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"Hidden" allergens in foods

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Deaths in children, adolescents, and adults who ingested foods to which they were highly allergic have been reported.^{1,2} These deaths are often caused by a "hidden" ingredient in the food to which the individual is allergic.¹⁻³ Yunginger¹ suggests that in the United States, more children and adolescents die annually as a result of food-induced anaphylaxis than as a result of insect stings. The majority of these deaths are due to severe allergy to peanut and nuts, and asthma appears to be an important risk factor for this form of allergy.²

Sensitivity can occur by ingestion of minute quantities of food allergens^{4,5} and even by inhalation of food allergens carried in air or in cooking fumes.⁶⁻¹² The association between a reaction and a food may not initially be obvious because many patients experience a reaction only several hours later.^{13,14} Unlike the very acute and often dramatic reaction to peanut, the form of reaction to egg, milk, wheat, and soy may be through "soft signs" (e.g., gastroenteropathies, asthma, and atopic dermatitis).¹² Other diagnostic difficulties occur in individuals experiencing anaphylactoid reactions and in patients with food-dependent exercise-induced anaphylaxis.¹⁵

REASONS FOR ALLERGENS BEING HIDDEN IN FOODS

Probably the most common reason for sensitive individuals to ingest a hidden allergen is contamination of a safe food. This occurs when the same serving utensils are used for different foods. Salad bars and ice cream parlors offer good examples of this practice. It also occurs when deli meat slicers are used for slicing both cheese and meat and when manufacturers use previously manufactured products for manufacture of a secondary product. Mayonnaise used in the manufacture of a new product may not prompt the listing of mayonnaise or egg, particularly if this ingredient is less than 2% of all the ingredients in the new product. Another form of contamination occurs when a manufacturing plant uses the same equipment to make different products, such as ice cream and milk-free sorbet, without adequate cleaning of the equipment¹⁶ or when the same oil is used for cooking French fries and fish in a take-away outlet.¹²

There are many other ways for allergens to be hidden in food. Misleading labels may disguise hidden allergens. This can be illustrated by non-dairy creamers or coffee whiteners, which contain skim milk¹⁷ or by meat products that contain soy. Some margarine, claiming to consist of 100% corn oil, may in fact contain skim milk powder. A drink advertised for "people who cannot drink milk" is actually milk with lactase enzyme for individuals with a lactose intolerance, but it clearly still contains milk protein.

Hidden allergens can also occur in processed food when an ingredient is added for a specific

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TABLE I. Labels that may indicate the presence of egg protein^{32,37,80,90}

Albumin	Globulin	Ovamucoide
Binder	Lecithin	Ovovitellin
Coagulant	Livetin	Powdered egg
Egg white	Lysozyme	Vitellin
Egg yolk or yellow	Ovalbumin	Whole egg
Emulsifier	Ovamucin	

application; for example, when egg is used in food products and is listed on the ingredient panel as a binder, protein, or emulsifier. This may also occur when soy is used for its "texturizing" or emulsifying properties. Natural flavors such as pineapple, milk casein, or hydrolyzed soy protein may be used and listed as flavoring or natural flavoring, as in microwave popcorn.

Ingredient switching is another source of concern and may happen when manufacturers change ingredients without making this clear on the label. This can transpire when a shortage of vegetable oil results in substitution with a tropical oil, or as noted previously, when a margarine manufacturer advertises 100% corn oil but adds skim milk without altering the label.

Mistakes take place when consumers assume that a brand of food that uses similar labels for a range of products has similar formulations.

Loopholes in labeling regulations allow allergens to be hidden in a food product when a manufacturer is excused from listing an ingredient that is present at less than a specific percentage of the total product.

Another major problem is that a food may be listed on the product label by an uncommon term. This practice is addressed in this article.

Food manufacturing practices vary throughout the world, and because the importation of food is common practice, this review aims to assist the individual with allergies and the traveller by including in the tables as many sources of hidden food allergens as possible.

