out by accredited laboratories and directs the FDA to establish a program for laboratory accreditation to ensure that US food testing laboratories meet high-quality standards. <em>(Establishment of accreditation program due 2 years after enactment.)</em></td>
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<td>Mandatory recall</td>
<td>The FSMA provides the FDA with authority to issue a mandatory recall when a company fails to voluntarily recall unsafe food after being asked to by the FDA.</td>
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<td>Expanded administrative detention</td>
<td>The FSMA provides the FDA with a more flexible standard for administratively detaining products that are potentially in violation of the law (administrative detention is the procedure the FDA uses to keep suspect food from being moved).</td>
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<td>Suspension of registration</td>
<td>The FDA can suspend registration of a facility if it determines that the food poses a reasonable probability of serious adverse health consequences or death. A facility that is under suspension is prohibited from distributing food. <em>(Effective 6 months after enactment.)</em></td>
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<td>Enhanced product tracing abilities</td>
<td>The FDA is directed to establish a system that will enhance its ability to track and trace both domestic and imported foods. In addition, the FDA is directed to establish pilot projects to explore and evaluate methods to rapidly and effectively identify recipients of food to prevent or control a foodborne illness outbreak. <em>(Implementation of pilots due 9 months after enactment.)</em></td>
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<td>Additional record-keeping for high-risk foods</td>
<td>The FDA is directed to issue proposed rulemaking to establish record-keeping requirements for facilities that manufacture, process, pack, or hold foods that the Secretary of Health and Human Services designates as high-risk foods. <em>(Implementation due 2 years after enactment.)</em></td>
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**Figure 1.** Summary of the Food Safety Modernization Act (FSMA) mandates and legislative directives. Adapted from: US Food and Drug Administration. Background on the FDA Food Safety Modernization Act. [http://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm239907.htm](http://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm239907.htm). Updated April 9, 2014. Accessed May 19, 2014.
expansion of regulatory authority since the enactment of the Food, Drug, and Cosme tic Act in 1938. The FSMA mandates a risk-based food safety system approach focusing on comprehensive scientific preventive measures across the food supply chain. In addition, the law strengthens the FDA’s inspection, compliance, and outbreak response; modernizes oversight of food imports; and calls for enhanced partnerships as a part of a more integrated global food safety system (Figure 1). Increased collaboration through partnerships, where better-integrated ideas and information lead to reinforcement of recommended food safety behaviors, is anticipated to lead to a sustainable food safety culture. Examples of such reinforcement include accurate record-keeping, follow-up for problems as they occur, ongoing training and supervision of personnel who work in the food production and marketing system, and strategies to reward recommended behaviors and remediate inappropriate behaviors.

**FOOD SAFETY REGULATIONS AND PROGRAMS**

Food safety affects all segments of the population in a global society. In its global strategy, the World Health Organization actively promotes practices during food preparation to ensure food and water safety, and the United Nations Codex Alimentarius Commission seeks to ensure safety of food traded internationally using scientific evidence for safety decisions. These international recommendations are important to the United States because much of our seafood, fruit, spices, coffee, tea, and other products are imported, and the United States exports many foods to other countries. This harmonization of policies facilitates international trade by having countries follow similar

