



Practice Paper of the Academy of Nutrition and Dietetics: Role of the Registered Dietitian Nutritionist in the Diagnosis and Management of Food Allergies



ABSTRACT

Incidence of food allergy has increased significantly over the past decade and represents an important health issue for millions of Americans. Diagnosis of immunoglobulin E–mediated food allergies is sometimes difficult because blood and skin tests have high rates of false positives, and oral food challenges are uncommon due to the expense and potential for serious reactions. Accurate diagnosis is crucial to avoid unnecessary dietary restriction, especially in children. Because registered dietitian nutritionists often work independently, receiving referrals for dietary education and guidance for a patient who is followed by one or several other practitioners, navigating the data available and making the appropriate follow-up contact optimizes treatment. The purpose of this paper is to provide guidance to the registered dietitian nutritionists and nutrition and dietetics technician, registered on appropriate and evidence-based nutrition counseling for diagnosis and management of food allergies.

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IT IS ESTIMATED THAT >15 million Americans and >300 million individuals worldwide suffer from food allergies.^{1,2} The diagnosis and management of food allergies are significant for several reasons, not the least of which is the associated substantial economic, psychosocial, and physiological burdens. In 2013, Gupta and colleagues³ estimated that the economic cost of food allergies in the United States

was approximately \$24.8 billion annually, including medical costs, lost productivity, out-of-pocket costs, and lost opportunity costs. In a review, Cummings and colleagues⁴ stated that individuals with a food allergy consistently rated quality of life lower than those without, with a more significant negative impact on psychosocial well-being than having a chronic disease, such as diabetes. Finally, the US Food and Drug Administration reports that food allergies are responsible for as many as 30,000 hospitalizations, untold medical visits, and even deaths.⁵ For these reasons, accurate diagnosis, effective medical management, and appropriate support are essential. The role of the registered dietitian nutritionist (RDN) is as clinician, counselor, and advocate, while the nutrition and dietetics technician, registered (NDTR) can work as a team member to provide support, education, and advocacy as well.

DEFINING AND IDENTIFYING FOOD ALLERGIES

According to the National Institute of Allergy and Infectious Disease's (NIAID) Expert Panel, "a food allergy is defined as an adverse health effect

arising from a specific immune response that occurs reproducibly on exposure to a given food."⁶ A non-immune-mediated reaction or a reaction that occurs only sometimes when a food is eaten is not considered a food allergy. According to Fleischer,⁷ most adverse food reactions are not due to allergy. Food sensitivities and intolerances, for which there are few evidence-based clinical laboratory tests, will not be discussed in this paper. Eosinophilic esophagitis, food protein–induced enterocolitis syndrome, and celiac disease will not be covered in this paper because they each have their own specific diagnostic criteria and treatments and require additional expertise and cooperation between the RDN and other members of the care team.

This paper will explore the role of the RDN in working with patients and clients with immunoglobulin E (IgE)–mediated food allergy; therefore, all references to food allergy in this paper will specifically refer to IgE-mediated food allergy.

Allergic reactions to >170 different foods have occurred; however, >90% of allergic reactions to food occur in response to the following foods: milk, egg, peanuts, tree nuts, soy, wheat, fish,

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and crustacean shellfish.^{5,6} The NIAID-sponsored expert panel developed definitions in 2010 for what constitutes a food and food allergen for the purpose of providing guidance on diagnosis and management. “A food is defined as any substance—whether processed, semiprocessed, or raw—that is intended for human consumption, and includes drinks, chewing gum, food additives, and dietary supplements. Substances used only as drugs, tobacco products, and cosmetics (such as lip-care products) that may be ingested are not included.”⁶ Food allergens are typically proteins that, when ingested, result in an immune response.⁶

The food allergy immune response can vary from mild to life threatening. Anaphylaxis, the most severe kind of reaction, can occur. Signs and symptoms of food allergy include some or all of the following: rash or hives; runny nose; itching and watery eyes; gastrointestinal distress, such as nausea, vomiting, and diarrhea; itching and/or swelling of the mouth or throat; wheezing and breathing difficulty; and a decrease in blood pressure that can result in dizziness, fainting, and death. Reactions for IgE-mediated food allergies occur within minutes to hours after ingestion, unlike other adverse food reactions, which can take longer to manifest.⁶ This condition does not cause migraines, behavioral or developmental disorders, arthritis, seizures, or inflammatory bowel disease.⁸ Reactions are unpredictable from incident to incident, between individuals, and among various types of food allergies.