PROBLEMS RELATING TO SOME SPECIFIC FOODS

Egg

Egg is one of the most allergenic of all foods, and minute amounts of egg can result in symptoms within minutes, including life-threatening anaphylaxis. This is also seen after contact with egg through non-oral routes.^{6, 18-20} Reactions may occur the first time a child is given egg.²¹

Although ovalbumin, ovomucoid, and ovotrans-

TABLE II. Foods that may contain egg protein^{32,91}

Baked goods (most except some breads)	Marshmallows
Baking mixes	Mayonnaise
Batters	Meringues
Béarnaise sauce	Muffins
Bouillon (in restaurants to clear it)	Noodles (egg)
Breakfast cereals	Omelettes
Cake flours	Pancakes
Candy (see Sweets)	Processed meat products (e.g., bologna, meat loaf, meatballs, sausages)
Cookies	Puddings
Creamy fillings	Salad dressing (creamy)
Custard	Sherbets
Egg noodles	Soufflés
Eggnog	Soups
French toast	Spaghetti
Hollandaise sauce	Sweets (e.g., fondant creams, truffles, marshmallows, etc.)
Ice cream	Tartar sauce
Lemon curd	Turkish Delight
Macaroni	Waffles
Malted cocoa drinks (e.g., Ovaltine, Ovamalt)	Wines (if cleared with egg white)

ferrin have been identified as the major allergens in egg white,²¹ 10 other unnamed allergens of lesser importance have been identified.²² These allergens are also present in egg yolk but in lesser quantities.²¹ This is important because components of egg may be individually used for specific actions in food preparation. For example, hen's egg lysozyme is used as a preservative in food; and in some countries, notably Japan and Switzerland, lysozyme is used in medications.^{23, 24} Individuals sensitive to hen's egg have been shown to be allergic to lysozyme produced from hen's egg.^{18, 23-26}

A variety of descriptions may indicate the presence of egg protein in a product (Table I). The function that egg performs in a product may be named on the ingredient panel (e.g., binder, emulsifier, or coagulant). Because legislation may permit a manufacturer not to list an ingredient constituting less than a specific percentage of the total product, noodles containing egg may not have egg listed on the ingredient panel. A similar situation may occur when egg white is used to give pretzels, bagels, and other baked goods their shiny appearance. In most products, lecithin is derived from soy, but sometimes it may be egg-derived. Provitamin A (extracted from egg) may be used and

TABLE III. Foods that may contain milk protein^{17,32,90,91}

Batter-fried foods	Margarine
Biscuits	Muesli
Bread	Muffins
Breakfast cereals	Other baked goods
Cakes	Packaged soups
Chocolate	Pies
Cookies	Puddings
Cream sauces	Rusks
Cream soups	Sausages
Custard	Sherbet
Fish in batter	Soy cheese
Gravies and gravy mixes	Soup mixes
Ice cream (and "non-milk" fat)	Sweets
Imitation sour cream	Canned soups
Instant mashed potatoes	Vegetarian cheese

described as a colorant, but its antigenic properties are unknown.

In addition to food products (Table II) that may be dangerous to egg-sensitive individuals, egg proteins are also found in cosmetics, shampoos, and pharmaceuticals, such as the laxative Agarol. A patient allergic to egg should avoid buying fried foods from vendors who use the same frying surface for preparing multiple types of food. Recent evidence suggests that egg-sensitive children can receive measles immunization safely.²⁷

Although rare, avian proteins can induce egg allergy in susceptible individuals.²⁸⁻³¹ It has been suggested that duck egg be substituted for hen's egg in egg-sensitive individuals. These individuals are able to tolerate cooked chicken.³²

Milk

Patients with very sensitive milk allergy can react to a very small quantity of milk protein, including minor contamination¹³ and even inhalation of milk powder.⁷

