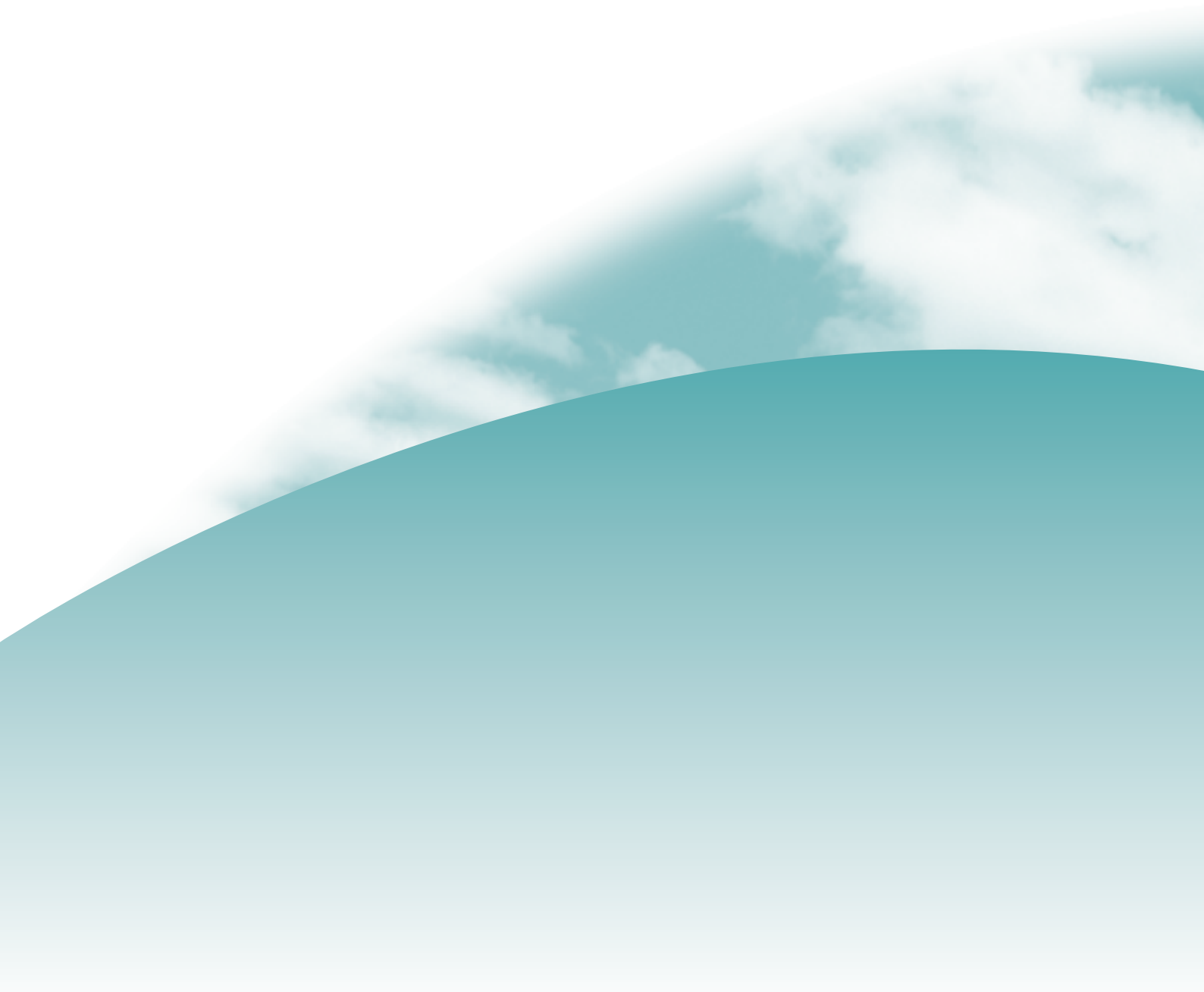


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Asthma and Allergy

A guide for health professionals



Asthma and Allergy

A guide for health professionals

The aim of this paper is to provide an up-to-date, evidence-based summary of allergy and asthma management issues including practical advice on allergen avoidance. A consumer brochure on this topic has also been developed. These documents have been produced by the Australian Government Department of Health and Ageing in collaboration with the Australasian Society of Clinical Immunology and Allergy.

