Preventing asthma; Does allergen avoidance work?

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A worldwide increase in the prevalence of allergic disease has occurred over the last few decades. The United Kingdom has one of the highest prevalences of asthma and allergy in the world with 1 in 4 persons being affected. The cost to individual with asthma and to the society in general is considerable. To curb this rising trend we need to find ways of preventing their development. Nearly 80% of asthma is associated with allergy, and allergen sensitisation is a major driver of asthma. There is a strong association between asthma, rhinitis and eczema and these are collectively called allergic diseases. The presence of one allergic disease increases the risk of developing another.

Allergic diseases tend to run in the family. We also know that allergy develops because those who inherit allergy genes acquire sensitisation on exposure to allergens present in the surroundings. The assertion that allergen exposure early in life leads to the development of allergic disease is biologically plausible, and there is considerable evidence in the scientific literature to support this notion. A dose-dependent (higher the exposure, higher the effect) relationship between allergen exposure and sensitisation and between sensitisation and the development of allergic disease is well established. Specifically, House dust mite (HDM) allergen exposure has been shown to be closely associated with sensitisation to this allergen and the development of asthma. UK has one of the highest prevalence of asthma and it is no coincidence that HDM is the commonest allergen in the UK. However, other allergens are also important. Food allergies are common in infancy and pose a risk for developing asthma and rhinitis in later childhood. Most asthma can be traced to symptoms of cough and wheeze early in childhood. Thus, prevention by early allergen avoidance seems a logical step in high-risk children. These observations led to the question; could reduction in exposure to potent allergens such as HDM and common food allergens reduce the risk of a child developing asthma and allergy?

Thus, the Isle of Wight prevention study was designed to investigate if reduction in exposure to HDM and common food allergen during infancy will prevent asthma and other allergic disease. We enrolled 120 Children considered at high risk of allergic disorders due to their family history. One-half of the study participants (prevention group) avoided highly allergic

foods such as cow's milk, egg, fish and nuts during the first year of life. These infants were either exclusively breast fed or given hypoallergenic milk. Introduction of solid foods was delayed and gradual. Exposure to HDM allergen was also reduced in the home from birth. The other half (control group) followed standard advice for diet and home environment. Children were assessed repeatedly from ages 1 to 18 years for the development of asthma and allergy. The prevention group, who practised allergen avoidance, were found to have less asthma, eczema and sensitisation of common allergens at age 1, 2, 4, 8 and 18 years. We concluded that comprehensive allergen avoidance in the first year of life is effective in preventing asthma and allergy in individuals considered at high risk due to heredity. The effect occurs in the early years, but persists through to adulthood.

The Isle of Wight prevention study tested a very comprehensive and strict allergen avoidance regime. Conforming to the presumed sequence i.e. allergen exposure leading to allergic sensitisation and sensitisation to allergic disease, we found a larger preventive effect on allergen sensitisation and a smaller, but clinically meaningful and statistically significant, effect on allergic manifestations such as asthma and eczema. Our analysis demonstrates a significant reduction in the prevalence of sensitisation to common allergens and specifically HDM in the prevention group in childhood. There was no significant effect on allergic sensitisation or asthma developing during adolescence for the first time. However, the effect seen in childhood was sustained over the duration of follow-up i.e. until the age of 18 years, with no narrowing of that difference.

A number of studies have attempted to prevent the development of allergy, often with disappointing outcomes. This is the only study that has shown a persistent and significant reduction in asthma and allergy throughout childhood. However, none of the other trials have replicated the design and methodology of the Isle of Wight study. Strategies, such as exclusive breast-feeding, the use of hypoallergenic formula and delaying of solid foods in infancy have shown mixed effects, whereas avoidance of HDM alone has been generally disappointing. Studies assessing combined food and aeroallergen avoidance have met with greater success, although none of the primary prevention studies have tried such stringent measures, including strict dietary restriction during lactation as well as extensive HDM avoidance measures. Moreover, in the Isle of Wight study, the compliance to allergen avoidance measures was remarkably high. Thus, a combined food and HDM allergen avoidance regime in infancy could be considered for prevention of allergy in high-risk

infants. Although, the island population is not different from the mainland UK, it is possible that there were some unique factors that made this group of participants particularly responsive to the effect of a comprehensive reduction in allergen exposure. Therefore, further studies are needed to confirm this preventive effect in a larger population, assess cost-effectiveness of this approach and to understand mechanisms underlying this effect.

In conclusion, our study provides convincing evidence that a comprehensive and strict food and HDM allergen avoidance strategy in the first year of life can prevent the development of asthma and allergy. If shown to be successful in other populations, it has the potential to reduce the rising trend of allergic diseases.

Isle of Wight prevention study publications

1. *Arshad S H, Matthews S, Gant C, Hide D W. Effect of food and house-dust mite allergen avoidance on development of allergic disorders in infancy. The Lancet 1992; 339: 1493-7.*
2. *Hide D W, Matthews S, Matthews L, Stevens M, Ridout S, Twiselton R, Gant C, Arshad S H. Effect of allergen avoidance in infancy on allergic manifestations at age two years. J Allergy Clin Immunol 1994; 93: 842-6.*
3. *Hide D W, Matthews S, Tariq S, Arshad S H. Allergen avoidance in infancy and allergy at 4 years of age. Allergy 1996; 51: 89-93.*
4. *Arshad S H, Bateman B, Matthews S M. Primary prevention of asthma and atopy during childhood by allergen avoidance in infancy: a randomised controlled study. Thorax 2003; 58(6):489-93.*
5. *Arshad S H, Bateman B, Sadeghnejad A, Gant C, Matthews SM. Prevention of allergic disease during childhood by allergen avoidance- The Isle of Wight prevention study. J Allergy Clin Immunol 2007;119(2):307-13.*
6. *Scott M, Raza A, Karmaus W, Mitchell F, Grundy J, Kurukulaaratchy RJ, Arshad S H, Graham Roberts. The influence of atopy and asthma on exhaled nitric oxide in an unselected birth cohort study. Thorax 2010;65(3):258-62. [PMID: 20335297]*