Milk may be found in a large variety of processed foods (some obvious and others not), including confections, margarine, cheese, and pies (Table III). Cheese and cream contain milk protein and should be avoided. Milk contamination of a product is possible if the same manufacturing equipment is used for various products. There is also a carryover effect when one product is used in the manufacture of another.¹⁶ In addition, patients should be careful when ordering sliced products from outlets that use the same slicers for cutting a variety of foods (e.g., cheese and cold meat). Lactose, which may contain residual milk protein,

TABLE IV. Labels that may indicate the presence of milk protein^{32,80,90}

Artificial butter flavor	Lactalbumin phosphate
Butter	Lactose
Butter fat	Milk
Buttermilk solids	Milk derivative
Caramel color	Milk protein
Caramel flavoring	Milk solids
Casein	Natural flavoring
Caseinate	Pasteurized milk
Cheese	Rennet casein
Cream	Skim milk powder
Curds	Solids
"De-lactosed" whey	Sour cream (or solids)
Demineralized whey	Sour milk solids
Dried milk	Whey
Dry milk solids	Whey powder
Fully cream milk powder	Whey protein concentrate
High protein flavor	Yogurt
Lactalbumin	

may be found in foods and as a filler in the manufacture of medicines such as Benadryl capsules (United States).

Hypoallergenic milk formulas have been used as a milk replacement for children with milk hypersensitivity. However, hypoallergenic milk formulas are not nonallergenic, and many children react to these, depending on the particular formula.³³⁻³⁶

Common descriptions on ingredient panels are "milk," "pasteurized milk," "full cream milk powder," "dried milk," and "skim milk powder" (Table IV). Extracted milk proteins added to foods retain their antigenicity and may be described as "casein," "caseinate," "whey," or "whey powder." In our community, many individuals consider skim milk and skim milk powder not to be milk and substitute these for milk. In some instances milk is used in emulsions and can be described as "caseinate," "emulsifier," or "protein."

Soy products are often purchased by those specifically avoiding cow's milk, with the assumption that a soy-based product is free of cow's milk protein. This is not true. "Vegetarian" cheese may contain cow's milk protein. This term simply means that the rennet used in its manufacture is of vegetable origin.³⁷

Soy

Because of the almost unlimited uses of soy, it is a particularly insidious hidden allergen. As with many other allergens, reactions may occur to very small quantities of soy protein, and anaphylaxis to soybean protein has been reported.^{2, 38, 39} Soybean

TABLE V. Labels that may indicate the presence of soy protein^{39,90,92}

Gum arabic	Soy protein
Bulking agent	Soy protein isolate or concentrate
Carob	Soy sauce
Emulsifier	Soybean
Guar gum	Soybean oil
Hydrolyzed vegetable protein (HVP)	Stabilizer
Lecithin*	Starch
Miso	Textured vegetable protein (TVP)
MSG (Monosodium glutamate)†	Thickener
Protein	Tofu
Protein extender	Vegetable broth
Soy flour	Vegetable gum
Soy nuts	Vegetable starch
Soy panthenol	

*Mostly produced from soy but may be manufactured from egg.

†Sometimes produced from soy or wheat but now mostly by synthetic means.³⁹

lectin is also an important allergen and has been associated with allergic reactions.⁴⁰

Soybeans may be ingested as whole beans, as flour, or as oil. In addition, soy can be used in the manufacture of food in a great variety of ways, including as a "texturizer," emulsifier, and protein filler. Soy may thus be listed on the ingredient panel according to its use (e.g., "hydrolyzed protein" or "lecithin"³⁹) (Table V).

Soybean flour is often added to cereal flour and is used extensively in the baking industry. The majority of breads contain some soy flour. Pastries, cakes, biscuits, and baby foods may contain soy flour. It is also used in the manufacture of sausages, processed meats, hamburgers, and other meat products⁹ (Table VI). Fermented soybean may be used in the preparation of soy sauce or Worcestershire sauce. Fermented soy is in wide use as a food in the Far East.

