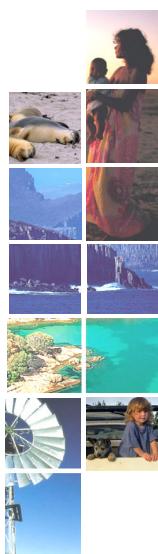


Allergies and asthma in the rural setting

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INTRODUCTION

Our airways are the first contact for all types of allergens and chemicals we breathe into our lungs. As the inflammatory nature of asthma becomes accepted, recognition that asthma is an immune-mediated disease leading to chronic inflammation of the airways, with associated hyperresponsiveness, mucus production and bronchoconstriction becomes important. Identifying possible allergenic trigger factors becomes part of any organised asthma management plan. Investigation into the role of allergen avoidance in both the antenatal and postnatal environments may allow reduction in the development of asthma and improved management in those with existing disease.



ASTHMA

Asthma is a chronic inflammatory disorder of the airways in which many cells play a role, in particular mast cells, eosinophils and T lymphocytes. In susceptible individuals this inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness, and cough, particularly at night and/or in the early morning. These symptoms are usually associated with widespread but variable airflow limitation that is at least partly reversible, either spontaneously or with treatment. This inflammation also causes an associated increase in airway responsiveness to a variety of stimuli.

Allergy and asthma facts

- Australia has the second highest prevalence of asthma in the world.
- One in four children, one in seven adolescents and one in ten adults have asthma.
- The prevalence of asthma in Australia doubled between 1982 and 1992.
- Around 40% of Australians have allergies.
- Early childhood asthma is often associated with sensitisation to environmental allergens.
- The level of early childhood exposure to indoor allergens correlates with allergen sensitisation.
- The presence of allergen sensitisation correlates with development of asthma.
- **More than 80% of people with asthma have allergies.**



Rural asthma and allergy: specific issues

Rural and remote area asthma presents special problems for the health professional and the patient. While prevalence and hospital admissions for asthma do not appear to be significantly higher for rural Australia, the challenge of managing asthma and related allergic conditions is much greater. People with allergy and asthma may face the following difficulties:

- distance from hospitals and medical facilities
- limited access to health professionals
- difficulty in limiting exposure to seasonal and occupational asthma triggers, leading to more frequent disease exacerbations.

In addition, rural and remote area practitioners face problems:

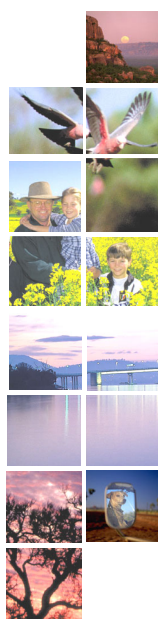
- resourcing issues and high workloads
- reduced opportunity for peer support
- less convenient access to clinical education.

Therefore, **maximising the available resources** is very important. Teamwork between all members of the asthma management team, including the patient and their family, is crucial. Good personal relationships and a support network are essential to improving communication and providing a consistent message to the person with asthma.

Reducing asthma triggers is especially important in agricultural areas. Farm dusts and pollens, as well as farm animals, chemical irritants, odours and physical exertion, can be potent triggers. Leaving the farm to avoid exposure to these triggers is not an option for most people, and there may be no easy way of limiting exposure.

Environmental modification may be possible to some extent. Measures to deal with house dust mite, animal allergens and others in the home are described below. On the farm, the following measures can make a difference:

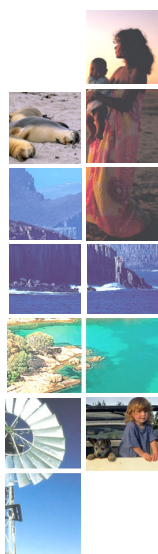
- protective equipment, such as personal respirators worn during the harvest or when working in dusty or fume-laden environments
- masks worn when unwrapping silage or handling hay stored in damp sheds (to limit mould spore exposure), or when working with animals or birds (to limit exposure to animal and bird dander, dust and dust mites in grain stores, animal feed and bedding)
- sealed and air-conditioned cabs on tractors and harvesters
- covered chutes and spouts in dusty areas
- installation of ventilation systems
- keeping crops that trigger asthma away from the house.



Regional environmental modification is more complex. Agricultural practices that affect asthmatic and allergic people's lungs include "burning off" and aerial crop-dusting. Local pollens can be a major trigger. Land stabilisation practices that limit environmental dust need to be considered wherever possible.