PREVALENCE AND DISTRIBUTION

Determining prevalence is challenging due to a variety of issues, including lack of a centralized national health record database, inconsistencies in diagnosis, and limitations of surveys (eg, selection bias). It is estimated that 3.5% to 4% of the total US population, including about 4% of adults and 5% to 8% of children, have a food allergy.^{9,10}

Allergies can vary based on location worldwide and within the United States.¹¹ This might be more a reflection of what is in the diet rather than an increased sensitization related to location. Research has demonstrated a possible link between urban living and

food allergies, with higher rates of food allergies among children living in more densely populated cities compared with those in more rural areas.¹² In addition, this same research suggests that race and genetics appear to play a part, as African-American and Asian children are at higher risk for developing food allergies, but less likely to be diagnosed by a physician.¹⁰

CAUSES AND INFLUENCES

Scientists do not yet know what causes some people to have food allergies and others not, but genetic and environmental factors are believed to contribute to their development. A variety of hypotheses have been suggested, with the most widely accepted being the hygiene hypothesis, proposed by Strachan, according to Stanwell-Smith and Bloomfield, in 1989.¹³ The idea behind the hygiene hypothesis is that exposure to bacteria, viruses, and disease helps to train the immune system. Pollution, changes in diet, maternal factors, and sedentary lifestyle are also being considered as causes.¹⁴

Recent and emerging research has implicated the microbiome as a potential influencer on the development of food allergies. Differences in the microbiome exist among children who received antibiotics shortly after birth, those who were born vaginally vs by cesarean section and those who are breastfed vs formula fed.¹⁴ Each of these differences impacts the development of the infant microbiome and influences the immune system and possibly the development of food allergies.

Some have hypothesized that the Westernization of traditional diets and lifestyles has encouraged the development of food allergies, perhaps by their impact on the microbiome. A Western diet, according to Skypala and Vlieg-Boerstra,¹⁴ includes refined grains, soups and sauces, savory snacks, other fats, sugar-containing beverages, and meat. Conversely, a nutrient-dense Mediterranean diet with healthy fats helps reduce inflammation and may protect against allergy.¹⁴ Skypala and Vlieg-Boerstra suggest that the key is in the whole dietary pattern, which provides adequate nutrients and promotes a healthy microbiome. This approach to a diet that may allow individuals to

avoid the development of food allergies fits appropriately within the Academy of Nutrition and Dietetics' position paper, “Total Diet Approach to Healthy Eating.”¹⁵

FOOD ALLERGY DIAGNOSIS

It is essential to utilize an evidence-based approach in the diagnosis of food allergies, ideally with the RDN working alongside the individual's care team. Evidence shows that >20% of individuals are modifying their diet due to a perceived food allergy.⁸ The consequences of unnecessary dietary restriction can be serious, and range from nutritional deficiencies to reduced quality of life to significant total economic impact.^{3,16} A case study of a 15-month-old infant whose diet was severely limited by her health care team, in the absence of objective data for food allergy diagnosis, resulted in the development of kwashiorkor and acquired acrodermatitis enteropathica.¹⁷ While this is an extreme example, it highlights the importance of accurate diagnosis and treatment.

History

The first step in diagnosing a food allergy is collecting a thorough history. The European Academy of Allergy and Clinical Immunology has developed a detailed food allergy-focused diet history tool for both adults and children.¹⁸ Figure 1 provides a summary of the adult tool questions for taking a history in a case of possible food allergy. In addition, the NIAID-Sponsored Expert Guidelines recommend nine critical questions when taking a history.⁶ These nine questions may be enough to determine the need for a more detailed food allergy focused dietary history questionnaire. The RDN and NDTR have an important role to play in collecting accurate information from patients and caregivers regarding history and in disseminating this information to other health care providers to avoid accidental exposures via therapy or medications that may contain potential allergens.

Testing

Accurate diagnosis of a food allergy should include a detailed and convincing medical history, physical examination, and clinical diagnostic testing.^{6,7} Sensitization—the condition

| Category | Items to consider |
|----------------------------|--|
| Symptom and atopic history | <ul style="list-style-type: none"> • Ask specific questions about symptoms and pattern of appearance by system, including details regarding skin, oropharyngeal, gastrointestinal, upper and lower airway, and cardiovascular symptoms. Has anaphylaxis occurred? Do symptoms occur intermittently or continuously? |
| | <ul style="list-style-type: none"> • Determine the age, circumstances under which, and location where symptoms first appeared. |
| | <ul style="list-style-type: none"> • What were past treatment experiences? |
| | <ul style="list-style-type: none"> • Were there any extrinsic factors, such as medications, exercise, or alcohol that might influence reactions? |
| | <ul style="list-style-type: none"> • Are there current and/or previous potentially associated conditions (eg, other atopic disease or asthma) in the client? What about other family members? Infertility or pregnancy? |
| | <ul style="list-style-type: none"> • Assess anxiety regarding condition. |
| Linking foods to symptoms | <ul style="list-style-type: none"> • Catalogue current medications or supplements. |
| | <ul style="list-style-type: none"> • Determine what previous food elimination may have been attempted and whether or not it was helpful. |
| | <ul style="list-style-type: none"> • Ask about symptoms related to food. Collect a detailed list of potential foods currently being avoided as a means to avoid symptoms. |
| | <ul style="list-style-type: none"> • Based on the information collected, determine whether or not the individual is currently on a restricted diet and/or at risk for deficiencies. |