Soy is so widely distributed in processed foods that avoidance of soy in the diet is very difficult. Soy may find its way into a food product when added as a "compound" ingredient. For example, if margarine is added to a food product it will be listed as such, but soy present in the margarine itself will not be listed on the ingredients panel.

Soy protein isolate or concentrate may be used to emulsify fat in food products and may thus be used in the manufacture of ice cream, mayonnaise, and a variety of other liquid fat- or oil-containing foods. The concentrate or isolate may also be used in soy milk and as a protein concentrate added to

health foods and high-protein biscuits. Other foods that may contain soy include pureed and cereal baby foods, margarine, and white and brown bread³⁹ (Table VI).

Other uses for soy include the manufacture of tofu (soybean curd), which may in turn be used for the manufacture of soy-based ice cream. Soy may be converted into products having a meat-like texture.⁴¹ This "textured vegetable protein" is used in simulated meat products or may be added to meat as an extender. These products are often used as meat substitutes in vegetarian products and in catering establishments, including hospital and army food services, and feeding programs.

The seeds of soybeans are widely used as a source of oil. The oil has many uses (e.g., in salad dressings, margarine, baby foods, industrial components, linoleum, paint, plastics, soap, and glue for plywood) (Table VII). Although soybean oil was initially thought to be safe for soy-sensitive individuals,⁴² it is now evident that soy protein may occur in soybean oil.⁴³ Thus the allergenicity of soybean oil would depend on its purity, which in turn depends on the extraction process. Recent evidence has demonstrated that although oxidized soybean oil may not show allergenicity, proteins in soybeans are capable of interacting with oxidized lipid to form products that are allergenic to soybean-sensitive patients.⁴⁴ Indeed, Hiyama et al.⁴⁵ report a case of urticaria associated with parenteral nutrition with an intravenous 10% lipid emulsion containing a soybean oil base. Such reactions, however, appear to be uncommon, and there are very few reports of this nature in the literature.

Soy products are often purchased by those specifically avoiding cow's milk, often with the assumption that a soy-based product is free of cow's milk protein. This may not always be true, and caution is required. Again, labels should be read carefully, and they should, of course, contain the correct declaration.

Thickeners, stabilizers, emulsifiers, and bulking agents may be manufactured from a variety of other members of the legume family in addition to soybeans. On the basis of *in vitro* studies, Barnett et al.⁴⁶ suggested that there may be cross-reactions between soy and other members of the legume family (Table VIII). Further evidence for broad cross-reactivity has been provided by RAST and skin prick tests; however, it is rare to have symptomatic reactivity to more than one member, and clinical hypersensitivity to one legume does not require elimination of the entire legume family.^{47, 48} Carob, derived from the carob bean, is used

TABLE VI. Foods that may contain soy protein^{39,90,91}

Baby foods	Cooking oils	Sauces (e.g., Worcestershire, sweet and sour, HP, Teriyaki)
Bakery goods*	Crackers	Seasoned salt
Black pudding	Desserts	Shortenings
Bread (esp. high-protein bread)*	Gravy (sauce) powders	Snack bars
Breakfast cereals (some)	Hamburger patties	Soups
Burger patties	Hot dogs	Soy pasta products
Butter substitutes	Hydrolyzed vegetable protein (may be wheat)	Soy sauce
Cakes	Ice cream	Soy sprouts (Chinese restaurants)
Candy	Infant formula (including cow's milk formula)	Soybeans
Canned meat or fish in sauces*	Liquid meal replacers	Stews (commercial)
Canned or packaged soups*	Margarine	Stock cubes (bouillon cubes)
Canned tuna	Meat products (e.g., sausages, pastes, Vienna sausages [wieners])	Tofu
Cheese (artificial) made from soybeans*	Muesli	Tofutti
Chinese food	Pies (meat or other)*	TV dinners
Chocolates (cream centers)	Powdered meal replacers	
Cookies	Salad dressings	

*May be present because of soya in the flour used.