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<td>Importer accountability</td>
<td>Importers have an explicit responsibility to verify that their foreign suppliers have adequate preventive controls in place to ensure that the food they produce is safe. (<em>Final regulation and guidance due 1 year following enactment.</em>)</td>
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<td>Third-party certification</td>
<td>The FSMA establishes a program through which qualified third parties can certify that foreign food facilities comply with US food safety standards. This certification may be used to facilitate the entry of imports. (<em>Establishment of a system for the FDA to recognize accreditation bodies is due 2 years after enactment.</em>)</td>
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<td>Certification for high-risk foods</td>
<td>The FDA has the authority to require that high-risk imported foods be accompanied by a credible third-party certification or other assurance of compliance as a condition of entry into the United States.</td>
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<td>Voluntary qualified importer program</td>
<td>The FDA must establish a voluntary program for importers that provides for expedited review and entry of foods from participating importers. Eligibility is limited to, among other things, importers offering food from certified facilities. (<em>Implementation due 18 months after enactment.</em>)</td>
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<td>Authority to deny entry</td>
<td>The FDA can refuse entry into the United States food from a foreign facility if the FDA is denied access by the facility or the country in which the facility is located.</td>
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<td>State and local capacity building</td>
<td>The FDA must develop and implement strategies to leverage and enhance the food safety and defense capacities of state and local agencies. The FSMA provides the FDA with a new multiyear grant mechanism to facilitate investment in state capacity to more efficiently achieve national food safety goals.</td>
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<td>Foreign capacity building</td>
<td>The law directs the FDA to develop a comprehensive plan to expand the capacity of foreign governments and their industries. One component of the plan is to address training of foreign governments and food producers on US food safety requirements.</td>
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<td>Reliance on inspections by other agencies</td>
<td>The FDA is explicitly authorized to rely on inspections of other federal, state, and local agencies to meet its increased inspection mandate for domestic facilities. The FSMA also allows the FDA to enter into interagency agreements to leverage resources with respect to the inspection of seafood facilities, both domestic and foreign, as well as seafood imports.</td>
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*aFDA = US Food and Drug Administration.*

standards that have been agreed to in international discussions. These standards are monitored through compliance programs, such as the FSMA, which has a strong focus on regulation of imported foods through importer accountability, third-party certification programs, and authority to deny entry to foods if the FDA is denied inspection access to a food production facility. The United States includes food safety objectives in Healthy People and in the Dietary Guidelines for Americans and has food safety regulatory authorities at the federal, state, and local levels. Food that is sold across state borders comes under the US Constitution’s commerce clause and is regulated by federal agencies. Meat, poultry, and egg products are inspected by the US Department of Agriculture’s Food Safety Inspection Service. The National Oceanic and Atmospheric Administration unit of the US Department of Commerce oversees voluntary inspection programs for fisheries industry. The FDA, using a risk-based methodology, has primary food safety responsibility for 80% to 90% of US domestic and imported foods. The US Environmental Protection Agency oversees registration of pesticides, including sanitizing agents used in food production. State laws and agencies regulate foods produced and sold within a state.

Programs such as the National Outbreak Reporting System, the Foodborne Diseases Active Surveillance Network, PulseNet, and the Environmental Health Specialists Network track foodborne illnesses and factors that contribute to foodborne illnesses during outbreaks. The FDA has recently reorganized its approach to managing outbreak activities through the Coordinated Outbreak Response and Evaluation Network to centralize outbreak surveillance, response, and postresponse activities throughout the agency. The primary goal of this reorganization is development of effective food safety practices and policies through improved surveillance, faster response times, and seamless coordination and communication among agency units and state partners. This effort is based on having a traceability system embedded in the food production chain and sharing information to allow faster determination of problems and more rapid removal of product from the marketplace.

The Conference for Food Protection and the National Antimicrobial Resistance Monitoring System for Enteric Bacteria help to assess needs for future regulation, and university food safety centers conduct research on current and potential food safety problems. The commercial food supply chain includes agricultural production, food formulation and processing, warehousing, and distribution, and retailing; each of these links in the chain has food safety regulations in place to improve traceability of foods in the event of an outbreak of foodborne illness and to safeguard the food supply. Some companies use independent third-party audits to determine and correct potential food safety problems and are working to create food safety cultures. An active recall system is in place and, through the new FSMA requirement, the government and food system production and marketing units are working to develop a stronger traceability system that will enable more rapid determination of contaminated food sources. The Partnership for Food Safety Education, a public–private partnership that includes government agencies with primary responsibilities for food safety and professional, consumer, and commodity/ trade associations, promotes food safety through consumer guidelines designed to keep food safe. State and local health departments and the Cooperative Extension Service link consumers and federal agencies through outbreak investigations and food safety messaging.

FOOD- AND WATERBORNE ILLNESSES

Hazards can occur naturally, some are unintentionally introduced, and some are intentional, such as an act of terrorism. There are ways to reduce the burden of foodborne illness at every step of the food supply chain, although the risk of foodborne illness is never completely eliminated. Waterborne illness is most likely to be reduced at the municipal level or at an individual water supply level.

