Mite Allergens Avoidance in Asthma: What we need to do?

Asthma is a common disease among schoolchildren in Taiwan. There is a trend that the prevalence of asthma and allergic diseases has been increasing in the developed countries such as Taiwan.[1-3] The current prevalence of wheeze ever, rhinitis and atopic dermatitis of 6 to7 year-old children in northern Taiwan are 19%, 45.7% and 8. 6%, respectively and 10.4%, 31.7% and 5.7%, respectively in central Taiwan in 2002.

Atopic diseases, such as bronchial asthma, rhinitis and atopic dermatitis, are reaching epidemic proportions in both the developed and developing world. Key factors driving these rising trends are increased exposure to sensitizing aero- and food allergens and reduced stimulation of immune system during still doubtful critical periods of development. In atopic diseases, there is a polarization of T-lymphocyte response, and enhanced secretion of cytokines involved in regulation of IgE, mast cells, and eosinophils, ultimately leading to inflammation and disease. A clear understanding of immune mechanisms of atopic disease and the complex interplay between genetic and environmental factors will create new opportunities for public health and therapeutic interventions.

Certainly, the characteristics of modern indoor environments (insulation of door/windows, reduced natural ventilation, upholstered furniture), in addition to current lifestyle (more time spent indoors) increase the duration of and intensity of exposure to mites, pets and cockroach products[4,5] as well as to indoor chemical agents. It has been clearly shown that exposure of sensitized patients to allergens is a risk factor for development of asthma and asthma exacerbation.[6,7]

In 1925, twenty years after von Pirquet coined the term allergy and Wolff-Eisner revealed a link between asthma and hypersensitivity, Storm van Leeuwen[8] proposed enclosing patients with asthma in an allergen-proof chamber or moving them to high altitude to reduce allergen exposure. Eighty years later, after clinical trials of these and other allergen avoidance interventions, there remains substantial uncertainty and controversy concerning which interventions should be recommended to patients with asthma.

The process of sensitization usually results from contact of allergens with mucosal surfaces. In the case of respiratory allergy, it is exposure to aeroallergens that is important, asthma being associated more with indoor allergens derived from dust mitee, pets and fungi, whereas seasonal rhinoconjunctivitis requires exposure to grass and tree pollens. The nature of the the allergen itself seems important, with many inhalant allergens exhibiting enzymic activity (such as *Der P1* and *Der P9* from dust mites).[9] In an experimental setting, simultaneously exposure to allergen and proteolytic activity enhances sensitization, possibly by disrupting epithelial tight junctions. This might in turn allow greater access of allergen to dendritic cells.

The role of the indoor environment in asthma is of major concern because 1) the disease has become more severe; 2) we spend over 90% of our lives indoors and 3) a large proportion of asthmatic children and young adults are allergic to allergens found indoors. Allergens have been described from the families Acaridae, Glycophagidae and Pyroglyphidae.[10,11] The acarid mites Acarus siro and *Tyrophagus putrescentiae* are minor sources of house allergens. For Glycophagidae, *Lepidoglyphus destructor* is primarily a storage mite while *Blomia tropicalis* has emerged as a prominent house dust mite in tropical and subtropical regions.[12] The pyroglyphid mite *Dermatophagoides (D.) pteronyssinus* is distributed from temperate to tropical regions. Other important Pyroglyphid mites are *D. farinae* found in drier regions. A mite-allergen level of *Der P1* of >2 ug/g dust is considered to be threshold level for mite sensitization, and >10 ug/g the risk level for acute asthma.[13,14]

Sensitization to allergens can be assessed by immediate skin test (i.e. wheal and flare) or by assays of serum IgE antibodies radioallergosorbent test (RAST). The common used of commercialized RAST tests in Taiwan and also in the world are Cationic Antimicrobial Protein (CAP; Pharmacia Diagnostics, Uppsala, Sweden) method and Multiple Antigen Simultaneous (MAST, Hitachi Chemical Diagnostics, Mountain View, California, USA) test.

In this issue, we published two studies[15,16] about the distribution of various allergen in central Taiwan and the difference of sensitivity between CAP test and MAST test from southern Taiwan study. Liu *et al* survey the prevalence of aeroallergen and food allergens in 224 atopic patients, aged 1 to 77 year, with asthma, rhinitis and atopic dermatitis using both MAST and CAP tests. They found CAP test has higher sensitivity rate in identification of both aeroallergen and food allergens than MAST test particular for the food allergen IgE measurement. They suggest CAP test and allergen skin tests could be as screening tests in identify the possible sensitized allergens in atopic patients. Because only 224 patients from very younger infancies to older adults were examined and there was also lack of standard allergen skin tests as control. It needs more patients enrolled to study before we could get an optimal conclusion. Another paper from the study of Huang *et al*, the authors want to evaluate the current prevalence of aeroallergen

in atopic children in central Taiwan. Four-hundred-ninety-eight patients, aged 2 to 16 years, diagnosed as asthma, rhinitis or atopic dermatitis, were enrolled to measure the sensitive rate of aero- and food allergens in central Taiwan using CAP test. Because the authors found a little higher sensitization rate to mite but significant lower sensitization rate to cockroach in atopic children in central Taiwan than those in northern Taiwan, they suggest exposure to higher level of cockroach allergen should be a possible reason to explain the different rate of various atopic disorders among different regions in Taiwan. However, the study subjects in this study enrolled younger children, it has some difficulties to make a diagnosis of asthma and prove those patients sensitized to allergen particular to aeroallergen.

The rationale for allergen avoidance by atopic patients with asthma is clear. Asthma is strongly associated with allergy to common aeroallergens, and asthma exacerbations can be provoked by allergen exposure. In addition, some reports have demonstrated that among patients with asthma sensitized to a particular allergen, asthma morbidity is directly related to the degree of exposure to that allergen.[17,18] By contrast, although it has been clearly shown that allergens are an important risk factor for development of respiratory symptoms and that several avoidance measures reduce allergen levels, whether this gives clinical improvement in symptoms is debatable. Given the importance of controlled trials of mite allergen avoidance both to understanding the role of allergen exposure in disease and in designing treatment, it is very disturbing when two articles, published in *New England Journal of Medicine*, that are interpreted as showing that mattress covers are not an effective measure for treating allergic rhinitis or asthma.[19,20] The studies were striking because they enrolled large numbers of patients, they were designed as a controlled, they were continued for 1 year, and they used mattress covers that were almost certainly effective at preventing live mites or mite allergens from leaving the mattress. Because of their possible impact on treatment, these articles have already received considerable comments.[21-23] Tovey et al,[22] in Sydney, have demonstrated that changes measured in dust samples obtained from the mattress surface might not be reflected in directly measured inhaled allergen. Thus although the authors reported a modest but significant decrease in allergens on the mattress, their intervention probably did not have a significant effect on inhaled allergen levels.

It is clearly that recent studies should not change our conclusions. Allergen avoidance remains a cornerstone of treatment of allergic patients who present with rhinitis, asthma or atopic dermatitis. Successful treatment requires defining specific sensitivity (skin tests or serum IgE antibodies), education, an overall plan to reduce exposure in the home, and school.[24]

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