Figure 1. Initial questions and information to consider for clients with possible food allergy. Adapted with permission from Skypala and colleagues' Diagnostic Tool for Adults.¹⁸ Note: For interpretation of the questionnaire, Skypala and colleagues provide a detailed chart to interpret symptoms, categorizing them into likely immunoglobulin E–mediated food allergy vs likely non-immunoglobulin E–mediated food allergy or other adverse food reactions. An algorithm for oral allergy syndrome is also provided.

by which the body makes IgE antibodies to a specific substance (usually a protein)—can occur without resulting in clinical food allergy.⁷ Blood testing is highly effective for ruling out a food allergy. However, even with positive blood tests, dietary modification is unnecessary if there are no actual signs and symptoms of allergy.⁷

Serum IgE tests measure the amount of antibodies found in the blood.¹⁹ Skin-prick tests are frequently used as an early confirmation of food allergy after a convincing history. This involves placing a drop of solution containing the allergenic protein on the skin, then pricking or scratching the skin to introduce the allergen into the upper layer of skin.²⁰ The skin is then monitored for reaction (eg, wheal/flare). Both of these tests can be an important part of collecting information for diagnosis, however, they are not adequate for diagnosis alone.

The NIAID Guidelines recommends against broad skin and blood testing (allergen panels) of potential allergens without specific clinical evidence of reactivity.⁶ These tests have a high false-positive rate, meaning that many people

will test positive yet do not have a clinically relevant food allergy and may result in significant overdiagnosis.^{6,7}

Food Challenge: The Gold Standard

The double-blind, placebo-controlled food challenge is the gold standard for diagnosing a true food allergy.^{6,7} Ideally, neither the individual with potential allergies nor the individual administering the test know whether the patient is receiving the allergen or a placebo during the test. To administer the challenge, the individual is given a small amount of the suspect food and monitored for a reaction.^{21,22} If there is no reaction, the individual eats continuing doses of the allergen until they have a reaction or have eaten the equivalent of a typical serving without reaction.^{21,22} Food challenges should only be conducted under the supervision of a physician with experience conducting them, with adequate safety personnel, and emergency medication on hand.⁶ While food challenges are the gold standard, many physicians are hesitant to perform them because they

are expensive, time consuming, and have the potential to induce severe reactions.⁶ Due to the potential for severe reactions and scope of practice, RDNs and NDTRs should never perform food challenges in isolation.

Diagnostic Tests not Recommended for Food Allergy Diagnosis

According to the NIAID, there are a variety of non–evidence-based tests that should not be used for diagnosing a food allergy.⁶ Namely, basophil histamine release/activation, lymphocyte stimulation, facial thermography, gastric juice analysis, endoscopic allergen provocation, hair analysis, applied kinesiology, provocation neutralization, allergen-specific IgG, cytotoxicity assays, electrodermal test (Vega), and mediator release assay (LEAP diet).⁶

According to the Academy's Code of Ethics, "The dietetics practitioner practices dietetics based on evidence-based principals and current information."²³ Therefore, it is essential for those working with clients with potential food allergies to utilize

evidence-based practices to prevent unnecessary over-restriction of the diet, which could lead to malnutrition, nutritional deficiencies, economic burden, and unnecessary increased anxiety. This is particularly important in children, for whom a varied and adequate diet is essential to ensure appropriate growth and impacts long-term health.

NUTRITION CARE PROCESS

The Nutrition Care Process (NCP) provides a framework for standardizing care by all RDNs and NDTRs.²⁴ Regardless of the area of practice, the NCP can be used to ensure evidence-based, appropriate, and standard care. Utilizing the nutrition assessment, nutrition diagnosis, and nutrition intervention, the RDN and NDTR can ensure that individuals with food allergies receive the highest quality care. Moreover, utilizing the final step of nutrition monitoring and evaluation, those with food allergies can grow normally, avoiding nutritional deficiencies for which their condition makes them susceptible.

Nutrition Assessment

A thorough nutrition assessment requires the collection of physical, historical, and laboratory data. Taking a diet history is important for initial food allergy diagnosis, as well as for the development of a nutrition diagnosis, and is an area where RDNs can play an especially important role in identifying abnormalities in diet, such as significant restrictions. A thorough dietary history can also reveal symptoms, such as those that may indicate nutritional deficiencies as a result of over-restriction and malnutrition. Dietary and medical histories provide helpful information to aid the RDN in making the appropriate nutrition diagnosis and preparing intervention.

The RDN should review the dietary history with the patient or caregiver, including determining what foods are being avoided, what foods may have been introduced and tolerated, when was the last reaction to known ingestion of potentially allergenic food, does the individual tolerate baked foods (eg, egg and milk) compared with uncooked foods, and evaluating nutritional adequacy of the current diet and competency with both

feeding and eating. With pediatric patients, it is important to gather this information from all caregivers. Identifying nutritional deficiencies compared with current Dietary Reference Intakes for age is an essential part of collecting a dietary history. In addition, the dietary history will determine the adequacy of allergen elimination alongside a history of accidental ingestion.