Food- and waterborne illnesses are caused by microorganisms (pathogens), chemicals (toxins), and other pathogenic agents, such as misfolded prion proteins (very rare) that disrupt body systems and functions. In addition, some items, such as glass, that may contaminate food can cause mechanical injury to the body, and individuals may have idiosyncratic responses to food components, such as allergies and intolerances. Pathogens or toxins cause most water- and foodborne illnesses.

Food- and waterborne pathogens include bacteria, viruses, and parasites. Pathogens may cause infections (invasive and injury body tissues) or intoxications (produce toxins). Food- and waterborne infections typically result in fever and gastrointestinal symptoms such as cramping, vomiting, and diarrhea lasting up to a few days. These infections can be more serious for high-risk populations. In some cases, serious conditions, such as Guillain-Barre syndrome, hemolytic uremic syndrome, or reactive arthritis, follow the initial infection. Food- and waterborne toxins can be naturally occurring, such as fungal toxins or toxins produced naturally by plants or fish and shellfish, or can result from industrial or agricultural contaminants, residues from equipment or cleaning/sanitation or other forms of handling, from high cooking temperatures (such as acrylamide from fried foods or heterocyclic amines from blackened or charred meats), from intentional adulteration of food, or from discharges from nuclear power plants or similar accidents. Toxins have a wide range of symptoms, depending upon the characteristics of the toxin, the amount of the toxin consumed, and the tissue affected. The dose of a toxic substance makes a difference, just as the dose of a medication makes a difference, and lipid-soluble toxins can be stored in the body in the same way that lipid-soluble vitamins are stored. There are many toxins in food that do not affect us because the dose consumed can be detoxified by the liver and/or kidney. However, individuals who have damage to their gastrointestinal tracts may allow entry to toxic substances that would not be absorbed by an intact, healthy gastrointestinal tract, and damage to the liver and/or kidney.
can reduce detoxification processes in the body. A large dose of a toxic substance can overwhelm the liver or kidney detoxification process, just as an overdose of medicine can. For these reasons, many clients undergoing therapy for a variety of conditions have a higher risk of food- and waterborne intoxication than do healthy adults.

Although general information is used to describe overall food and water safety in the context of risks, each pathogen and toxin has a specific time to onset of symptoms, dosage for causing symptoms, and list of potential symptoms. The FDA’s Bad Bug Book includes both professional and consumer information on the pathogens and naturally occurring toxins in the US food supply; and the CDC website’s listing of foodborne pathogens includes information on diagnosis and treatment of foodborne illness. The US Environmental Protection Agency information on pathogen and chemical contaminants in drinking water lists both pathogens and toxins found in drinking water and primary source contaminants. TOXNET, the Toxicology Data Network site from the US National Library of Medicine, and the FDA webpage on foodborne illness and contaminants are good sources of information about specific industrial, agricultural, and environmental toxins.

### FOOD SAFETY THROUGH THE FOOD SUPPLY CHAIN

Good agricultural practices and good handling practices are designed to reduce risks from both pathogen and toxin contamination of foods during agriculture production. Pathogens can contaminate food through agricultural practices, such as using contaminated water to irrigate crops or wash food products; natural processes, such as defecation by birds flying over crops or animals in cultivated fields or water supplies; handling, through the distribution chain by contaminated transport vehicles, inappropriate warehousing, processing equipment, or personnel who do not practice good hygiene; and through consumer handling. Water is primarily contaminated through waste from sewage, industrial activities, and agricultural run-off. Contaminated water can contaminate food that is produced in water, such as fish, shellfish, seaweed, and rice. Regulations promulgated from the FSMA are designed to reduce these hazards through updated good agricultural practices and good handling practices to prevent contamination of produce on the farm.

As agricultural technologies develop to enhance efficiency of production, food safety concerns related to newer technologies are a part of their evaluation for use in our commercial systems. The FDA has responsibility for determining the safety of these processes. Two examples of agricultural technologies that are being questioned are potential contributions to antibiotic resistance related to food animal production methods and overall safety of genetically modified organisms (GMOs) in food production. Antibiotic resistance reduces the ability of current and future treatment for life-threatening infections, and overuse of antibiotics is related to development of resistance through natural selection. Current guidance from the FDA is to limit antibiotic use in food animal production to what is needed to keep animals healthy as determined by a veterinarian; this is an area of active research needed to inform regulatory actions. Evaluation of data on GMOs by the World Health Organization, the American Association for the Advancement of Science, the American Medical Association, Britain’s Royal Society of Medicine, and the European Commission do not show a health or food safety risk related to the process of creating GMOs. However, some individuals have philosophical or religious convictions against production and consumption of GMOs and would like to see GMO-containing foods labeled as GMO-free or contains GMOs to help them make their choices, in much the same way that individuals can choose kosher or halal foods.

