# Anaphylaxis to Food

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**KEYWORDS**

• Food-induced anaphylaxis • Dietary avoidance • Emergency preparedness
• Epinephrine autoinjectors

**KEY POINTS**

- Anaphylaxis to food is a growing personal and public health concern.
- Comorbid asthma, delayed administration of epinephrine, and age (teens and young adults) are factors associated with increased risk of fatal and near-fatal reactions.
- Cofactors such as exercise or concurrent ingestion of alcohol, aspirin, or nonsteroidal anti-inflammatory medications should be considered in the evaluation of patients with food-induced anaphylaxis.
- Health care providers should prescribe epinephrine autoinjectors, provide written emergency action plans, and review their appropriate use on an ongoing basis.

## INTRODUCTION

Anaphylaxis related to foods is of growing concern, not only for individuals who must maintain constant vigilance against accidental exposures and manage uncertainty about severity of future reactions but also for society at large, given the prominent role of food in social settings and the direct and downstream economic costs related to health care utilization. This article is intended to provide the reader with a clinically oriented review of the epidemiology, risk factors, allergens, diagnosis, and management of food-induced anaphylaxis.

## EPIDEMIOLOGY

Most epidemiologic studies of food-induced anaphylaxis have focused on analysis of emergency department visits and hospitalizations. Investigative approaches targeting discharge codes and using consensus reports and expert review for diagnosis have been used to overcome challenges related to the variable presentation of anaphylaxis

The authors have nothing to disclose.
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Immunol Allergy Clin N Am 35 (2015) 231–245
http://dx.doi.org/10.1016/j.iac.2015.01.003 **immunology.theclinics.com**
0889-8561/15/$ – see front matter 

and inconsistencies in diagnosis. In the United States, a multicenter study estimated that nearly one-half million emergency department visits for food-induced anaphylaxis occurred between the years 2001 and 2005.[1] A time trend analysis of 2001 to 2009 US data showed that the rate of emergency department visits was stable overall and stable among children, with a decrease in adults.[2] This study also calculated that, on average, an emergency department visit for food-induced anaphylaxis occurred every 5 minutes in the United States. Although the incidence of anaphylaxis of all causes has been reported to be increasing in westernized countries, this phenomenon seems to be most prominent in young children under 5 years of age, for whom food is the most common trigger.[3]

Researchers have used other methods to study the epidemiology of food allergy and food-induced anaphylaxis. For example, geographic variations in epinephrine autoinjector prescription rates in the United States and Australia have been studied as a proxy for food allergy. Significantly higher prescription rates have been found in less sunny regions of both countries.[4,5] Of note, the Australian study also revealed that hospital anaphylaxis admission rates were significantly higher in areas having less sunlight.[5] A study of 24 pediatric hospitals in the United States found that the incidence of food-induced anaphylaxis was almost double in the north compared with the south (0.31 vs 0.17 per 1000 encounters; relative risk, 1.81; 95% confidence interval, 1.66–1.98; $P<.001$).[6] A nationally representative study of US emergency department data comparing visits for allergic reactions related to foods also found similar geographic differences.[7] Taken together, these findings have led to speculation that sunlight/vitamin D status may play an etiologic role in food allergy and perhaps its severity. More research is needed to answer this important question.

Given the risk of fatality from food allergy, investigators have also looked at trends and patterns in mortality. From 1999 to 2010, food-related causes were relatively uncommon (6.7%) as compared with medication (58.8%) and venom causes (15.2%) in a study of US mortality data from the National Center for Health Statistics.[8] Age, African American race, and male gender were significantly associated with fatal food-induced anaphylaxis. Of note, the overall rate of US mortality did not increase over the 12-year period and was similar to that reported in Australia, but the rate of fatal anaphylaxis to foods did increase among male African Americans as compared with whites and Hispanic subjects. Interestingly, the study did not find any geographic differences. Fatalities from food-induced anaphylaxis have similarly remained stable in Australia.[3]

## RISK FACTORS

Risk factors for food-induced anaphylaxis are largely poorly understood. Attempts to predict severe reactions focused on easily obtainable data, such as age, gender, comorbid asthma and allergic diseases, prior food reactions, skin test, and allergen-specific immunoglobulin (sIgE), have been largely disappointing. Spontaneous basophil activation, which is not yet commercially available, has been found to be higher in children with more severe milk-induced reactions.[9]

To date, the factors that have been most commonly associated with fatality include peanut or tree nut allergy, presence of asthma (particularly severe or poorly controlled asthma), lack of access to epinephrine, failure to administer epinephrine promptly, upright (rather than supine) position during a reaction involving the cardiovascular system, and age, with teenagers and young adults at highest risk.[10–13] Whether this last association is related to age-associated risk-taking behavior or other factors is unclear.