A complete nutrition assessment—for instance, using subjective global assessment techniques—should be done, including obtaining anthropometric data, including weight, height, weight for length, body mass index (patients older than 2 years), head circumference (patients younger than 36 months), assessment of individual growth velocity/growth history, and comparison of growth to the reference population.²⁵

A critical element of the nutrition assessment is the nutrition-focused physical examination. Utilizing inspection, palpation, percussion, and auscultation, the RDN can gather important information about the patient's symptoms as they relate to food allergies. The nutrition-focused physical examination should begin with a general inspection (assessing the patient's overall weight, height, and physical appearance), followed by a head-to-toe examination. Assessing the patient for skin issues such as eczema, and signs of nutrition deficiency, are key areas for those with possible food allergies.

Depending on the physical assessment and history, as well as type and number of food allergies, specific blood tests can be helpful in identifying potential nutritional deficiencies. Nutrition-specific tests to consider include serum calcium, serum or plasma zinc, hemoglobin, mean corpuscular volume, serum iron, vitamin D 25-hydroxy, plasma α -tocopherol (vitamin E).²⁶ Patients with cow's milk allergy or with more than two food allergies should be assessed for calcium, vitamins D and E, and zinc. Iron status via ferritin level should be checked, if warranted.²⁶

Developing the Nutrition Diagnosis

Utilizing the NCP, the RDN should develop a nutrition diagnosis. The

diagnosis is meant to name a specific nutrition problem that can be resolved or improved by nutrition intervention provided by the RDN.²⁷ Within the context of food allergies, some examples of diagnoses include nutrient deficiencies, overly restrictive eating behavior, lack of safe cooking skills, limited ability to self-advocate, or food- and nutrition-related knowledge deficit. The diagnosis should be stated as a PES (Problem, Etiology, and Signs and Symptoms) statement and should be used to develop the intervention needed.

NUTRITION INTERVENTION

A detailed intervention should address the specific diagnosis established utilizing the nutrition assessment. It will generally involve much education and follow-up. The following sections discuss specific recommendations to assist the RDN and NDTR in working with clients within specific stages of life or situations (Figure 2).

Pregnancy and Early Feeding: Potential for Prevention

Whenever possible, it is best to intervene before a nutrition problem begins. Emerging evidence suggests that early nutrition intervention might prevent food allergies.²⁸⁻³⁰ Previous guidelines (which are no longer recommended) suggested that those at high risk for development of food allergies should avoid potential allergens during pregnancy, breastfeeding, and for the first 1 to 3 years of early feeding. However, starting in 2008, the American Academy of Pediatrics released guidelines stating that evidence did not support avoidance during these times as a means of preventing food allergies.³¹ More recently, the American Academy of Allergy, Asthma, and Immunology published guidelines providing guidance on nutrition intervention, which might prevent food allergies, as well as recommendations on early introduction of peanuts to high-risk infants.^{32,33}

Pregnancy. As with many other conditions, allergies can be influenced by maternal diet. Once it was thought that allergens should be avoided during pregnancy to prevent food allergies. However, research does not support the avoidance of any foods during pregnancy as a means of preventing

| Area of focus | Key messages | Select food allergy resources for practitioners and clients |
|--|---|--|
| Safe and nutritious alternatives and substitutes for commonly allergenic foods | <ul style="list-style-type: none"> Prevent nutritional deficiencies by substituting foods that provide those nutrients most likely to be missed. | <ul style="list-style-type: none"> Academy of Nutrition and Dietetics' Food Allergies and Intolerances: Client Education Tools for Dietary Management, by Janice Vickerstaff Joneja, PhD, RD Academy of Nutrition and Dietetics' Nutrition Care Manual: www.nutritioncaremanual.org |
| Label reading | <ul style="list-style-type: none"> Read label for potential allergens three times for every item, every time—once at purchase, again when storing, and a final time before preparing or eating. Foods can change anytime due to manufacturer product substitutions and reformulations. | <ul style="list-style-type: none"> Food and Drug Administration Food Allergy Labeling and Consumer Protection Act of 2004 Academy of Nutrition and Dietetics' Food Allergies and Intolerances: Client Education Tools for Dietary Management, by Janice Vickerstaff Joneja, PhD, RD |
| Dining out in restaurants | <ul style="list-style-type: none"> Research restaurant in advance online and by calling to speak with staff. Always notify server of food allergy. Ask questions for clarification. Consider giving staff a "chef card" listing the specific foods that must be avoided. Do not dine in a restaurant that may not be able to provide safe food. Avoid buffets due to potential cross-contact. Peanut- and tree nut-allergic individuals should avoid Asian restaurants, as these are frequently used ingredients and not always easily identified. | <ul style="list-style-type: none"> AllergyEats.com Food Allergy Research and Education Chef Card: http://www.foodallergy.org/managing-food-allergies/dining-out |
| Managing food allergens in schools | <ul style="list-style-type: none"> Food allergies are considered a disability and reasonable accommodations must be made. All allergic students should have an Emergency Anaphylaxis Plan. A comprehensive approach to managing food allergies in schools focuses on prevention, caution, and preparation for a reaction. Schools should address: annual staff food allergy training; maintaining non-student-specific epinephrine (where legal); and clear communication of when and where allergenic foods may be present, among others. | <ul style="list-style-type: none"> Center for Disease Control and Prevention Voluntary Guidelines for the Management of Food Allergies in Schools and Early Childhood Education Food Allergy Management and Education by St. Louis Children's Hospital Food Allergy & Anaphylaxis Connection Team's Food Allergy School Curricula Programs: http://www.foodallergyawareness.org/education/school_curricula_program-2/ |