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Disclaimer

The information contained in this brochure has been expert reviewed and represents the available published literature at the time of review. It is not intended to replace professional medical advice. Any questions regarding a medical diagnosis or treatment should be directed to a medical practitioner.



Australian Government

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Asthma... Think allergy

In asthma, **allergic inflammation** is the major underlying abnormality affecting the airways.¹ This inflammation leads to bronchial hyper responsiveness to triggers, including infections, allergens and non-specific irritants.

Exposure to common aeroallergens such as house dust mite, animal dander, pollen or mould can initiate and maintain airway inflammation in most people with asthma.²

A comprehensive approach to asthma management includes:

- identification of relevant allergen triggers
- allergen avoidance measures where appropriate and possible
- appropriate medication
- specific allergen immunotherapy (SIT) where indicated.

Asthma and allergy facts

Australia has the second highest prevalence of asthma in the world.

The reasons for this are unclear. However, it is known that:

- the prevalence of asthma in Australia is approximately one in four children, one in seven adolescents and one in ten adults^{3,4}
- the prevalence of asthma in Australia doubled between 1982 and 1992.⁵

There is a strong link between asthma and allergy:

- around 40 per cent of Australians have allergic disease³
- more than 80 per cent of people with asthma have evidence of allergic sensitisation⁶
- early childhood asthma is associated with sensitisation to environmental allergens in many but not all cases
- the level of early childhood exposure to indoor allergens correlates with allergen sensitisation^{7,8}
- sensitisation to a greater number of allergens is associated with an increased prevalence of asthma.^{9 <LE IV>}

Atopy is a marker for asthma that persists beyond early childhood

Most wheezing illness in early childhood resolves by 6 years of age. Early transient wheezing is associated with abnormal lung function in infancy and maternal smoking, but not maternal asthma or atopy. Small airway calibre is thought to predispose to virus induced wheezing in infancy that resolves in later childhood as airways increase in size.

Atopy is strongly associated with asthma that persists beyond the first 6 years of life. Allergic sensitisation to food allergens in the first 2 years of life and/or inhalant allergens at 7 yrs are associated with asthma at 7 yrs and 22 yrs.^{10, 11} The presence of other allergic disorders (eczema or allergic rhinitis) or parental history of atopy are risk factors for persistent asthma at 6 years.¹²

Atopy is also a risk factor for hospitalisation in asthma, as are frequent respiratory symptoms, airway hyperresponsiveness and reduced lung function.¹³

It should be noted that the absence of associated atopy or other allergic disorders does NOT preclude a diagnosis of asthma, particularly in early childhood.

Atopic individuals commonly suffer from several allergic disorders throughout their life. The manifestation of allergic disorders typically follows a characteristic sequence that is described as the Allergic (or Atopic) March.¹⁴⁻¹⁸ Atopic eczema and food allergies tend to commence in infancy or early childhood. These are often followed by the development of asthma and perennial allergic rhinitis in the preschool years. In teenage years symptoms of perennial rhinitis may persist and increase and hay fever (seasonal allergic rhinitis and conjunctivitis) may develop for the first time.

Atopy is defined as a personal or familial tendency to produce IgE antibodies to low doses of allergens, and as a consequence, to develop typical symptoms such as asthma, rhinitis/conjunctivitis or atopic eczema/dermatitis.¹⁹

Asthma triggers

Triggers of asthma include:

- upper respiratory infections, particularly viral, as well as bacterial infections, such as sinusitis and bronchitis
- allergens – these are usually small glycoproteins which provoke an immune response in allergic people. They include house dust mites, animal skin and saliva, pollen, moulds and in rare cases, foods
- physical factors such as exercise, cold air, changes in temperature and oesophageal reflux
- irritants such as cigarette smoke, irritant smells (eg paint, cleaning agents, perfumes) and air pollution (eg high levels of car exhaust fumes or fumes from gas heaters)
- medicines such as aspirin, non-steroidal anti-inflammatory agents, beta blockers
- food additives including some preservatives
- emotion upheaval.

Unlike most other asthma triggers, exposure to some allergen triggers can be reduced or avoided.

This can lead to improved control of asthma and a reduced need for medication.

Information on specific allergen avoidance strategies are outlined in this brochure in pages 6-10.

Seasonal (or intermittent) allergies tend to be caused by pollen.

Perennial (or persistent) allergies occur all year round and may be caused by allergens such as house dust mites.