It is important to consider these rural issues in relation to **overall asthma management and patient education**. Along with careful diagnosis, discussion of the role of allergy in asthma, related to the individual's or family's own environment, is necessary to establish a context for management, pharmacological treatment, immunotherapy (if this is an option), and for the prevention of allergy development in children. Good self-management, including a written Asthma Action Plan and readily accessible reliever medication for emergencies, smoking cessation and personal fitness are particularly important when seasonal and occupational triggers may be unavoidable.

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PRIMARY PREVENTION OF THE ALLERGIC CONDITION

Even in the intra-uterine environment, the foetus is exposed to allergens that are both inhaled and swallowed by the mother.¹ However, it is usually early stimulation of the immune system in infancy that leads to the development of an atopic state. Factors leading to development of allergies are multi-factorial: genetic predisposition with exposure to allergens and environmental agents such as infections and tobacco smoke.²

Prenatal choices

Specific research has shown Th-2 cells drive the expression of IgE and atopy. Offspring born to an atopic mother have a high risk of becoming atopic. Those born to an atopic father have less risk, but children with both parents atopic have a very high chance of becoming atopic (>70%). For those prospective fathers with atopic disease, choose your parental partner wisely! Unfortunately the majority of children who develop atopic disease, particularly recurrent wheezing and asthma during childhood, do not belong to high-risk groups.

Antenatal environment

Advice to all

- Avoid maternal smoking during pregnancy.
- There is **no** evidence to recommend exclusion diets during pregnancy.

Postnatal environment

Advice to all

- Avoid exposure to all tobacco products. Children of parents who smoke have higher rates of asthma, wheeze and allergic sensitisation.



Dietary advice to high-risk individuals

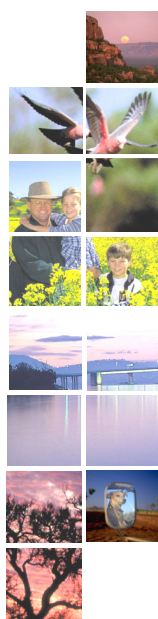
- Exclusive breastfeeding until 4–6 months of age.
- Consider weaning onto extensively hydrolysed formula (PBS does not fund Neocate/ EleCare/ Alfare/ Pepti-Junior in children without established cow's milk/soy allergy).
- Hypoallergenic diets in breastfeeding mothers may reduce the risk of the child developing specific food allergy and early eczema, but not asthma. Weaning to soy milk and goat's milk formulas do not reduce development of allergies.
- Delayed introduction of high allergy foods into the infant's diet reduced the development of specific food allergies and eczema, but not asthma. Consideration should be given to delaying introduction of solids until six months of age, then commence with low allergenic foods such as rice, vegetables, fruits then meats, introducing one food each week.

Environmental

- Unlike other airborne allergens, there is a linear relationship between development of allergy to house dust mite and the level of exposure to mite.^{3,4} While research based on reducing exposure to house dust mite has not shown dramatic benefit, for those families who wish to undertake active primary prevention strategies, house dust mite avoidance is reasonable as it does reduce the incidence of eczema and may reduce the development of asthma. Unfortunately, research based on antenatal and postnatal house dust mite avoidance has not shown a dramatic reduction in the development of airborne allergy.
- Animal dander (especially cat) exposure in very early infancy may be associated with increased risk of development of cat allergy,⁵ but eliminating the cat from the environment prior to birth does nothing to reduce asthma triggering. In fact, some studies have shown that houses with large numbers of cats resulted in a lower incidence of sensitisation to both cats and other inhalant allergens.⁶ New house, new clothes, new furniture, no cat may reduce the incidence of cat allergy.
- Dietary changes with increase in omega 3-omega 6 composition in the diet may predispose increased risk of allergic disease in those children who maintain T helper 2 -lymphocyte phenotype after birth. Increasing the intake of oily fish may have a preventive effect, with the high level of trans-fatty acids typical of a Western diet possibly associated with an increased risk of triggering atopy.

