Food Allergy, a Newly Emerging Food Epidemic:  
Is the Current Regulation Adequate?  

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ABSTRACT - Food allergy refers to an immunologically mediated adverse reaction to food, mainly to proteinaceous constituents. Health implications vary between those individuals who experience mild physical discomforts to those with fast-acting, life-threatening anaphylactic reactions. The prevalence of food allergy is higher in children than in adults, estimated around 4-8% and 1-2% respectively in developed countries. Food allergy has no effective cure at the present time and total avoidance of causative foods is the most reliable prophylactic method currently recommended by the medical community. To help food allergic patients to make informed choices of their foods, mandatory labeling of selected food allergens has been introduced in several countries. All food allergen labelling provisions specify a set of allergens common to the regulated countries. Policy divergence, however, exists between countries by inclusion of additional allergens unique to specific countries and enforcement of specific labelling requirements. Such variations in food allergen labelling regulations make it difficult to manage allergen labeling in imported pre-packaged food products. This paper addresses two current issues in food allergen regulation: 1) an urgent need to determine true prevalence of food allergy in the Asia-Pacific region. This will enable refinement to the food allergen regulation to be more country-specific rather than simply adopting CODEX recommendations. 2) There is an urgent need for harmonization of food allergen regulation in order to prevent food allergen regulation becoming a trade barrier.

Key words: food allergy, food safety, public health, mandatory declaration, harmonization, trade barrier

Introduction

Most of us enjoy food every day without much fuss. For a small but increasing population of people, however, consumption of certain foods can be an unhappy event as they cause undesirable physiological reactions in the body. Such adverse reactions to food are called food sensitivity. Adverse reactions to food can be divided into two general categories, depending on the involvement of an immune system. Those reactions that are not mediated by the immune response are generally called food intolerance. Examples of food intolerance include lactose intolerance (alactasia), intolerance to some food additives such as sulfite, benzoates and azo- dyes, some naturally occurring biogenic amines, and monosodium glutamate (MSG) that is sometimes called the Chinese restaurant syndrome1).

Food allergy refers to an adverse reaction that involves an immune reaction to an ingested food, mainly to proteins. Unlike, food intolerance, where the reaction is generally slow and shows symptoms within days of food consumption, food allergy can trigger immediate reaction occurring within minutes. The symptoms of food allergy vary drastically between sensitive individuals, exhibiting mild conditions such as respiratory (asthma, rhinitis), cutaneous (eczema, urticaria) or gastrointestinal (vomiting, diarrhea) symptoms) to life threatening anaphylactic shock2).

It is well-established that genetic factors strongly influence the development of food allergy. Environmental factors such as changing environments, increasing air pollution, changing diets, and increased exposure to food additives and preservatives, have been hypothesized to play an important role in the food allergy development3,4). In genetically predisposed individuals, the interaction between food proteins and their immune system can be simplified into two phases (Fig. 1); the first phase is called sensitization and the second, elicitation5). Sensitization is a phase during which the absorbed food proteins induce the production of immunoglobulin E (IgE). The IgE molecules, which circulate in the body, attach to specialized cells called basophils and mast cells. In a sen-
sensitized individual (and during the elicitation phase), the same food proteins when re-introduced into the body bind to the IgE affixed to the mast cells or basophils. This results in cross-linking of IgEs and allergenic molecules, and triggering the release of inflammatory mediators such as histamine. The mediators interact with specific receptors present in various parts of the body, leading to the symptoms of allergic reactions.

**Food allergens**

Major food allergens are divided into plant food origin and animal food origin. The major plant food allergens include peanuts, tree nuts, soybeans and other legumes, and cereals. The animal food allergens include cow’s milk, eggs, fish and shellfish and crustacean. An analysis of major food allergens according to protein families were narrowed down to 7 major protein families that accounted for > 60% of food allergens.

For plant food allergens, these are prolamin, prolin, cupin and Bet v 1 families, and for animal food allergens, tropomyosin, parvalbumin and casein families are the dominant protein families. These observations suggest that food allergens share common protein structures that are highly conserved among the allergens and demonstrate similar properties such as high tolerance to acid and heat and high resistance to proteolytic hydrolysis. In general, more than one allergenic protein is present in an allergenic food and their relative allergenicity varies significantly. Some of the major plant and animal allergens are described below and the list of allergens identified from the major allergenic foods is given in Table 1.

**Egg Allergens**

Egg allergy is one of the most prevalent food allergies in childhood, accounting for 1.6-3.2% of children. Only 0.2% of adult population experience allergic reaction to egg allergens, showing the outgrowing rate to be relatively high. Egg allergy in infants appears to have occurred before their first exposure to egg protein in infant weaning foods, suggesting they may have been sensitized via other routines such as via in-uterus exposure before birth. Both egg white protein and egg yolk protein are potentially allergic, but only egg white proteins have shown clinical symptoms. The identified egg white allergens include ovalbumin, ovomucoid, ovotransferrin, ovomucin and lysozyme. The egg yolk allergens are apovitellenins I and IV and phosvitin.

**Cow’s Milk Allergens**

Cow’s milk allergy (hereafter referred as milk allergy) is also one of the most prevalent food allergies in childhood,