Allergen triggers of asthma

In individuals with asthma, it is well established that exposure to relevant allergens may trigger an asthma attack and/or worsen asthma symptoms.

Evidence of this exists for indoor allergens such as house dust mite, pets and cockroach, as well as outdoor allergens such as pollen and moulds.^{20-29 <LE III-2>}

However, there is not necessarily a direct relationship between allergen exposure and symptoms in some individuals as:

- patients are often sensitised and exposed to a number of allergens
- there are other triggers such as viral infection, passive smoke exposure and medication
- the magnitude of response to the same level of allergen exposure can vary considerably between individuals
- intrinsic airway factors unrelated to allergens may contribute to the level of symptoms
- there can be a late phase response, that is, reactions evolve over hours.

Occupational asthma

Occupational asthma is often allergy related. Examples include:

- laboratory workers allergic to rats and mice
- health care workers allergic to natural rubber latex
- bakers allergic to flour dust.

Over 300 causes of occupational asthma have been described and the majority of these are due to allergens rather than irritants.³⁰

DIAGNOSIS – History taking

As well as general questions about asthma symptoms, consider the following:

1 Atopy is strongly linked with asthma

- Over 90% of children and 80% of adults with asthma are atopic.^{31, 32}
- The presence of eczema is a marker of more severe and/or persistent asthma.^{33, 34}
- Children still wheezing at 6 years are more likely to have a maternal history of asthma and elevated serum IgE levels.¹²
- Sensitisation to house dust mite and the mould, *Alternaria* is associated with a high incidence of asthma.^{35, 36<LE D>}

2 Rhinitis

Rhinitis of any cause is a risk factor for asthma (including allergic rhinitis).^{37, 38}

3 Are allergens triggering asthma symptoms?

Timing of symptoms

- Perennial (persistent) or seasonal (intermittent) symptoms.
- Time of day, for example, allergy symptoms provoked by house dust mite are often worse at night and first thing in the morning.
- Time of week, for example, if at weekends consider some activity such as horse-riding, or environment such as old dusty weekenders.

Occupation

- Is there a slow improvement away from the workplace?
- What potential allergen exposures are occurring at work?

Geographic associations of symptoms

- Such as work, home or holidays.

Environmental descriptors

- Conditions at home, such as house age, construction, ventilation, dampness, floor coverings, room clutter, bedding.
- Soft toys in the bedroom.
- Pets in the home.
- Smoking history of family members.

When should referral to an allergy specialist be considered?

- When there is evidence of continuing poor asthma control despite regular use of preventer medication or if there is regular use of bronchodilators.
- When there are other allergic diseases.
- When foods or food allergy are suspected as asthma triggers.
- In cases of occupational allergy.
- If immunotherapy is contemplated.
- When patients express an interest in exploring allergy issues.
- For further education regarding allergy issues of patient or family.

DIAGNOSIS – Allergy tests

Allergy testing is important in allergy and asthma management. It enables the identification of avoidable environmental triggers for asthma and allows appropriate avoidance advice to be given. Allergy testing:

- detects the presence of specific IgE antibodies to selected allergens
- identifies allergens to which the patient is sensitive
- may be done *in vivo* by skin prick testing or *in vitro* using blood (RAST) tests – however, these tests cannot be used to test for food intolerance
- results must be considered together with patient history and in some cases results of specific challenge tests to be clinically relevant.

Skin prick tests

Skin prick testing is indicated in all patients suspected of suffering from moderate to severe episodic asthma or persistent asthma. There are no age limitations, although the very young and the elderly may have diminished wheal sizes compared to other subjects.

Skin prick testing is only useful if there is appropriate allergen selection, based upon patient history, knowledge of local aerobiology and the patient's environment.

Skin prick testing is:

- the gold standard for allergy testing and more sensitive than blood (RAST) tests³⁹
- more accurate for identification of allergens than relying on history alone⁴⁰ <LE III-2>
- very safe and usually well tolerated, even by small children as it is quick and causes minimal discomfort
- convenient as results are available within 15-20 minutes
- a specialised procedure that should only be performed by a person who has been trained in the procedure and interpretation of test results
- rebated by Medicare and is relatively inexpensive compared to RAST tests.