Figure 2. Nutrition interventions and educational opportunities for clients with food allergies.

allergies. For example, in a study of 8,205 children, those whose mothers ate the most peanuts and tree nuts had a significantly lower risk of having a child with peanut allergy.²⁹ In addition,

many potentially allergenic foods are excellent sources of nutrients and affordable, including eggs, peanuts, some tree nuts, and some fish. Pregnant women should be encouraged to

eat these foods as a means of improving nutrition, not avoid them.

Breastfeeding. Breastfeeding confers a variety of health benefits to infants,

which can last well into adulthood. Research on the influence of breastfeeding on the development of food allergy has been inconclusive. Current guidelines do not recommend restricting breastfeeding mother's diets as a means of preventing food allergies.^{31,32} However, restrictions may be necessary in the mother's diet if the child develops food allergies while breastfeeding, and the RDN and NDTR can provide education to ensure successful breastfeeding, adequate nutrition for the mother, and safe nutrition for the infant.

Early Infant Feeding. Evidence-based guidelines for feeding children, including those from the American Academy of Pediatrics, recommend³²:

- no need to avoid potential allergens during pregnancy or while breastfeeding (unless the mother is allergic);
- exclusive breastfeeding for about the first 6 months;
- high-risk infants (those with eczema or a first-degree relative with allergy) can be fed partially hydrolyzed formula to help reduce cow's milk allergy (although not in place of breastfeeding, if that is an option);
- introduce solid foods at 4 to 6 months;
- once a child has shown tolerance of some other foods, potentially allergenic foods can be introduced (in safe forms, such as thinned peanut butter vs whole nuts, as with all other foods);
- introduce potential allergens at home, not in restaurants or elsewhere, and watch for reactions;
- for those at high risk, discuss with pediatrician or allergist before introduction; and
- siblings of a child with food allergies should be evaluated by allergist before introducing peanut protein.²⁶

Research has shown that children who were fed eggs, milk, and peanut proteins early had lower rates of these allergies.^{28,29} In the Learning Early About Peanut Allergy study of 530 children at high risk for developing peanut allergies (subjects had either moderate to severe eczema or egg

allergy), where half were randomized to avoid peanuts and half were fed peanut protein (in the form of peanut butter or peanut powder) between 4 and 11 months, food allergies among those who experienced early introduction of peanuts were reduced by 86% among those who tested negative and 70% among those who tested positive to peanut allergy at the start of the study.²⁸ All children in the study received skin-prick tests and oral food challenges before study entry.

The follow-up to the Learning Early About Peanut Allergy study, the LEAP-On study, showed that when peanut consumption was discontinued for nearly 12 months after early introduction, infants who had eaten peanut early remained protected against development of peanut allergy.^{34,35} Another study by the same group, called the Enquiring About Tolerance study, tested the early-introduction hypothesis with multiple potentially allergenic foods and concurrent breastfeeding. Investigators discovered protection for the early introduction of peanut, milk, and egg, but not for fish, wheat, or sesame.³⁰ Poor adherence to the dietary protocol confounded results.³⁰

As the result of the Learning Early About Peanut Allergy study, the World Allergy Organization, along with nine other international and domestic allergy and pediatric health organizations, released the Consensus Communication on Early Peanut Introduction and the Prevention of Peanut Allergy in High-Risk Infants.³³ The document recommends the early introduction of peanut protein, in a safe form, for children at high risk for development of peanut allergy, and provides some guidelines on how this should be done. At the writing of this document, the NIAID is in the process of preparing an addendum document to provide additional guidelines on the implementation of these recommendations in the United States.³⁶

Microbiome. The microbiome is a growing area of research in many areas of health, including food allergies. Research has shown that reduced diversity within the microbiota increases risk of food allergies.¹⁴ Antibiotics, method of birth delivery (cesarean vs vaginal), and diet all have an impact on the natural development of the body's microbial ecosystem.¹⁴ RDNs can

encourage breastfeeding, complementary feeding in line with the research, and a diverse diet to promote overall good health, and that can also help promote colonization of healthy bacteria and development of a more diverse microbiome.

