Misdiagnosed Food Allergy Resulting in Severe Malnutrition in an Infant

abstract
As food allergies become increasingly prevalent and testing methods to identify “food allergy” increase in number, the importance of careful diagnosis has become even more critical. Misdiagnosis of food allergy and inappropriate use of unproven testing modalities may lead to a harmful food-elimination diet. This case is an example of an infant who was placed on an overly restrictive elimination diet at the recommendation of her health care providers, resulting in kwashiorkor and acquired acrodermatitis enteropathica. Pediatrics 2013;132:e229–e232

AUTHORS: Michael Alvares, MD,¹ Leon Kao, MD,¹ Vineeta Mittal, MD,² Alice Wuu, MD,³ April Clark, RD,⁴ and J. Andrew Bird, MD⁴

Divisions of ¹Allergy and Immunology, ²Pediatrics, and ³Dermatology, University of Texas Southwestern Medical Center, Dallas, Texas

KEY WORDS
food allergy, food intolerance, acrodermatitis enteropathica, kwashiorkor, food allergy testing

ABBREVIATION
Ig—immunoglobulin

Drs Alvares and Bird were the primary authors; Drs Kao and Wuu participated in the acquisition of data, revision of the article, and final approval; Dr Clark participated in the interpretation of data, analysis of clinical history, revision of the article, and final approval; and Dr Mittal was the pediatrician who facilitated the care of this patient, and participated in acquisition of data, revision of the article, and final approval.

www.pediatrics.org/cgi/doi/10.1542/peds.2012-2362
doi:10.1542/peds.2012-2362

Accepted for publication Mar 18, 2013

Address correspondence to J. Andrew Bird, MD, University of Texas Southwestern Medical Center, Division of Allergy and Immunology, 5323 Harry Hines Blvd, Dallas, TX 75390-9063. E-mail: drew.bird@utsouthwestern.edu

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).
Copyright © 2013 by the American Academy of Pediatrics

FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose. Dr Bird has received payment for lectures from Nutricia.

FUNDING: No external funding.
Food allergy is a significant health problem, with increasing prevalence\textsuperscript{1} and potentially life-threatening sequelae. Overdiagnosis of food allergy may also lead to unnecessary avoidance of food, resulting in an impaired quality of life and, as this report shows, potentially fatal disease secondary to malnutrition, as food avoidance is the only current recommended therapy for food allergy. Previous reports have shown that food allergy is commonly overreported, with a recent meta-analysis revealing that up to 35\% of individuals may report a food allergy, when in fact only 1.0\% to 10.8\% have objective evidence of food allergy confirmed by standardized testing.\textsuperscript{2}

It is also important to note that food avoidance is not a benign recommendation. Investigators have previously reported potential growth retardation in infants and young children with food allergies.\textsuperscript{3,4} Our report underscores these previous findings and highlights a potentially fatal secondary disease that results from nutritional inadequacies due to inappropriate nutrition advice.

**CASE REPORT**

A 15-month-old girl presented to the emergency room with a diffuse erythematous rash and edema. Her mother reported recurrent rashes since the child was a newborn, which she perceived to be associated with food ingestion. The child was initially breastfed exclusively, but formula supplementation was added within several weeks of birth, secondary to inadequate weight gain. The mother reported persistent “diarrhea and vomiting” and “red splotchy rash” within the first month of life. The mother believed these symptoms were related to food ingestion and, consequently, that the child was allergic to her formula. By 6 weeks of age, the mother’s breast milk was already supplemented with various extensively hydrolyzed formulas. At 6 months of age, the child was switched to goat’s milk, and by 8 months of age, the child was switched to coconut milk with the addition of rice syrup. Dietary management was being directed by both the child’s pediatrician and chiropractor: The child’s weight dropped from the 40th percentile at the 8-month visit to the 12th percentile by the 12-month visit. At 13 months of age, the child presented to her pediatrician with a “red rash,” which appeared “swollen and inflamed.” The rash was diagnosed as atopic dermatitis and the child was then taken to alternative health care providers who recommended numerous alternative therapies, including cold laser therapy, chiropractic adjustments, and liver detoxification, none of which resulted in any improvement. Several weeks before admission, immunoglobulin G (IgG) food allergy testing was performed, which identified coconut as a “high reaction class,” and the child’s milk was subsequently changed to rice milk. At this point, this was the only food allergy testing of any kind performed on this infant. Ten days before admission, the mother noted that the child’s skin became more difficult to control. She developed a red, weepy, crusting rash on her face, arms, back, legs, and feet. Her arms and legs became swollen with cracked, weeping digits.

In our emergency department, the child was noted to have sparse hair, protuberant cheeks and abdomen, edematous hands and feet with erythematous, scaly plaques, yellow crusting, and erosions with moist bases. Laboratory evaluation at that time revealed a normocytic anemia with hemoglobin of 7.7 g/dL, and an albumin of 2.0 g/dL (normal 3.5–4.8 g/dL). Wound cultures grew *Staphylococcus aureus*, *Klebsiella pneumoniae*, and *Corynebacterium* species. She was seen by the dermatology physician who, in addition to kwashiorkor, diagnosed her with acquired acrodematitis enteropathica from zinc deficiency, confirmed by a zinc level of 29 μg/dL (normal 60–120 μg/dL), that had become superinfected.