Methodology

- Skin prick testing is performed by introducing a small amount of allergen into the skin via a sterile instrument. If a person is sensitised, a wheal and flare develops within 15-20 minutes. A wheal diameter of 3 mm or greater than the negative control is considered to represent a positive result.
- It is most commonly performed on the forearm, although the back can be used in children.
- Medications with antihistamine activity must be withheld for 3-7 days before testing to minimise the likelihood of false negative results. These medications include antihistamines, tricyclic antidepressants and pizotifen (for migraines).
- Skin prick testing should be performed on normal skin.
- A positive and negative control must be performed.
- A medical practitioner with knowledge of the management of acute allergic reactions must be present and access to onsite resuscitation facilities (oxygen and adrenaline) must be available.

Interpretation of results

- Care must be taken to interpret results in the context of a negative control solution, otherwise dermographism may result in false positive results.
- Knowledge of any conditions suffered by patients, such as recent anaphylaxis and peripheral neuropathy is required, as these can modify the reaction and may result in false negative results.

Adverse reactions to skin prick tests are rare

Local itch and swelling normally subsides within 1-2 hours. More prolonged or severe swelling may be treated with an oral antihistamine, topical corticosteroid creams and an ice pack. Occasionally patients will experience vasovagal responses. Systemic allergic reactions occur in less than 1 per cent of subjects, and are extremely rare in patients tested for aeroallergen sensitivity alone.^{41-44 <LE IV>}

Alternative skin test methods

Other methods such as scratch testing have generally been abandoned because of poor reproducibility and greater patient discomfort.

Intradermal skin testing:

- has no role in inhalant or food allergy testing
- is not as safe or well tolerated as skin prick testing
- is more sensitive and more likely to lead to false positive and clinically irrelevant results
- is more commonly used for evaluation of patients with sensitivity to antibiotics or insect venom.

Blood (RAST) tests

In vitro allergy tests detect allergen specific IgE circulating in the bloodstream. They are commonly referred to as RAST tests, an acronym for *radioallergosorbent test*, even though the radioactive technology has now been mostly superseded by enzyme or fluorescence-based systems.^{45, 46}

Compared to skin testing, traditional RAST testing has a sensitivity of approximately 70-75% for the detection of allergen-specific IgE.^{47, 48} Newer technology such as CAP has higher sensitivity than traditional RAST tests.

Results of RAST tests:

- are not immediately available as they are performed in laboratories
- when done for allergen mixes may give false negative or positive results
- when negative, do not exclude that particular allergen as a trigger for asthma.

In vitro testing for allergic triggers in asthma should be considered in situations where diagnosis of suspected allergic triggers by skin testing is impractical or unavailable,⁴⁹ including when the patient:

- is likely to be uncooperative with skin testing
- has recently taken antihistamines, tricyclic antidepressants or pizotifen (for migraines)
- has dermatographism or extensive skin rash
- has an unusually high risk of anaphylaxis, for example, in cases of occupational asthma due to latex hypersensitivity.

There is a Medicare rebate for a limited number of RAST tests performed by laboratories accredited by the National Association of Testing Authorities (NATA).

NATA is an independent body whose task is to ensure that all laboratories performing diagnostic tests comply with minimum standards in all areas.

Unproven allergy tests

There are several unproven methods that claim to test for allergies. They include cytotoxicity testing, the provocation neutralisation procedure, Vega (electrodermal) testing, applied kinesiology, reaginic pulse testing and chemical analysis of body tissues, such as hair analysis.

Controlled studies of the cytotoxicity test, provocation neutralisation procedure and Vega tests have shown that the results are not reproducible and do not correlate with symptoms of allergy.^{50-52 <LE II>}

The other methods have not been evaluated in controlled trials for accuracy nor correlation with allergic symptoms and have not been scientifically validated.

These methods can be expensive and may lead patients to implement unnecessary, costly and particularly in the case of dietary manipulations, dangerous avoidance strategies. The costs of these tests are not rebated by Medicare and their use is not recommended.

MANAGEMENT – Medication

An asthma action plan should be used to document the long-term use of asthma medication and how this should change depending on asthma severity. The plan should be reviewed on a regular basis.

Medications for allergic rhinitis

It is difficult to optimally control asthma symptoms if there is associated untreated allergic rhinitis. Treatment options include:

- Topical nasal corticosteroids – these are the most effective long term medication for allergic rhinitis.^{53 <LEI>} When used in patients with concurrent asthma and allergic rhinitis, they may improve the control of asthma and lessen the need for medication.
- Non-sedating antihistamines – these are also useful for treating symptoms of allergic rhinitis and are safe in people with asthma.