Once Food Allergy Begins: From Children to Adults

The care of young patients can be more complex than that of adults in that it always involves the whole family. In addition to educating the patient, the RDN must also educate parents and other caregivers and prepare them to educate any others responsible for the care of the child. Education begins at diagnosis and should continue throughout the lifecycle. Parents of children with allergies, as well as the children themselves, might be highly anxious, so a focus on increasing self-efficacy and self-advocacy for both, while reducing fear, can be helpful.

Nutritional deficiencies are a real concern for individuals with allergies, especially children. Stunted growth is a potential issue for children diagnosed with food allergies, particularly those with cow's milk and multiple food allergies.³⁷ A 2014 study found that children with food allergies (6 to 36 months) had lower energy and protein, calcium, zinc, and polyunsaturated fatty acid intakes, as well as significantly lower weight to length ratios compared with healthy controls.¹⁶ With tailored dietary counseling, these subjects experienced correction of nutritional deficiencies and improved anthropometrics.¹⁶ The RDN can take care to collect detailed dietary history or food frequency in order to identify and address potential gaps. Teaching parents and caregivers simple safe cooking techniques, nutrient-dense substitutes for allergenic foods, and assistance with finding resources for allergen-safe recipes is essential.

Avoidance: Elimination Diet and Nutrition Education. Nutrition counseling for individuals with food allergies focuses primarily on education to avoid the allergen, avoiding or addressing nutritional deficiencies by replacing allergens with nutritionally adequate and safe foods, communicating about the allergy, and empowering the patient with information on

what they should eat and how to navigate meals away from home. Nutrition counseling should be age-appropriate and include the individual with allergies as often as possible. Food allergies are most often diagnosed early in life, but they can occur at any age. A study by Sicherer and colleagues³⁸ developed and validated food allergy education materials that were found to be highly effective. RDNs should focus heavily on these areas, as well as on finding ways to support healthy quality of life for patients.

Guidelines recommend extensively hydrolyzed casein hydrolysate formula (not partially hydrolyzed whey-based formulas) as an option for those children diagnosed with cow's milk protein allergy because most children with allergies will not react to the broken-down peptides. For those who continue to react, an amino acid-based formula may be indicated.³⁹ In addition, soy formula may be considered after 6 months of age and in the absence of soy allergy.³⁹

In order for an individual to avoid the allergen, they must first be able to identify it, both in its physical form and in writing on labels and menus. For example, in a 2012 study, neither adults nor children could reliably identify nuts in all their forms.⁴⁰ Ensuring that the child or adult knows what the food looks like in its whole and prepared form can be an important way to begin education. In addition, label-reading education should be part of nutrition counseling and education.

The Food Allergen Labeling and Consumer Protection Act (FALCPA) of 2004 required that manufacturers clearly label foods if they contain any of the top eight allergens (ie, milk, eggs, peanuts, tree nuts, wheat, soy, fish, and crustacean shellfish).⁴¹ The item must be identified by its common name either in the ingredients list, in parentheses in the ingredient list, or in a separate statement (often called the "contains statement"). Labeling has improved since the implementation of FALCPA, but issues still exist. For example, a 2015 study by the US Food and Drug Administration discovered undeclared milk in 33% of dark chocolate samples tested, which did not mention milk on the labels in any way, and in 75% of those that stated they "may contain" milk.⁴² In fact, there were more food allergy-related recalls

in 2015 than in the previous 17 years, according to the Food Allergy Resource and Research Program.⁴³ FALCPA applies to all packaged foods, but does not include fresh food items (such as fruit and vegetables, fresh meat, and fresh seafood, which are regulated by the US Department of Agriculture, not US Food and Drug Administration) or foods prepared in a restaurant or other foodservice establishment. Some manufacturers use precautionary label statements, which are voluntary and unregulated, that indicate a product "may contain" an allergen or was processed in a facility that also processes an allergen. Research has shown that <6% of items with precautionary labeling (compared to <2% of those without precautionary labeling) actually contain the potential allergen at levels that could cause reactions and, while small, this is a real risk for those with allergy.⁴⁴ For these reasons, precautionary labeling statements create confusion among the community with allergies. Most practitioners recommend that items stating that they "may contain" allergens to which an individual is allergic be avoided.

In a study of preschool-aged children with milk, egg, or peanut allergy, >70% of participants suffered reactions, despite the fact that parents had received advice on avoidance.⁴⁵ In addition, parents are the most frequent providers of foods that contained the allergen.^{45,46} In addition to label reading, individuals with food allergies and their families must learn safe food-handling practices to prepare foods safely at home. If the potential allergen remains part of the nonallergic family members' diet and in the household, prevention of cross-contact is essential. Assigning the individual with an allergy a space in food-storage areas (ie, cabinets, refrigerator, and freezer) can be helpful for both instruction and preventing accidental cross-contact.