Food processing and packaging are used to inactivate pathogens and spoilage organisms, reduce contamination by the environment and handling, and extend the food supply over time. Processing to inactivate pathogens and spoilage organisms requires appropriate packaging to contain food for processing treatments and to keep the treated food from being recontaminated. There are many processes in use and in development, and the FDA (most foods) and USDA (meat, poultry, and eggs) have strict regulatory authority over food processing methods. Canning and its derivative high-temperature—short time processing destroy pathogens and most spoilage organisms and result in products that are shelf stable until they are opened. Pasteurization inactivates pathogens, but it does not inactivate spoilage organisms and requires that products continue to be refrigerated to reduce their growth rates. Pasteurization of milk is an important public health measure because milk is a high-nutrient food that is frequently contaminated with pathogens during production and has no barriers to inhibit pathogen growth. Other foods, including fruit juices and eggs, may be pasteurized for safety. High-pressure processing inactivates pathogens by disrupting cell walls and membranes. Blast chilling and freezing reduce growth of pathogens and spoilage organisms, but they do not usually inactivate pathogens. Packaging is frequently an important part of food processing because it keeps the food contents free from postprocessing contamination. However, over time packaging components may leach into the food product. Examples of this would be metals from unlined cans and plastics from packaging. In some cases preservatives are added to foods to reduce pathogen growth or to keep foods from spoiling; these are tested according to required protocols before they are added to the food supply and are subject to removal if later problems are detected.

Transport and retail marketing of foods include steps to prevent, reduce, or eliminate contamination of foods and to keep perishable foods safe. Examples of regulations include requirements that foods be transported and warehoused in spaces that do not contain vermin and are not contaminated with toxic chemicals or filth. Also, appropriate time and food temperatures must be maintained throughout the food supply chain to reduce pathogen growth in perishable foods. Package indicators that register temperatures outside of the desirable range are available but are not in routine use. In retail settings, personnel are responsible for following food safety procedures, and public health inspections monitor this compliance. As in food production settings, personnel in foodservice and other retail operations can contaminate foods when they do not practice recommended hygiene behaviors. In addition to public monitoring,
third-party audits are used by many retailers to check their food safety processes for continuous implementation and improvement. Hazard Analysis Critical Control Points and Hazard Analysis and Risk-Based Preventive Control are written food safety plans at all levels of food production and marketing to prevent, eliminate, or reduce hazards in the food supply chain. Although slightly different in implementation, both are science-based and include recordkeeping mechanisms to evaluate hazards, establish controls, monitor the performance, develop corrective actions, and verify the effectiveness of the plan. Food safety programs that comply with Hazard Analysis Critical Control Points plans are required for foods such as seafood, juices, and USDA-regulated meat and poultry and in the federal school meal programs. Hazard Analysis and Risk-Based Preventive Control addresses potential hazards at a facility that manufactures, processes, packs, or holds food for human consumption and requires that a recall plan be in place.

As the final step for the food supply chain, consumers are a key resource for maintaining the safety of the food supply. Home food safety recommendations focus on keeping food safe during purchase, storage, preparation, and service. These recommendations are grouped under the “core four”—clean, separate, cook, and chill—general guidelines developed by The Partnership for Food Safety Education under a private-public partnership. These guidelines are the basis of food safety recommendations in Healthy People and the Dietary Guidelines for Americans and are reviewed and detailed for specific products and settings on a regular basis. Based on self-reports of their behaviors, consumers typically report washing their hands before preparing food, separating raw from ready-to-eat foods, and refrigerating food, but reports of using thermometers to ensure pathogen inactivation are very low.