Medications that may aggravate asthma

- Some prescribed and over the counter medications such as aspirin (ASA), NSAIDs and beta blockers.
- So-called natural treatments such as Echinacea and royal jelly can precipitate life-threatening anaphylaxis in predisposed individuals with asthma.

Measurement of dust mite allergen

Tests that measure environmental dust mite levels are available. However, evidence of their clinical usefulness is yet to be demonstrated. A threshold level of 2ug/g Der p1 of dust for mite sensitisation and 10ug/g Der p1/g for development of acute asthmatic symptoms has been proposed.⁵⁸ Average Sydney mattress levels vary widely but are in the vicinity of 30ug/g, which is fifteen and three times the threshold level respectively for sensitisation and development of asthma.

MANAGEMENT – Allergen avoidance

Effective allergen avoidance reduces exposure to allergens.^{54-57 <LEI>}

In sensitised individuals with asthma this can lead to reduced asthma symptoms and reduce the requirement for medications.

House dust mite

House dust mites, mostly *Dermatophagoides pteronyssinus*(Dp) and *Dermatophagoides farinae*(Df):

- are the major allergens associated with asthma in Australia
- are microscopic mites that live indoors and feed off human skin scales
- thrive in temperate and humid climates such as coastal Australia
- produce allergen particles greater than 10uM – these particles require vigorous disturbance such as vacuuming to become airborne, and settle after 20-30 minutes.

Exposure of people with asthma who are mite allergic to high levels of dust mite allergen has been shown to increase:

- airway reactivity
- the risk of having current asthma symptoms
- the risk of hospital readmission in children admitted for an asthma exacerbation.⁵⁸

House dust mite avoidance

House dust mite avoidance measures should only be recommended to patients with proven sensitisation to house dust mite. They aim to:

- kill house dust mites
- remove the allergens they produce
- eliminate places where mites can live and breed.

A combination of measures with these aims is recommended.⁵⁹

The greatest exposure to house dust mites occurs in domestic homes, predominantly in the bedroom from beds and bedding. Therefore the bedroom should be the first priority.

1 The bedding

- Cover mattress, pillow and quilt with dust mite resistant covers.^{59 <LE II>} The covers must be washed every 2 months.

Some health funds may provide a rebate for purchase of these items. If covers are not available, wash blankets and non-encased washable doonas at least every 2 months using the method described for sheets.^{60-62 <LE II>}

- Wash sheets and pillow cases weekly in hot water (>55°C). This will kill mites and wash away the allergen they produce.⁶³ Alternatively, if washing in cold water, use a commercial product containing essential oils such as tea tree or eucalyptus oil, formulated to kill dust mites.^{64, 65} If washing normally, hot tumble drying of washed items for 10 minutes after they are dry will kill mites.⁶⁶ Dry cleaning is not as effective as these methods, as it will kill house dust mites but not remove the allergen they produce.
- Remove sheepskin or woollen underlays.^{67, 68}
- Remove all soft toys from the bed and bedroom. Replace them with wooden or plastic toys which can be washed. If a soft toy is allowed it should be washed weekly using the method described for sheets. Freezing soft toys overnight will kill mites but won't remove allergen.

2 Other measures

- Damp dust or use electrostatic cloths to clean hard surfaces (including hard floors) weekly.^{69, 70}
- Vacuum carpets weekly. Vacuuming increases the amount of house dust mite allergen in the air for up to 20 minutes. So, if possible, ask someone else to do the vacuuming and wait for 20 minutes before re-entering the room. HEPA (high efficiency particulate air) filter vacuum cleaners may remove more allergen than other vacuum cleaners. However, they still increase the amount of mite allergen in the air.
- Consider replacing carpets with hard floors such as wood, tiles, linoleum or concrete, where practical and affordable. Carpets can contain large amounts of house dust mite and animal allergens which cannot be completely removed by vacuuming.^{71 <LE II-IV>} Although removing carpets will reduce allergen exposure, the benefit on asthma control is yet to be conclusively proven.

- Reduce humidity^{72-76 <LE IV>} – have a dry and well ventilated house, adequate floor and wall insulation. Avoid evaporative coolers.
- Windows – venetian blinds or flat blinds are easier to clean. Washable curtains or external shutters are other options.
- Consider house dust avoidance measures when building a new home.