TABLE VII. Other sources of contact with soy⁹³

Adhesives	Fertilizers
Blankets	Flooring materials
Body lotions and creams	Lubricants
Dog food	Nitroglycerine
Enamel paints	Paper
Fabric finishes	Printing inks
Fabrics	Soaps

commonly as a chocolate substitute, and one should possibly guard against cross-reactivity to this legume. Peanut sensitivity is discussed below.

Wheat

Wheat is the most allergenic of all cereals. IgE antibodies have been demonstrated to many components of wheat kernels, including albumin, globulin, gliadin, wheat germ agglutinin, a concanavalin A-purified glycoprotein, and a trypsin inhibitor.⁴⁹⁻⁵² Wheat is most rich in gluten, with the other grains containing a lesser mixture of gluten and gliadin.

In addition to being present in all wheat-based food products, wheat gluten is frequently added to baked products made from other grains, including those made from soy flour. Wheat-sensitive individuals should avoid a product that includes other flours, because it is likely that at least some wheat flour or a derivative will also be present.⁵³ Even "gluten-free" bread may contain small amounts of

TABLE VIII. Members of legume family^{46,47,90}

Beans	Other members
Aduki beans	Alfalfa (sprouts)
Broad bean	Acacia (gum)
Black turtle bean	Carob (chocolate substitute)
Black-eyed bean	Cassia or senna (in laxatives, curry, cinnamon)
Chick pea	Fenugreek (used in curries, cinnamon, primary flavoring in imitation maple syrup)
Cowpea	Lentils
Fava bean	Masur bean
Garbanzo bean	Licorice
Great Northern bean	Pea
Green bean	Green pea
Kidney bean	Purple-hull pea
Lima bean	Peanut
Mung bean	Senna or cassia (in laxatives and Epsom salts)
Navy bean	Soybean
Pinto bean	Tamarind
Snap bean	Tragacanth (gum)
String bean	
Wax bean	

gluten (0.4 mg per 30 gm slice).⁵⁴ Bread wheat, durum wheat, triticale, rye, and barley, to a lesser extent, are the main gluten-containing cereals. Others include semolina, spelt, and kamut.⁵⁵ Cereal products, such as couscous and graham flour, are also prepared from wheat. Spelt has occasionally been marketed as a wheat alternative but is

TABLE IX. Labels that may indicate the presence of wheat protein^{48,49,54,55,57,80,90}

All-purpose flour	Modified starch*
Bleached flour	MSG (monosodium glutamate)†
Bulgur (cracked wheat)	Protein
Bran	Semolina
Cornstarch	Spelt
Couscous	Starch*
Durum wheat	Unbleached flour
Enriched flour	Vegetable gum*
Farina	Vegetable starch*
Gelatinized starch* (or pre-gelatinized)	Vital gluten
Gluten	Wheat bran
Graham flour	Wheat flour
Hard durum flour	Wheat germ
High gluten flour	Wheat gluten
High protein flour‡	Wheat starch
Hydrolyzed vegetable protein‡	White flour
Kamut	Whole wheat
Miller's bran	Whole wheat flour
Modified food starch*	

*May indicate the presence of soy protein⁵⁰ or may be manufactured from cassava (tapioca), maize, or rice.

†Sometimes produced from soy or wheat but now mostly by synthetic means.

‡May be soy.

part of the wheat family.^{49, 56} Spelt may better be described as nonhybridized wheat.⁵⁶ No data have indicated differences in the allergenic profiles of the various wheat varieties, and they should all be viewed as potential allergens.

