

## Prevention of asthma – where are we now?

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Asthma is common, chronic illness, which afflicts people of all ages and represents a substantial burden on affected individuals, families and society. Broadly speaking there are three strategies that can be adopted to reduce this burden: prevent the onset of the disease, try to cure the disease, or control symptoms and prevent attacks in those in whom it cannot be prevented or cured. The first of these is most desirable if it is feasible. Substantial variation in prevalence between countries (1) and over time (1, 2) imply that changing environmental factors do contribute to the aetiology of this disease and, hence, it may be preventable.

Existing information about the environmental factors leading to asthma may be summarised in terms of four hypotheses: allergen, diet, hygiene and irritant/viral. Each of these has a mechanistic explanation and some observational data to support it.

The allergen hypothesis is probably the most long-standing hypothesis for the aetiology of asthma. It is based on the known role of allergen in initiating airway inflammation and airway narrowing, both of which are characteristic of asthma. The strong link between atopy (sensitisation to environmental allergens) and asthma provides further evidence for this link. However, recent clinical trials of specific allergen avoidance in children at high risk of asthma have yielded disappointing results (3, 4) despite promising findings in earlier studies (5, 6).

In the 1990s a study in NSW found that children with asthma were less likely than other children to eat fish regularly (7). Fish are major dietary source of omega-3 fatty acids, which are precursors of anti-inflammatory mediators and have been thought to have beneficial effects in other disease states. However, a recent trial of omega-3 fatty acid supplementation and omega-6 fatty acid restriction during the first five years of life demonstrated no reduction in the prevalence of asthma (4). Some observational studies have shown modest beneficial effects of breastfeeding on the risk of developing asthma (8, 9) or allergic disease (10) in early life but others have shown conflicting results (11, 12). Hence, the role of encouraging breastfeeding as a tool for the prevention of asthma is not clear.

Having older siblings (13, 14), attending childcare in early life (15), growing up on a farm with animals (16, 17) and having domestic pets (18, 19) are all associated with a reduced risk of having allergic disease including, in some instances, asthma. These observations have all been linked to the hygiene hypothesis and immunological pathways have been proposed to explain their effect. However, the actual protective exposure, and the mechanism by which it exerts its protective effect remains to be established.

Viral infections and irritants, such as environmental tobacco smoke, particles, and oxidant gases, trigger symptoms and exacerbations in people with asthma. Although some cohort studies have implied that there may be an intermediate term, if not long term, effects of these exposures on outcomes related to asthma (20-23) they are unlikely to be major contributors to the aetiology of asthma.

In order to make recommendations for the prevention of asthma, we are looking for interventions that are: (1) simple, cheap and unlikely to cause harm; (2) have ancillary benefits; (3) have most evidence to support the effectiveness in preventing asthma. Unfortunately, there are no interventions that definitely meet all these criteria, although avoidance of smoking during pregnancy definitely meets the first two criteria and meets the third criteria in relation to early childhood wheezing illness.

Future research in this field will need to accommodate the complex, heterogeneous nature of the disease we currently know as “asthma”. The most intriguing current challenge is to understand the

observations currently linked under the umbrella of the “hygiene hypothesis”. Further observational and mechanistic studies will yield new, testable hypotheses which should be tested in randomised controlled trials before they are translated into recommendations for the prevention of asthma.

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