Unlike personnel in food production and retail sectors, consumers rarely have formal training in food safety. They benefit from tested, evidence-based messages that inform and remind them about basic food handling and require complete instructions for safe handling of specific products. For example, cooking instructions for microwavable foods have been revised to stress the requirements for cooking products that may look ready to eat but have not been fully cooked. These instructions stress the wattage of the oven, cooking time, and any stirring or other heat distribution method, and standing time. These processes are necessary for foods to reach the appropriate internal temperature to inactivate pathogens, but many consumers hold the misconceptions that foods just need to be heated to make them appetizing or that microwave energy inactivates pathogens. Consumers can be misled and harmed by erroneous information about food safety, such as claims that raw (unpasteurized) milk is safer and more nutritious than pasteurized milk when raw milk and products made from raw milk can be contaminated with foodborne pathogens that cause tuberculosis, diphtheria, salmonellosis, campylobacteriosis, and other foodborne infections.

FOOD ATTRIBUTION AND SETTING

A foodborne outbreak occurs when two or more people acquire the same illness from the same contaminated food or beverage. The size and scope of the outbreak can vary based on the pathogen and range from a small, local outbreak (eg, community fundraiser), to a statewide or regional outbreak (eg, grocery store chain in neighboring counties), to national outbreaks (eg, product shipped to 24 states) and international outbreaks. In direct outbreak investigations, the goals are to determine the food involved, the pathogen or toxin that caused the illness, and the factors that contributed to the outbreak. Further analysis through PulseNet of a causal pathogen may link interstate outbreaks together through DNA fingerprinting of the pathogen. During an outbreak of foodborne illness determinations (attribution) of the food source of a pathogen or toxin and the setting in which the food was prepared and served are the basis for recommendations to discard potentially contaminated food. This can reduce the size and effect of some outbreaks. Another important measure associated with food commodity attribution is the determination of pathogen—commodity pairs. Pathogen—commodity pairs describe combinations of specific pathogens contaminating specific commodities that have been demonstrated through outbreak investigations to cause illness, hospitalizations, and deaths in outbreaks. In the longer term, compilation of data from commodity attribution, pathogen—commodity pairs, and food preparation and service settings provides insight on the effectiveness of regulations and control measures. These insights help to target future interventions and recommendations to prevent future outbreaks.

Two important unintended consequences can result from early release of attribution information during outbreak investigations. First, the attribution can be incorrect, as in the incorrect attribution of tomatoes for a multistate outbreak of Salmonella infection that was eventually traced to raw peppers. Second, it can take years for commodities to regain the public favor after a single, well-publicized outbreak. An example is the prewashed bagged spinach Shiga toxin-producing Escherichia coli (STEC) outbreak in 2006 that sickened 205, hospitalized 104, and resulted in 31 cases of hemolytic uremic syndrome and 4 deaths. After that outbreak, spinach sales dropped and have not recovered. Even though there are risks of premature attribution, early attribution remains an important step in limiting illnesses from outbreaks. Follow-through communication after an outbreak to describe the problem and how it was resolved is important in reducing avoidance of wholesome foods.

In the latest reporting period, the most often implicated foods in illnesses caused by outbreaks were leafy vegetables, dairy foods, fruits/nuts, and poultry. During this time the percentage of outbreaks associated with leafy vegetables and dairy products increased substantially, and the percentage of outbreaks associated with eggs decreased. The pathogen—commodity pairs responsible for the most outbreaks were seafood toxins—fish, Salmonella—poultry, and norovirus—leafy vegetables. Pathogen—commodity pairs responsible for the most illnesses in outbreaks were norovirus—leafy vegetables, Clostridium perfringens—poultry, Salmonella—vine-stalk vegetables, and Clostridium perfringens—beef.

FROM THE ACADEMY
Pathogen–commodity pairs responsible for the most hospitalizations in outbreaks were Salmonella–fruits/nuts, Salmonella–vine-stalk vegetables, STEC–beef, and STEC–leafy vegetables.47 Pathogen–commodity pairs responsible for the most deaths in outbreaks were Listeria–poultry, Salmonella–fruits/nuts, and STEC–leafy vegetables.47 These pathogen–commodity pairs show an increase in foodborne illness from plant-based foods that are eaten raw or lightly cooked. This highlights an area for messaging by food and nutrition practitioners, especially after outbreaks, because the implicated foods are important parts of a nutritious diet.