Quality of Life

Individuals with food allergies and their caregivers suffer from reduced quality of life and high levels of anxiety across multiple areas of life activities, including general health, school, eating outside the home, and even activities within the family.⁴ Those with multiple food allergies; allergy to peanut, tree nut, or sesame; history of

severe reactions; and those who have been administered an autoinjectable epinephrine device have very poor quality of life.⁴⁷ For children with food allergies, bullying is a serious issue, with research indicating >45% have been bullied at some time as the result of their food allergy.⁴⁸

Support groups for those with food allergies can be helpful for individuals and families with managing their emotional well-being while managing food allergies. Pediatric psychologists and therapists trained in assisting those with chronic illness can be helpful additions to the care team.

The RDN may be able to assist individuals and families to improve quality of life by ensuring accurate diagnosis, nutrition counseling focused on improved self-efficacy, and by providing support. A study showed that individuals who underwent oral food challenge to confirm food allergy experienced improved quality of life, whether they passed or failed the challenge.⁴⁹ RDNs should encourage patients and caregivers to stay connected to their allergist and primary caregiver and seek regular annual follow-up.

TREATING ALLERGIC REACTIONS

While avoidance is currently the primary course of food allergy management, treatment of food allergy reactions remains pharmacologic. Antihistamines are frequently utilized to control nonsevere symptoms.⁶ However, the primary treatment for anaphylaxis is epinephrine (adrenaline).⁶ Anaphylaxis is a serious and potentially life-threatening reaction that can progress quickly. A written emergency action plan is an important tool for individuals and caregivers of children with food allergies that identifies how to manage a potentially life-threatening reaction. Patients and caregivers should be educated to avoid reactions and how to respond when they do occur. According to a 2014 study of fatal anaphylaxis in the United States, it was estimated that approximately 14 deaths per year were due to food-induced anaphylaxis.⁵⁰

Automatically injectable epinephrine (such as EpiPen) should be prescribed by a physician at the appropriate dose for individuals who have previously experienced food-related anaphylaxis or who are at risk

for developing anaphylaxis. A study of individuals with food allergies (15 to 25 years old) showed that 34% fail to always carry their epinephrine.⁵¹ RDNs should encourage patients and all caregivers to be trained on the proper administration of epinephrine. Finally, patients with food allergies should know that they should seek emergency medical attention any time an epinephrine autoinjector has been used.

Treatments Being Researched

Immunotherapy. Success has been seen with a variety of delivery methods for food allergy immunotherapy with the goal to desensitize or induce tolerance in the individual with an allergy. *Desensitization* indicates the ability to tolerate an allergen for a short term without significant reactions, while *tolerance* is defined as “symptom free after consumption of the food or upon oral food challenge weeks, months, or even years after the cessation of treatment.”⁶ Oral immunotherapy (OIT) has shown a significant percentage of individuals with food allergies becoming significantly more tolerant (approximately 30% to 40%) of their potential allergen, but additional research is needed to determine long-term efficacy and to ensure the safety of patients.⁵² OIT should only be conducted in a medically supervised environment by researchers and physicians with the ability to handle potentially life-threatening reactions. During OIT, participants receive small doses of food allergen by mouth, with increasing doses, during the course of weeks or months until reactions occur or tolerance is achieved.⁵²

Sublingual immunotherapy is a similar method for developing tolerance, whereby tiny diluted amounts of allergen are delivered in solution under the tongue of individuals with allergies.⁵² The beginning dosage for sublingual immunotherapy is much lower and progresses much more slowly than OIT, resulting in fewer adverse reactions. Successful desensitization using this method has been seen among as many as 70% of participants.⁵²

In addition to OIT and sublingual immunotherapy, desensitization has been achieved utilizing epicutaneous patch therapy.^{52,53} A simple skin patch

is impregnated with allergenic protein and is then applied to the skin.⁵³ The major advantage of epicutaneous patch therapy is the significantly reduced risk for severe reactions.⁵³

Probiotics. To date, the administration of probiotics alone has not been shown to prevent or treat food allergies, despite the fact that researchers agree that differences in the microbiome of those with allergy and those without exist. Probiotic supplementation may reduce the risk for, or speed recovery from, atopic dermatitis, which is a risk factor for the development of food allergies, but results have not shown that supplementation prevents food allergies.⁵⁴

Nutrition Monitoring and Evaluation. Whatever the intervention, it is essential to remain connected to the patient in order to provide appropriate follow-up. Monitoring and evaluation will ensure that the nutrition problem has been addressed and lead to better outcomes.

Research by Canani and colleagues¹⁶ proves the importance of the ongoing relationship between the RDN and individual with food allergies or the caregiver, showing the significantly reduced risk for nutrition-related deficiencies among children with food allergies. Those with multiple food allergies, compared with those having just one food allergy, are at highest risk. Working with an RDN has shown improvements in anthropometrics, laboratory measures, and nutritional intake.¹⁶ RDNs can work collaboratively with the patient’s family, medical team, and community resources as part of a care team to provide comprehensive care.