Hygiene hypothesis:

- It has been noticed that atopic disease is far more common in affluent societies.
- Exposure of infants to viral and bacterial infection triggers the differentiation of human T helper cells (Th0 cells) into Th1 cells, which produce inflammatory proteins like interferon gamma, rather than Th2 cells which produce inflammatory proteins such as interleukin-4.⁷ Epidemiological studies suggest very early exposure to infections, such as those commonly experienced in a childcare setting or being the youngest sibling in a large family, may be beneficial in reducing atopic triggering.⁸



- Respiratory Syncytial Virus (RSV) and associated bronchiolitis has been associated with an increased risk of developing subsequent wheeze.
- The interaction of infants with commensal bacteria may lead to down-regulating Th2-based neonatal response. The use of probiotic supplements is currently being investigated in the primary prevention of atopic disease.

Is it allergy?

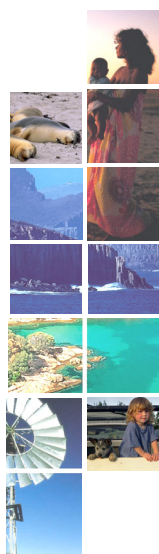
A careful history is essential in the diagnosis of allergy in the airways. Allergy to inhalants such as dust mites usually develops in the first two decades of life. It may occur later on in immigrants. Inhalant IgE-related triggers are associated with cross-linking of IgE molecules on mast cells, stimulating the release of histamine, leukotrienes and other immune modulators. Given that the onset of IgE-related allergy response is relatively rapid, the onset of clinical symptoms usually relates to recent exposure.

Clues from the history include:

- perennial symptoms rather than seasonal
- time of daily (e.g. night-time and early morning) symptoms relating to house dust mite, although night-time symptoms can also be related to both colder nocturnal air and bronchial reactivity associated with lower endogenous cortisol levels
- time of week, e.g. weekend symptoms associated with specific activity (horse riding) or living conditions (a sleep-over at a friend's house with cats, or holiday homes)
- occupational exposure to allergens, e.g. blackwood dust
- home environment, e.g. vacuuming and mite or mould exposure
- seasonal reactions may occur to pollen triggers in spring, or to outdoor moulds such as *Alternaria* and *Cladosporium* spp in hot windy conditions in summer and autumn.

IgE food allergy

Food allergy is frequently underestimated in association with asthma, however food allergy has only been shown to trigger or exacerbate bronchoconstriction in a very small percentage of children with asthma. In the large Melbourne Milk Allergy study, children with proven IgE allergy to cow's milk allergy had less than 30% chance of developing cough or wheeze.⁹ While uncommon, it is important to consider food allergy, especially since the development of eczema following sensitisation to food allergens is associated with increased risk of developing asthma at a later date. Usual food allergens are high protein foods such as egg, peanut, cow's milk, tree nuts, soy, fish, shellfish and wheat. Evidence of cross-reaction between pollens and vegetables, and between latex and foods, has recently been found.



Non-IgE food protein and food chemical hypersensitivity

There appears to be a very small group of people who develop asthmatic symptoms following ingestion of food proteins and food chemicals where testing for IgE remains negative. Non-IgE mediated type-3 and type-4 immunological reactions are often delayed and occur following accumulation of chemicals from one or a combination of foods.

Many patients with asthma are told to exclude cow's milk from their diet. This is a firm belief amongst many complementary health practitioners. Should a parent or patient with asthma wish to investigate whether cow's milk is exacerbating their asthma, full elimination and challenge needs to occur. Food exchange with hypo-allergenic milk or rice milk should occur, as soy milk allergy via both IgE and non-IgE mechanisms occurs more commonly in children with cow's milk allergy. Formal testing using serial peak flows / spirometry and symptom scores may fail to show any deterioration upon challenge. Removing cow's milk from a child's diet is a considerable nutritional loss and should only occur if absolutely essential.

Food chemical sensitivity can rarely be associated with the exacerbation of asthma via an idiosyncratic mechanism. Most commonly this is associated with sulphite sensitivity (anti-oxidant/preservative 220 found in wine and dried fruit), or, in very sensitive individuals, relating to salicylate or propionate ingestion. Again, clinical suggestion must be investigated using formal food elimination and challenge.

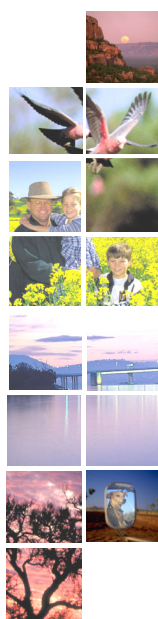
ALLERGY DIAGNOSTIC TESTING

IgE-mediated reactions are associated with immediate hypersensitivity.