It is important to note that:

- A combination of bedding covers, washing and reduction of reservoirs will reduce mite allergen levels by 90 per cent.⁵⁹
- House dust mite avoidance measures require an ongoing commitment.
- As some mite avoidance measures can be expensive, they may be inaccessible to some patients.

These measures help some but not all mite allergic people with asthma. At present we cannot predict which individuals will benefit. It is also unclear if the reduced levels can be maintained long-term.⁷⁷

A meta-analysis published in 2001 concluded that dust mite avoidance measures were not useful for asthma. However, there are significant concerns regarding the methodology, as measures that did not reduce mite levels were also included in the analysis.⁷⁸

Products that are not recommended

- Sprays (acaracides) – there is limited information on their effectiveness and safety.^{64, 79, 80}
- Domestic dehumidifiers have not been shown to benefit asthma control.^{81 <LE III-1>}
- Air cleaning devices – house dust mite allergen is only in the air for a short time after dust-raising activities such as vacuuming.

Animals

In asthma patients sensitised to pets, exposure to pet allergens can be a potent trigger of asthma. This exposure can precipitate asthma symptoms⁸² and/or worsen asthma control.⁸³

Cats and dogs are a major source of allergens in the home environment. The allergens come from the sebaceous glands in cats and the salivary glands in dogs. As all cats and dogs have sweat and salivary glands there are no breeds that do not contain allergens, although the amount of allergen released can vary between breeds.

As allergens adhere to the pet's own skin or hair, they become airborne for prolonged periods when the pets shed their hair.

Cat allergen is ubiquitous and difficult to eliminate even after removal of the cat.⁸⁴ It is carried from place to place on clothing and can therefore be found in places where cats have never lived, such as schools and offices.⁸⁵

Pet avoidance measures

The most effective method of allergen avoidance for people with asthma who are allergic to cats or dogs is removal of the pets from the home. It can take many months before allergens reduce to low levels.

Other avoidance measures that have been shown to reduce allergens include:

- keeping pets out of bedrooms and living areas
- washing pets^{86-89 <LE III-3 - IV>}
- weekly vacuuming of carpets using HEPA (high efficiency particulate air) filters^{90<LE III-2>}
- using HEPA air filters.⁹¹⁻⁹⁴

Studies have not yet evaluated the direct benefit of these measures on asthma control.

Occupational exposure to rats, mice, guinea pigs, rabbits, cattle and horses is a known trigger of acute asthma attacks for sensitised individuals. Avoidance of the animal may be necessary in cases of occupational asthma.

Some (but not all) recent studies have reported that early exposure to cats or dogs in the home may prevent the development of allergies and asthma. However this is controversial and no conclusions can be drawn from the available data (see page 12). This should not be confused with the clearly documented role of cat and dog allergens in triggering asthma symptoms in patients with asthma.

Pollen

Allergy to airborne pollen grains from certain grasses, weeds and trees:

- is common in people with asthma
- may worsen asthma symptoms during the pollen seasons (usually in spring, early summer or during the dry season in tropical regions)
- can cause outbreaks of asthma attacks after thunderstorms⁹⁵
- is usually caused by imported grasses, weeds and trees, which are wind pollinated – the pollen can travel many kilometres from its source
- is not usually caused by Australian native plants (although there are exceptions, such as Cypress Pine)
- is not usually caused by highly flowered plants as they produce less pollen (which is transported by bees) than wind pollinated plants.

Pollen avoidance measures

The following measures may help reduce exposure to pollen, but are yet to be proven to improve asthma control:

- Remain indoors on windy days or after thunderstorms.
- Avoid activities known to cause allergen exposure – such as mowing grass.
- Shower after outdoor activities where exposure to pollen is high.
- Use recirculated air in the car when pollen levels are high.

Forecasting of relevant grass, weed and tree pollen counts may be of use to people with asthma with known pollen sensitivities. In the USA where pollen counts are routinely quoted on weather forecasts, their clinical utility has not yet been tested.

Cockroach

Cockroach allergen may be relevant in the warmer climates in Australia. Studies from other countries suggest that children allergic to and exposed to the cockroach allergen in dust have increased risk of:

- hospitalisations and emergency presentations with asthma
- more symptoms of persistent asthma.^{25 <LEIII-2>}

Measures that reduce sites for breeding and remove cockroaches and the allergen they produce may help reduce exposure.⁹⁶ However as yet this is unproven.