The child was initially fed with total parenteral nutrition and an elemental formula while her food allergies were being evaluated. Secondary to the mother’s perception of the child’s food allergies, ImmunoCAP (Phadia AB; Pharmacia Inc, Uppsala Sweden)-specific IgE testing for milk, wheat, and soy were tested and found to be undetectable (<0.35 kU/L). During the hospital course, the child’s mother noted vomiting, diarrhea, or increased erythema on trying various foods. As a result, IgE testing to egg white, fish, shrimp, coconut, green beans, and potato were all found to be undetectable. Prick/prick skin testing to green bean and potato resulted in no measurable wheal. Open food challenges were performed while in the hospital to green bean and potato, and the child tolerated these foods without any observed adverse effects. After several weeks of aggressive wound care, antibiotics for her secondary infections, reversal of nutritional deficiencies, and introduction of all foods previously avoided, her rash completely resolved, and she was discharged from the hospital without any dietary restrictions.

**DISCUSSION**

The patient’s medical history is integral in accurately diagnosing food allergy. Tests for allergen-specific IgE are useful for confirming suspected disease but are not recommended for general screening.\textsuperscript{5} Serum-specific IgE testing is the most commonly used food allergy testing modality in the primary care setting. Of note, the European Academy of Allergy and Clinical Immunology Task Force report and the National Institute of Allergy and Infectious Diseases—sponsored expert panel both recommend against the use of IgG testing for routine evaluation of food allergies, as positive IgG levels likely represent a physiologic response of the immune system after exposure to a food and are not indicative of clinical disease.\textsuperscript{6,7}
When negative, specific IgE testing yields a high negative predictive value; however, positive specific IgE testing in the serum and skin testing may not be clinically meaningful, as a positive test indicates only sensitization and not necessarily clinical reactivity. Additionally, predictive capabilities of serum testing depend on the testing modality used, as predictive values for clinical reactivity to certain foods have been established using the ImmunoCAP method at this time.8,9 It is for these reasons that indiscriminant food panels are not recommended, as inaccurate interpretations may lead to overly restrictive diets, especially in children with atopic dermatitis.10 Recognizing symptoms consistent with food allergy is often an area of confusion as well. In this case, the infant was initially experiencing diarrhea after ingestion, which led to the misdiagnosis of food allergy. The differential of diarrhea in a newborn is vast, including anatomic abnormalities, infection, enteropathies, and both IgE and non–IgE-related reactions. Thus, in the absence of a history of an IgE-mediated reaction (e.g., urticaria, angioedema, bronchospasm, or vomiting within minutes to hours of ingestion), specific IgE testing for food allergy is not warranted. In cases in which testing is inconclusive, an oral food challenge conducted by an experienced provider comfortable with the recognition and treatment of anaphylaxis may be necessary.

The current standard of care for management of IgE and non–IgE-mediated food allergy is avoidance of the food allergen. This case illustrates how this seemingly noninvasive practice due to inappropriate testing and self-diagnosis can lead to severe consequences. In this case, aside from her limited diet, the child’s primary milk source was likely contributing to her zinc deficiency. Zinc is present in all organs, with a strong predilection for bone and skeletal muscle. There are differences in zinc bioavailability in the various milk/formula options and the nutritional zinc requirements increase as the child grows.11 Consequently, nutritional requirements should be assessed with formula changes. Although zinc can be found in a variety of foods, there are factors that can limit its absorption. Rice contains phytates (also found in grains and legumes), which can bind and hinder the absorption of zinc.12 This child’s mother was supplementing coconut milk with rice syrup, which was likely inhibiting zinc absorption, leading to the child’s zinc deficiency. Furthermore, coconut milk is also much lower in protein than cow’s milk (Fig 1), contributing to inadequate protein supplementation for this otherwise healthy child. The Food and Drug Administration regulates infant formulas, assessing for minimum nutritional requirements. Goat’s milk, coconut milk, or rice milk are not replacements for formulas in and of themselves, and would require additional nutrition by a variety of foods. Even among these types of milk there is a difference in the amount of protein, carbohydrates, fat, and zinc present (Fig 1). The nuances in dietary requirements become critical knowledge in the setting of food elimination, and thus, appropriately, the National Institute of Allergy and Infectious Diseases expert panel has recommended nutritional counseling and regular growth monitoring for all children with food allergy.6

REFERENCES

3. Isolauri E, Sütas Y, Salo MK, Isosomppi R, Kaila M. Elimination diet in cow’s milk allergy: risk for impaired growth in...


Misdiagnosed Food Allergy Resulting in Severe Malnutrition in an Infant
Michael Alvares, Leon Kao, Vineeta Mittal, Alice Wuu, April Clark and J. Andrew Bird
Pediatrics 2013;132;e229; originally published online June 3, 2013; DOI: 10.1542/peds.2012-2362

Updated Information & Services
including high resolution figures, can be found at:
/content/132/1/e229.full.html

References
This article cites 10 articles, 2 of which can be accessed free at:
/content/132/1/e229.full.html#ref-list-1

Subspecialty Collections
This article, along with others on similar topics, appears in the following collection(s):
Nutrition
/cgi/collection/nutrition_sub
Allergy/Immunology
/cgi/collection/allergy:immunology_sub
Immunologic Disorders
/cgi/collection/immunologic_disorders_sub

Permissions & Licensing
Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:
/site/misc/Permissions.xhtml

Reprints
Information about ordering reprints can be found online:
/site/misc/reprints.xhtml
Misdiagnosed Food Allergy Resulting in Severe Malnutrition in an Infant
Michael Alvares, Leon Kao, Vineeta Mittal, Alice Wuu, April Clark and J. Andrew Bird

*Pediatrics* 2013;132:e229; originally published online June 3, 2013;
DOI: 10.1542/peds.2012-2362

The online version of this article, along with updated information and services, is located on the World Wide Web at:
/content/132/1/e229.full.html