A prominent example of using outbreak data to inform future practice is the proposed FSMA regulations that would reduce risk of produce contamination by pathogens on farms.4 These regulations would ensure that agricultural water be safe and sanitary for contact with leafy greens and the harvestable portions of other produce items and that worker training and health hygiene programs be implemented. Once contaminated with pathogens, routine washing does not remove pathogens effectively, although it can remove dirt and other debris and some pesticide residues. Also, because leafy greens are frequently eaten raw or lightly cooked, there is no end-user control to reduce pathogen risk effectively. Leafy greens are an important low-calorie source of nutrients in the US diet, and these on-farm interventions could reduce risk of foodborne illness from their consumption.

Another important preventive step for reducing outbreaks and single cases of illness is recalls. Recalls are notifications that a US-regulated food does not meet food standards for wholesomeness (safety) or for labeling (may contain ingredients other than those listed).23 Commercial food recalls are usually initiated by manufacturers and distributors when they are alerted to a problem, with oversight provided by the government agency that regulates the product, and participation by the retailer. The retailer works with the distributor to remove the product from its shelves and to support consumer information and product returns. In cases where the regulatory agency finds a public health emergency, the agency can request and supervise a recall. Recall notices for prominent food safety issues will likely be on the television news, may be posted by the retailer, and may be distributed by the retailer when consumers with loyalty cards have purchased the food. Recall notices are posted at www.recalls.gov and are available by subscription to e-mail updates and news feeds.

The end-user role in a recall is to check food storage for the specific product (eg, by brand name or container code) and to follow the instructions for the recall. In some cases, the product may have an undeclared ingredient, such as wheat, that would be avoided by some but would be safe for others. In that case, the product would be safe to consume by individuals who do not have to avoid the unlabeled ingredient. Although consumption of this product may be safe for some, it should not be donated to a food bank or pantry because a sensitive individual could be the recipient. In a recall, only the designated products need to be avoided; products with the same name and produced by the same manufacturer that have not been implicated in foodborne illness are not influenced by the recall notification.

A single place of food preparation was reported for 86% of the 13,405 outbreaks reported from the latest reporting period.47 Restaurants and delis were associated with 68% of these outbreaks, including the majority of outbreaks of norovirus and Salmonella infection and 37% of STEC outbreaks. Other important settings for foodborne illness outbreaks were catering or banquet facilities (11% of total outbreaks) and private homes (20% of Salmonella outbreaks and 25% of STEC outbreaks). Schools (2% of outbreaks and 6% of illness from outbreaks) contribute to fewer occurrences of foodborne outbreaks. Hospitals (0.2% of outbreaks and 0.3% of illnesses from outbreaks) and nursing homes (0.9% of outbreaks and 1.5% of illnesses from outbreaks) are typically managed by registered dietitian nutritionists (RDNs); dietetic technicians, registered (DTRs); or individuals with food safety certifications and are less likely settings for outbreaks, even though these programs service many high-risk individuals who would be more susceptible to foodborne illness.

In addition to leafy greens, other unexpected product types have been associated with high-profile outbreaks. These include nuts and nut products and microwavable high-protein entrees.51 In the first case, the products—tree nuts, peanuts, and peanut butter—are low moisture (low water activity) foods that would not encourage pathogen growth. They were contaminated during cultivation and harvesting (tree nuts, such as almonds, pine nuts, hazelnuts, pistachios, and walnuts) and in production facilities (peanut butter) at levels so high that the original contamination load was sufficient to cause Salmonella infections. In the second case, consumers did not recognize that the frozen microwavable products were undercooked and needed sufficient microwaving to heat them to appropriate temperatures, not just to warm them.46 In the peanut butter cases, consumers had no way other than recall to protect themselves because nuts and peanut butter typically receive no cooking by the end user. In the second case, manufacturers have worked to improve visibility and wording of cooking instructions on product packages.