FOOD ALLERGIES, COMMUNITY NUTRITION, AND THE DIETETICS PRACTITIONERS

RDNs and NDTRs have the opportunity to serve those with food allergies in a variety of community settings. The following information provides guidance for those RDNs who work in foodservice and retail and may advocate on behalf of those with food allergies. There is a movement to increase awareness about food allergies, including increasing access to

emergency epinephrine in public places.

School Foodservice

Managing food allergies in schools is particularly important because as many as 16% to 18% of food allergy reactions happen there, including among children who did not previously know they had allergies.⁵⁵ Schools present a unique opportunity for children with allergies to learn about self-management within the context of a safety net, provided by well-trained adults.

The Centers for Disease Control and Prevention provide voluntary guidelines for schools on the management of food allergies in schools and early child education programs.⁵⁶ Food allergy management in schools should utilize a comprehensive approach that include standardized forms and systems while incorporating individualized emergency plans. At the district and school level, policies should require specific provisions for accommodations, annual staff training, and empower local school staff to champion food allergy management. Banning specific foods cannot guarantee a completely safe environment because it is impossible to prevent food allergens from being brought into schools.⁵⁶ It is important for school districts to be aware of federal, state, and local laws with regard to food allergy management and managing students with disabilities, including potentially life-threatening food allergies.

At the local level, accommodations should be tailored to meet the needs of the individual student and may be able to utilize individualized health plans, section 504 plans, or individualized education plans. Within the cafeteria, staff should be trained to identify potential allergens, read labels, safely prepare potentially allergenic foods (including prevention of cross-contact) and respond to reactions. Menus and signage should clearly include the top eight potential allergens. Schools also need to employ methods to identify those with food allergies, while simultaneously providing them with confidentiality as required by law.

RDNs are uniquely trained to understand the clinical perspectives of food allergy management, as well as provide food safety training that includes food allergen handling to

prevent cross-contact and accidental ingestion of allergens. Nutrition and dietetics practitioners specializing in children's nutrition have expressed a lack of confidence in managing food allergies, as well as concern about communicating with other stakeholders.⁵⁷ RDNs can work on staff for schools supervising child nutrition services or as consultants providing menu development and analysis—incorporating food allergy management—or providing food allergy safety training for staff. At all levels, the RDN can serve as an advocate for the student with food allergies.

Restaurants, Foodservice, and Retail

Dining out is an important part of life, particularly of socialization. However, when food allergies are a concern, eating out can be much more challenging. Individuals with food allergies often avoid dining out due to anxiety about potential reaction. Helping patients learn to navigate dining out safely can reduce potential harm, while increasing quality of life.

Key recommendations for clients navigating restaurants include the following: call in advance and/or review the menu online; ask for accommodations directly by notifying the server, manager, and/or chef about the allergy; and when in doubt, do not eat at that restaurant.

Other helpful tips include avoiding eating out during the busiest times of the week, choosing restaurants that specifically advertise themselves as allergy aware, and providing wait staff with a card that clearly states the offending allergen(s) so that the information is provided in writing. Individuals with food allergies should notify their fellow diner(s) in order to ensure timely assistance should anaphylaxis occur and the individual with allergies be unable to self-administer emergency medication. Finally, diners with allergies can choose to bring allergen-safe foods with them in case the restaurant is unable to accommodate their allergy.

RDNs and NDTRs can provide valuable expertise, training, and consulting services to restaurants desiring to provide allergen-safe dining experiences. RDNs working in the area of food safety training should include

instruction on identifying food allergens, preventing cross-contact, and general food allergy information.

Supermarkets and retailers are employing more RDNs as a way to provide value-added services to health-conscious customers. RDNs working in retail have a unique opportunity to influence offerings by the retailer to ensure easier access to allergen-safe foods; educate pharmaceutical, foodservice and retail staff on safe food allergen handling; and provide information and education to customers via point-of-purchase displays, in-store demonstration, and mass communication channels.

Advocacy: Building Allergy-Aware Communities

RDNs and NDTRs can serve as resources to individuals and families managing food allergies through participation in awareness campaigns and support groups. National food allergy education and advocacy organizations, like Food Allergy Research and Education and Food Allergy Anaphylaxis Connection Team, as well as state and local food allergy organizations provide opportunities to volunteer.

SUMMARY STATEMENT

In conclusion, the RDN is an essential part of the care team for individuals with food allergies. As it is a quickly changing area of nutrition practice, working with a potentially life-threatening condition, RDNs and NDTRs working with food allergies must obtain adequate training and remain abreast of the evolving science in this advanced area of practice. Utilizing the NCP, RDNs with support from NDTRs provide vital services to individuals and families dealing with food allergies, including medical nutrition therapy, nutrition education, and assistance with improving self-efficacy and quality of life.

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