- Skin prick testing (SPT) is the most convenient, specific and least expensive method of investigation. Additional benefit is found from visual reaction, where the patient can understand the type of reaction occurring within the airways. SPT is appropriate for inhalant and food allergens, but shows no reaction to non-IgE mediated responses.
- RAST testing of venous blood is useful where severe IgE-related reactions are possible, for example where the use of SPT may trigger an anaphylactic reaction. They are also of benefit where extensive eczema makes SPT difficult, or where antihistamine medication cannot be stopped prior to investigation.

Non-IgE mediated reactions associated with foods and food chemicals are investigated by the use of food chemical elimination diets followed by challenges. This process needs to be guided rather than self-directed to achieve optimal outcome. Referral to a doctor or dietitian with an interest in allergy diseases is recommended.

Testing of cell-mediated immune reactions using epi-cutaneous (patch) testing has no place in the investigation of asthma.



MANAGEMENT OF EXISTING INHALANT ALLERGY

Following the development of a reaction to an inhalant allergen, three steps may be taken:

- secondary prevention by avoiding allergen
- pharmacological management
- allergen immunotherapy.

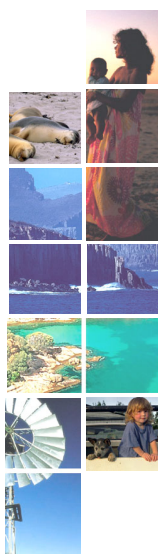
Secondary prevention by allergen avoidance

Meta-analysis of chemical and physical measures to reduce exposure to house dust mite antigens in the homes of mite-sensitive asthmatics does not usually provide improved control. However, many people with asthma are willing to try mite avoidance as a drug-free method of management. Children with mixed atopic disease, e.g. eczema or atopic rhinitis, may achieve additional benefit. Despite poor research outcomes there exists a small group of patients who achieve considerable relief following modification of bedroom environments. Should a patient wish to trial house dust mite modification, assessment of asthma severity before, during and after is recommended.

Suggested environment modification includes the following:

- use of specific dust mite-proof bedding covers, e.g. AllergEnd, Miteguard or Allersearch. Covers should be washed every 1–2 months. All washing needs to be in hot water (55–60°C). Thorough drying to eliminate all moisture is recommended
- wash bed linen weekly in hot water, as well as comfort blankets and pram liners
- cotton cellular or synthetic blankets can be washed monthly in hot water. Recent studies suggesting new feather doonas are associated with less frequent wheeze may relate to more effective covering material
- avoid all fluffy friends within the bed, otherwise wash in hot water, dry thoroughly then place in freezer overnight in sealed plastic bag
- avoid fabric furnishings and curtains within the bedroom
- remove carpet from the bedroom, replacing with polished boards, tiles or vinyl
- wet-dust all surfaces on a regular basis
- keep pets, especially cats, out of the house
- improved airflow through bedrooms to reduce humidity.

Note: For those people who gain improved control from modifying the home bedroom environment, increased drug therapy may be required when sleeping elsewhere.