HIGH-RISK POPULATIONS

RDNs and DTRs have unique roles in promoting and establishing food safety cultures when practicing with high-risk populations, which include children younger than age 5 years, seniors aged 65 years or older, pregnant women, and individuals who have compromised immune systems due to health conditions or their treatment, such as diabetes, human immunodeficiency virus/acquired immune deficiency syndrome, kidney failure, and cancer.40,52,53 Many high-risk populations obtain food from “a facility that provides services such as custodial care, health care, or assisted living, such as a child or adult day care center, kidney dialysis center, hospital or nursing home, or nutritional or socialization services such as a senior center.”40 The administrative, supervisory, and training roles of RDNs and DTRs in these and other foodservice settings are critical to the health of their clients. Many high-risk individuals are under the care of an RDN as a component of their therapy—as in dialysis or therapeutic counseling—or as a public health measure—as in the Special Supplemental Nutrition
Program for Women, Infants, and Children—and benefit from food safety education. Thus, food safety is a component in the care of many RDN clients, both individually and as a public health or community nutrition activity. Research has shown that immune-compromised patients recognize RDNs as a “preferred and credible source of food safety information.”

RDNs, DTRs, AND FOOD SAFETY

There are many evidence-based food safety resources available to RDNs and DTRs for personal training and to share with clients in public health and health care settings and with consumers in settings such as grocery stores, festivals, and other public venues. Excellent materials are available online free of charge. These include basic references on foodborne illness and food safety from the FDA and the CDC; the Food Code; information on food and water safety in disaster or emergency situations; CDC journals such as Morbidity and Mortality Weekly Report (www.cdc.gov/mmwr) and Emerging Infectious Diseases (wwwnc.cdc.gov/eid); and food safety materials from the USDA. The Partnership for Food Safety Education, and the Academy. There are notification systems (e-mail and Rich Site Summary feeds) through the National Outbreak Reporting System and the Health Alert Network. The USDA maintains the hotline Ask Karen for consumers who have food safety questions. There are local credible sources of food safety information and training, including state and local health departments and the Cooperative Extension Service.

Examples of certificate programs and practice certifications in food safety are in Figure 2. These can be used to meet requirements for professional development for RDNs and DTRs and for RDNs to maintain state licensure credentials. RDNs and DTRs who work with clients who are at high risk of foodborne illness and those who work in foodservice or other settings that procure, prepare, store, serve, or sell foods must maintain competency in food safety to meet ethics requirements for the profession of dietetics.

During 2010, the Academy adopted the stance that the Academy be a visible participant where food safety decisions are made, such as the Partnership for Food Safety Education and the Conference on Food Protection; in direct conference with federal and state agencies;

<table>
<thead>
<tr>
<th>Credential/certificate</th>
<th>Organization</th>
<th>Website</th>
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</thead>
<tbody>
<tr>
<td>Certified in Comprehensive Food Safety</td>
<td>National Environmental Health Association</td>
<td><a href="http://www.neha.org/credential">www.neha.org/credential</a></td>
</tr>
<tr>
<td>Certified Foodservice Professional</td>
<td>National Association of Food Equipment Manufactures</td>
<td><a href="http://www.nafem.org">www.nafem.org</a></td>
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<tr>
<td>Certified Food Safety Manager</td>
<td>National Registry of Food Safety Professionals</td>
<td><a href="http://www.nrfsp.com">www.nrfsp.com</a></td>
</tr>
<tr>
<td>Certified Food Safety HACCP Manager</td>
<td>National Registry of Food Safety Professionals</td>
<td><a href="http://www.nrfsp.com/HACCP.aspx">www.nrfsp.com/HACCP.aspx</a></td>
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<tr>
<td>Certified Professional Food Manager</td>
<td>Prometric</td>
<td><a href="http://www.prometric.com/en-us/clients/foodsafety/Pages/landing.aspx">www.prometric.com/en-us/clients/foodsafety/Pages/landing.aspx</a></td>
</tr>
<tr>
<td>Certified Professional-Food Safety</td>
<td>National Environmental Health Association</td>
<td><a href="http://www.neha.org/credential">www.neha.org/credential</a></td>
</tr>
<tr>
<td>Certificate in Food Process Engineering</td>
<td>Illinois Institute of Technology</td>
<td><a href="http://www.iit.edu/ifsh/degrees_and_training/specialized_training.shtml">www.iit.edu/ifsh/degrees_and_training/specialized_training.shtml</a></td>
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<tr>
<td>Certificate in Food Safety and Technology</td>
<td>Illinois Institute of Technology</td>
<td><a href="http://www.iit.edu/ifsh/degrees_and_training/specialized_training.shtml">www.iit.edu/ifsh/degrees_and_training/specialized_training.shtml</a></td>
</tr>
<tr>
<td>Food Processing Specialist Certificate</td>
<td>Illinois Institute of Technology</td>
<td><a href="http://www.iit.edu/ifsh/degrees_and_training/specialized_training.shtml">www.iit.edu/ifsh/degrees_and_training/specialized_training.shtml</a></td>
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<tr>
<td>SafeMark</td>
<td>Food Marketing Institute</td>
<td><a href="http://www.fmi.org">www.fmi.org</a></td>
</tr>
<tr>
<td>ServSafe Food Handler (Certificate)</td>
<td>National Restaurant Association Foundation</td>
<td><a href="http://www.servsafe.com">www.servsafe.com</a></td>
</tr>
<tr>
<td>SuperSafeMark</td>
<td>Food Marketing Institute</td>
<td><a href="http://www.fmi.org">www.fmi.org</a></td>
</tr>
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</table>