Hydrolyzed wheat proteins can be used in processed foods for flavoring purposes (e.g., in meat flavorings) or as a binder in vegetarian burgers. In the United States legislation dictates that this form of wheat must be labeled as wheat-derived, but this is not always the case in other countries. Wheat can appear under various names on ingredient panels (Table IX) and can be found in many food products (Table X). Gluten finds its way into a few pharmaceutical products (e.g., Dimetapp LA, Nulacin, and Fybranta).⁵⁷

Buckwheat is not a member of the grass family and is thus not a true cereal.⁵⁸ The grain may be used for human food in various forms from pancake flour to buckwheat noodles and baby foods.⁵⁸

For the wheat-hypersensitive individual, products made from oats, rice, rye, barley, or corn or specialty foods made for gluten-sensitive individuals generally may be used instead of wheat. However, cross-reactions, although unusual, may occur between wheat, barley, rye, maize, rice, and

TABLE X. Foods that may contain wheat^{57,90,91}

Alcoholic beverages (made from grain alcohol)	Gravy
Ale	Hot dogs
Beer	Ice cream
Wine	Ice cream cones
Bourbon	Luncheon meats
Whiskey	Licorice
Baked goods	Macaroni
Biscuits	Malt
Breads (including rye bread)	Malted milks (e.g., Horlicks)
Cakes	Milk shakes
Cookies	Noodle products
Crackers, etc.	Pasta (noodles, spaghetti, macaroni)
Baking mixes	Pepper (compound or powdered flour filler)
Barley bread and drinks	Pies
Battered foods	Processed meats
Bouillon cubes	Sausage
Breaded meats	Semolina
Breaded vegetables	Snack foods
Breakfast cereals	Spaghetti
Candy or chocolate candy	Soup mixes
Canned processed meat	Soups
Cereal grains	Soy sauce
Couscous	Tablets

sorghum,^{8, 59, 60} as well as between the pollens of cereals and cereal flours.⁶¹

Peanuts

Peanuts are one of the most allergenic foods,^{62, 63} and peanut allergy is one of the most common food allergies.⁶⁴ Peanuts are probably the most common cause of death by food anaphylaxis in the United States, and about one third of peanut-sensitive patients have severe reactions to peanuts.^{65, 66}

Peanuts are added to a large variety of processed foods (Table XI). These include ice cream (as a flavoring), marinades, snack foods, and biscuits. Peanuts can be used as a flavoring or a seasoning agent⁶⁷ and may be labeled as such (Table XII). Nuts may be used in the manufacture of vegetable burger patties.⁶⁸ A fatal reaction to peanut antigen in almond icing has been recorded.⁶⁹ Peanut butter may also be used to "glue down" the ends of egg rolls to keep them from coming apart.⁷⁰ Some individuals do not know that peanut butter is commonly used in Oriental cooking. Peanuts can be "deffavored," "reffavored," and pressed into

TABLE XI. Foods that may contain peanut or peanut oil^{66,70,72}

Baked goods	Margarine
Baking mixes	Marzipan
Battered foods	Milk formula
Biscuits	Pastry
Breakfast cereals	Peanut butter
Candy	Satay sauce and dishes
Cereal-based products	Soups
Chili	Sweets
Chinese dishes	Thai dishes
Cookies	Vegetable fat
Egg rolls	Vegetable oil
Ice cream	

other shapes such as almonds and walnuts.^{9,65} These products retain the allergenicity of the peanut. Some patients with peanut allergy also react to sweet lupine seed flour, which may be used, for example, to fortify a spaghetti-like pasta.⁷¹

Although uncommon, a peanut protein hydrolyzate may also be used in soft drinks as a foaming agent or in confections as a whipping agent.⁶⁷

Peanut oil has been considered to be devoid of allergenicity,^{72,73} and this was initially confirmed by double-blind crossover studies.⁷⁴ However, peanut oil allergenicity is clearly process-related, because cold-pressed peanut oils may contain peanut allergen.⁷⁵ Moneret-Vautrin et al.^{76,77} confirmed the allergenicity of peanut oil in milk formulas, and 11 of 45 brands of milk formulas in France contained variable amounts of peanut oil.⁷⁷ Residual peanut proteins are believed to become more allergenic with heating.⁷⁷

The oil is frequently used in the preparation of so-called "health foods." The oil can be used for many nonfood products, which may, on contact, affect sensitive individuals. Like peanut oil, other vegetable oils such as soy, maize, sesame, and sunflower oils contain very low quantities of protein.^{78,79}

Individuals who are allergic to peanuts are said to not be allergic to nuts such as almonds, pecans, or walnuts; and these nuts can be substituted for peanuts.⁹ This is contradicted by a recent study, which showed that 50% of individuals allergic to peanuts reported allergic reactions to other nuts as well.⁷⁰ These findings were not validated by further clinical investigation.