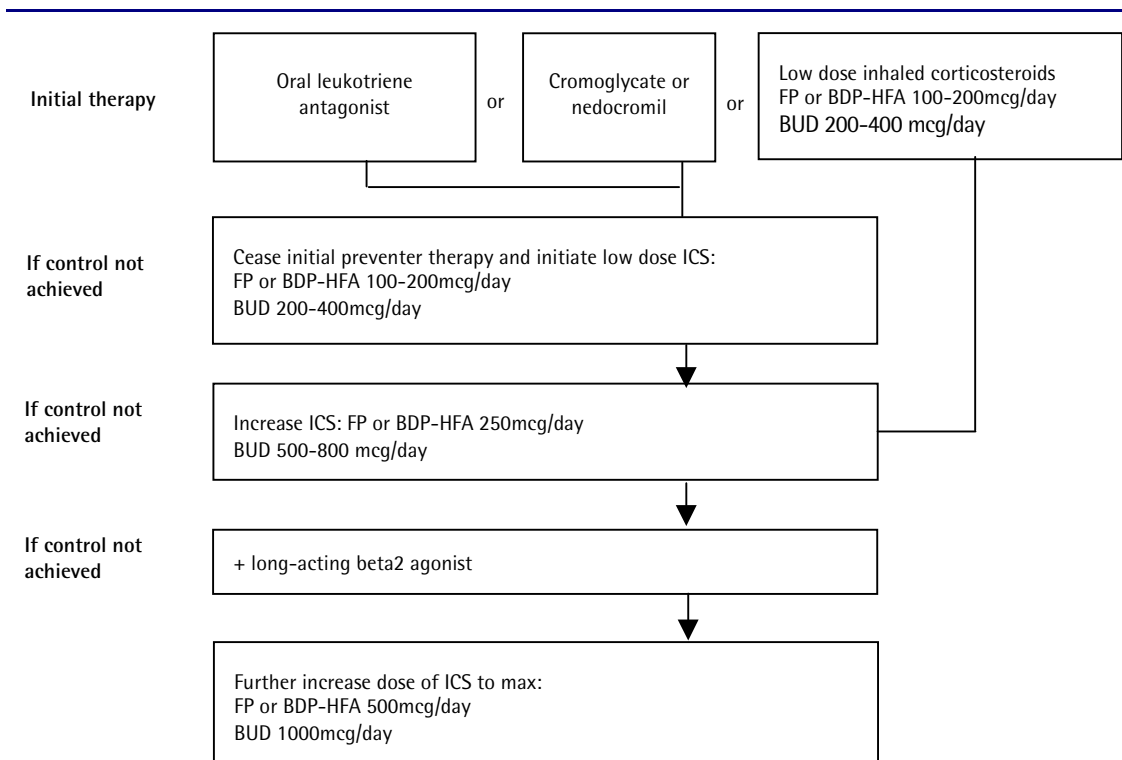
Acaricide house dust mite sprays, domestic dehumidifiers and air cleaning filters are not recommended.

PHARMACOLOGICAL MANAGEMENT

As we are becoming more aware of the inflammatory nature of asthma, regular preventive medication is recommended for patients with moderate intermittent or mild persistent asthma. Preventive medication falls into three primary groups:

- inhaled corticosteroids
- anti-leukotrienes
- inhaled cromolyns.

Approach to preventive therapy



Source: adapted from *Asthma Management Handbook 2002*, National Asthma Council.

* CFC-containing beclomethasone and budesonide are being withdrawn in 2002. Budesonide in dry powder form (non-CFC containing) will continue to be available.

* Once control of asthma is achieved and maintained for at least 3 months, a gradual reduction of the maintenance therapy should be tried in order to identify the minimum therapy required to maintain control.

Pharmacological intervention in infants with atopic eczema

There is some evidence to suggest that early pharmacological treatment in children at high risk of developing asthma (family history of atopy, the early onset of atopic dermatitis and positive IgE reaction to dust mite or pollens) may reduce the later development of asthma.¹⁰ Consideration should be given to the use of certirizine in this group at the parent's request.

What does the future hold for allergy management in asthma?

In patients whose allergic asthma is dependent on IgE response controlled by T and B lymphocytes and activated by the interaction of antigen with mast-cell bound IgE molecules, trials have been performed using a humanised monoclonal antibody to IgE. Results have included reduced exacerbations and dramatic reductions or even cessation of the need for inhaled corticosteroid therapy, as well as improved quality of life.

Who knows if the use of specific monoclonal antibodies to IgE will lead to the development of a vaccination that may modify response to inhaled and ingested allergens?

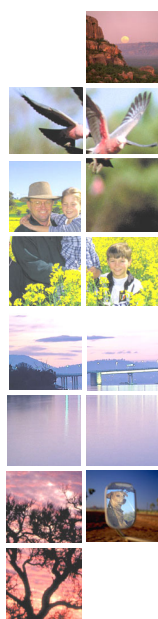
CONCLUSION

In all patients with asthma, allergy triggering is possible. The most important weapon in the diagnosis is having knowledge of the pattern of asthma, recognition that allergic reaction might play a part in both the development and exacerbation of asthma, and attentive listening to the patient or their parents for what they feel may be triggering the problem.

In those patients who feel they have an allergic trigger, our role as their health provider includes guiding them through the process of deciding whether there is an allergic basis to their disease, and leading in discussion regarding management options.

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PRESENTER

Chris Luttrell is a solo special-interest general practitioner in Launceston, Tasmania. His interest in paediatric and adolescent asthma has led to an increasing interest in allergic influences on health and the education of patients to become self-reliant in the management of their diseases. Chris has had experience in peer education and is Asthma Liaison Officer for Northern Tasmania Division of General Practice. He is a member of the NAC General Practitioners' Asthma Group.