*HACCP = hazard analysis and critical control points.

Figure 2. Food safety certificates and credentials.
and internationally in Codex Alimentarius discussions. RDNs and DTRs have unique roles in promoting and establishing food safety cultures in clinical and community settings because their training integrates food and health, both preventive and therapeutic. Standards from the Accreditation Council for Education in Nutrition and Dietetics include food safety in core competencies for both RDNs and DTRs. Other health care providers and community health professionals may not have this integrated training. RDNs integrate food safety into medical nutrition therapy and counsel clients with reduced immune function; provide effective food safety programming in community nutrition programs that focus on seniors (Meals on Wheels and other aging programs), pregnant women and infants (Special Supplemental Nutrition Program for Women, Infants, and Children), and other high-risk clients; report potential foodborne illness to their local health departments; respond to food recalls for their institutions and clients; participate in food and water disaster/emergency task forces and situations; apply food safety principles in diverse practice settings and to use the best evidence available in their practices. Development of additional analysis schemes would be useful for these areas, including reviews of antibiotic use in farm animals and use of new food additives and processes. RDNs and DTRs are encouraged to expand their food safety knowledge and seek and apply advanced training in food safety in their practice settings and to use the best evidence available in their practices.

References


This Academy of Nutrition and Dietetics position was adopted by the House of Delegates Leadership Team on October 20, 1996, and was reaffirmed on June 15, 2001; July 11, 2006; and February 15, 2011. This position is in effect until December 31, 2017. Requests to use portions of the position or republish in its entirety must be directed to the Academy at journal@eatright.org.

Authors: Mildred McInnis Cody, PhD, RDN (Georgia State University, Atlanta, GA), and Theresa Stretch, MS, RDN, CP-FS (Synergy Visions, LLC, Oxford, MS).

Reviewers: Julie A. Albrecht, PhD, RD (University of Nebraska, Lincoln, NE); Food and Culinary Professionals Dietetic Practice Group (Cynthia Chandler, MS, RD, LD, Dietary Consultants, Richmond, KY); Dean Chiarello, MA, RDN, HFS, CHES, REHS (Arizona State University, Phoenix, AZ); Academy Quality Management Committee (Alana Cline, PhD, RD, University of Northern Colorado, Greeley, CO); Hunger and Environmental Nutrition DPG (Ashley Colpaart, MS, RD, Colorado State University, Fort Collins, CO); Sharon Denny, MS, RD (Academy Knowledge Center, Chicago, IL); Public Health and Community Nutrition Dietetic Practice Group (Elizabeth Yakes Jimenez, PhD, RD, University of New Mexico, Albuquerque, NM); Junehee Kwon, PhD, RD (Kansas State University, Manhattan, KS); Management in Food and Nutrition Systems Dietetic Practice Group (Charnette Norton, MS, RDN, LD, FADA, FAND, FFCSI, The Norton Group, Inc, Missouri City, TX); Mary Pat Raimondi, MS, RD (Academy Policy Initiatives & Advocacy, Washington, DC); Alison Steiber, PhD, RD (Academy Research & Strategic Business Development, Chicago, IL).

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