

Prevention of Environmental Triggers in Allergic Diseases



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Introduction

A wide range of epidemiological and experimental studies have contributed to major advances in the field of allergic diseases. A variety of risk factors play a multifaceted role, in secondary prevention of allergy. Identification of allergy triggers forms the actual basis of secondary environmental prevention. These triggers include both indoor allergens such as house dust mites, molds, pets, cockroaches etc. and outdoor allergens such as pollen grains, molds, plant debris etc. Molds and their metabolites are considered to be triggers of respiratory allergy. Pets, dogs, cats are well known to trigger allergic symptoms in sensitized subjects. Outdoor molds may trigger allergy and asthma exacerbations. Amongst outdoor allergens pollen are important triggers of seasonal allergy symptoms such as allergic rhinitis, atopic dermatitis and asthma [1].

Indoor Allergens

House dust mites' allergens (HDM)

HDM allergens are ubiquitous pyroglyphidae that are commonly found in human dwellings. These mites grow best with higher indoor humidity and elevated temperatures. Involvement of mites as triggers of allergy and asthma includes an association between HDM allergen exposure and patients [2,3]. There have been several studies on avoidance procedures with respect to mite allergens [4,5]. Four meta-analyses on HDM allergen avoidance by Gotzsche and Johnsen concluded that avoidance was of no benefit to asthmatic/allergic patients [6]. Further, Custovic and Wij concluded inadequate evidence to advocate avoidance in adults but have some benefit in children [7]. However Platt Mills criticized the method of meta-analysis as allergen avoidance protocols are multipronged and personalized [8]. Dusts collected from houses of patients include many more contaminants beside mites as molds, bacteria, endotoxins, fungal glucans, mycotoxins, pollen, insect derived materials etc [9,10]. Thus house dust avoidance procedures aimed directly on HDMs may only provide partial benefit to sensitized patients.

Molds (Fungi) Avoidance

Among indoor triggers fungi or molds are important microorganisms in patients' dwellings. Although there are

thousands of fungal species but avoidance to 60-80 molds are considered allergenically important. There is direct association between dampness and mold proliferation leading to health impacts. The association between dampness and molds in houses has been reviewed by Cox Gamser [11]. In UK randomized controlled study, allergy symptoms and medications use declined in an interventional group as compared to control group.

Avoidance to Pets

It is estimated that ~50% of families in developed countries have pets [12,13], so is the case of families with allergies. Cats are important triggers of allergic symptoms [14]. Allergy to pets can be readily documented based on clinical history. Allergic particles from pets are small ranging from 2-10 μ size which allows them to be airborne and even stick to cloths of sensitized subjects and floors. Although removal of cats from patients have may minimize their exposure, but may encounter from other locations as it is ubiquitous [15,16]. When the cast remain in the house, basic avoidance measures do not help in decrease of Pet allergen levels [17,18]. Dog allergens are found in dog hairs, skin cells, saliva and urine. Dog allergy is less common as compared to cats and avoidance measures do not help much.

Cockroach allergens

Cockroach allergens are mostly found in kitchen with lower and middle class houses. Allergy and asthma are associated with cockroach allergen exposure [19]. It is observed that strategies that reduce cockroach allergen by environmental management are clinically beneficial to patients [20]. A Joint Task Force on environmental management of cockroaches has recently been summarized by major professional organizations [21]. The environmental measures include clean kitchens, timely washing of utensils, keeping food items in closed containers, frequent disposal of garbage, setting of cockroach traps and chemicals & sprays etc.

Outdoor Allergens:

- a. Pollen Allergens: Environmental management of pollen is relevant during their pollen seasons particularly that are airborne and are important as allergens. During the pollen

period, patients are advised to (if possible) to be outdoor during early morning before sunrise and during the late afternoon. In addition to this, door and home windows should be kept shut to reduce pollen exposure from air. Patients are further advised to use air conditioner, use pollen mask, and use showers after coming from outdoors. Patients also advised to cover their hairs for a long period during outdoors. Although there are common suggestions to minimise pollen exposure but these have not been validated scientifically.

b. Outdoor Moulds: Some of the fungi considered allergenically important as outdoor allergens are *Alternaria*, *Cladosporium* and *Fusarium*. However, some of the aerophilic species such as *Penicillium* & *Aspergillus* are indoor allergens causing allergic diseases. Compared to indoor allergens, the diagnosis of outdoor mould allergy is difficult due to non-availability of standardized mold allergen extracts. These fungi also have greater cross reactivity with even taxonomically unrelated species.

Smoking

a. Passive smoking: It is well established that passive smoking is associated with aggravation of asthma & allergy with increased hospitalization [22]. The implementation of public ban on smoking has been observed to have reduced exacerbation of asthma [23,24]. A meta-analysis of 11 studies published between 2008 to 2013 reported 10% reduction in hospital admission after smoke ban [25].

b. Air Pollution: Avoidance of outdoor air pollution is very hard to achieve because there is no realistic way for avoidance their exposure. In children with moderate asthma/allergy have decreased lung function. Many regulatory agencies recommend that allergic patients may remain indoors during high pollution to avoid exposure to clinical and organic volatile substances. However, some believe indoor air pollution is also equally harmful to susceptible individuals. When air quality index reaches certain harmful level, all patients should avoid outdoor exposure and reduce the time in outdoor air [26]. Many organizations recommend wearing dust mask and taking antioxidants which may not be very effective [27]. Therefore, sustained clean air remains the most effective way to reduce health effects of respiratory allergy patients that are pollutant related.

Weather Parameters

In general, the effect of cold temperature triggers asthma symptoms & hospital visit, so is the ease of increasing temperature and increase in emergency visits particularly by elderly patients [28]. High altitude has been well known to be associated with reduced mite exposure leading to reduced sensitization rate to mites [29]. However recent studies suggest that reduced allergy in high altitude could be due to overall reduction of pollen and molds leading to reduced exposure of outdoor allergens.

Stress and Emotional constrains

Stress enhances the airway inflammation by modulating immune cell function. Psychological triggers have been consistently associated with exacerbation and emergency visits [30]. Anxiety may exacerbate the effects of disrupted sleep on childhood asthma [31].

Recommendation from Professional Organisations

Recommendation by National Societies in the identification and managements of triggers vary widely. US guidelines for management of allergy & asthma suggest trigger identification and avoidance instructions. The British Thoracic Society also recommends identification of triggers and emphasize on the role of passive smoking. The French Society of Pulmonology provides a list of triggers. The American Academy of Allergy also recommends avoiding triggers. However, with respect to allergen avoidance there are discrepancies in their recommendations. The British Society does not recommend the use physical and clinical methods for reducing HDM allergen levels in the home and concludes that single interventions have very limited or no effect. However, the British Society of Allergy and Clinical Immunology advocate that avoidance of HDM may be beneficial in highly motivated allergy patients with multiple interventions. The ARIA guide line suggested not using single clinical or physical preventing method of avoidance but to use combinations.

Summary

To summarize the natural history of allergy and asthma are influenced by many triggers of allergenic and non-allergenic origin. Educational programmes should focus on patient's questions to address triggers. In many situations the avoidance of triggers does not provide guarantee for success and multifaceted approach. It must be adopted in avoidance strategies.

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