Fish

Fish are one of the most common causes of food allergy, particularly in adults and in Scandinavian

TABLE XII. Labels that may indicate the presence of peanut protein⁶⁷

Peanut
Peanut butter
Emulsifier (uncommon)
Flavoring
Oriental sauce

countries.⁹ Fish may find their way into processed foods in raw, powder, or oil form. In the majority of instances, this substance is clearly labeled as "fish" or with another obvious descriptor. However, fish allergens may be found unlisted if added as part of an oil. Fish products are not usually hidden ingredients but may be hidden in Caesar salad dressing or in Worcestershire sauce if it contains anchovies.⁹

Some seafood flavors (e.g., shrimp) are added to food in the form of a powder manufactured from the seafood's shell. Shrimp antigen II is heat stable.⁸⁰ A variety of antigens are shared by several crustaceans including shrimp, prawns, crabs, lobsters, and crayfish (crawfish).

At present, some manufacturers are researching the possibility of adding fish meal (flour) to bread as a source of omega-3-fatty acids (personal communication, M. M. Melnyczuk).

Skin prick tests and RASTs indicate extensive cross-reactivity among fish species, but recent research suggests that patients may be able to consume some species of fish despite positive test responses to one or two.⁸¹ However, it is generally recommended that patients allergic to fish avoid all fish species.

DIAGNOSIS

A major difficulty in identifying a food allergen in some patients is that they may be unaware of the connection between a specific food and allergic symptoms, because the symptoms may appear much later.^{13,14} Although clinical history and routine laboratory studies have great predictive value in most individuals with food allergy, they may have little value in predicting which foods are responsible in many others, particularly in adults.^{64,82,83} Moreover, in some individuals with a history of a reaction to food, there may be poor correlations between history and results of skin tests, in vitro blood tests, and double-blind, placebo-controlled food challenges.^{64,84-86} The double-blind, placebo-controlled food challenge remains the gold standard in the diagnosis of food hyper-

sensitivity, and in the event of negative skin prick test and RAST results, may be the only method with which to confirm a food hypersensitivity.^{87, 88}

PREVENTATIVE MEASURES

One clear message from the literature is that most fatal and near-fatal reactions happen when eating away from home.^{2, 3, 11, 69, 89} Individuals with severe food hypersensitivity should probably avoid processed foods. If it is necessary to purchase these foods, they should be made by a reliable manufacturer. Parents and children can learn to scrutinize food labels carefully. Unfortunately, the multiplicity of possible names for any one ingredient may let a hidden allergen slip by. If possible, hypoallergenic formulas should be tested in each case before being prescribed for children sensitive to cow's milk.^{35, 36} The very sensitive individual should wear a Medic Alert bracelet and carry an epinephrine (adrenaline) self-injector at all times.¹ Less sensitive individuals may need to carry antihistamines with them.

Fortunately, many individuals lose their reactivity to foods over time, albeit not completely in some. Bock⁸⁹ recommends careful and periodic challenges in these patients to save families from prolonged anxiety about accidental ingestion. Unfortunately, sensitivity to peanut is seldom outgrown.⁶⁶

Acknowledgement should be made to the food industry for the strides made in improved labeling of food products. In many countries, the food industry has played a leading role in constructing food intolerance databases, which can assist sensitive individuals in avoiding foods containing a particular ingredient. In the long term, manufacturers must be persuaded to bring common ingredient names into use, and legislation should be passed to make food labels more accurate. A possible solution would be to list the derivative in brackets after the ingredient, for example, ovomucoid [egg].

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