Mould

Like other environmental allergens, indoor exposure to mould has been shown to correlate with wheezing and peak flow variability.^{97-100 <LE IV>}

Fungal exposure occurs both indoors and outdoors. Exposure to moulds such as *Alternaria* increases the risk of asthma symptoms and airway reactivity in sensitised children and the risk of sudden respiratory arrest in sensitised young adults with asthma.^{29, 101 <LE III-2>}

Mould avoidance measures

Dehumidifiers in the home do not provide any benefit for asthma control.^{79 <LE III-1>}

Air filters and ionizers have been shown to reduce airborne mould, however a direct effect on asthma control has not yet been shown.⁷⁹

Other avoidance measures which have not been adequately tested include:

- application of fungicides such as bleach with detergent or quaternary amine preparations
- removal of indoor plants
- using high-efficiency air filters
- natural ventilation of homes
- removal of garden mulch and compost.

Food

Foods are not common triggers for asthma.

Many people with asthma believe that food often induces symptoms. However:

- as few as 2.5% of people with asthma actually react to the food in blinded challenges¹⁰², whereas 20-60% of people with asthma feel that food may be a trigger factor¹⁰³⁻¹⁰⁵
- allergy to foods such as nuts, fish, shellfish, milk and eggs may trigger asthma symptoms in conjunction with other symptoms in the skin or gut, as part of an anaphylactic reaction. However this is uncommon in children with asthma (5.7-8.5%) and rare in adults (2%). Such reactions usually occur within minutes of ingestion^{106, 107}
- foods rarely cause respiratory symptoms alone, without other symptoms in the gut or skin.^{108, 109}

A careful history of each episode needs to be taken. Suspected food/s can be further investigated using skin prick tests or RAST tests. If these are negative, it is unlikely that the food has triggered the asthma symptoms.

Food additives

The role of food additives in asthma is controversial.

- Sulphites such as sodium metabisulphite, can trigger asthma symptoms in susceptible individuals with pre-existing asthma.^{110 <LE ID>} They are found in processed foods, dried fruit and beverages (eg beer and wine).
- There is little evidence that food colours (eg Tartrazine) and preservatives can provoke asthma.^{111, 112}
- Monosodium glutamate (MSG) has not been shown to provoke asthma in double blind placebo controlled (DBPC) trials.¹¹³⁻¹¹⁵ This is in contrast with earlier reports of associations of these additives and asthma.¹¹⁶ If MSG does cause asthmatic reactions this is rare.

There is no validated test for adverse reactions to chemicals and food additives, as most of these reactions are not IgE mediated and hence cannot be tested for using skin prick or RAST tests. A challenge is needed to make a definitive diagnosis.¹¹⁷ This must be performed in an appropriate centre with access to resuscitation facilities. A referral to an allergy specialist is required.

Double blind placebo controlled challenges (DBPCC) remain the gold standard. These are usually not available outside research centres. Single blind placebo controlled challenges (SBPCC) are usually used in clinical practice.

Any suspicion about the role of foods and food additives in triggering asthma should be assessed by an allergy specialist. If foods are confirmed as asthma triggers, allergy specialists may recommend a dietitian for advice.

MANAGEMENT – Immunotherapy

Specific Allergen Immunotherapy (SIT), also known as 'desensitisation':

- is the process of injecting gradually increasing quantities of an allergen extract, which modifies the immune response
- can improve asthma control by reducing airway inflammation and bronchial hyper-responsiveness
- should be used in conjunction with allergen avoidance and appropriate use of medication
- should be initiated and supervised by a doctor with appropriate expertise such as an allergy specialist
- should be administered according to established guidelines and precautions
- is a long term (3-5 years) approach for selected patients.

Efficacy

Immunotherapy by injection has been shown to benefit selected individuals with asthma.¹¹⁸ This pertains to people with asthma who are allergic to house dust mite, cat and grass pollen.^{<LE>} There is limited evidence for some weed and tree pollen and the mould *Cladosporium*.^{<LE 2>} Most patients with asthma have allergic rhinitis and SIT is also of proven efficacy in allergic rhinitis.^{<LE>}

Other routes of immunotherapy such as high dose sublingual-swallow immunotherapy may provide some clinical benefits in selected subjects. However, the magnitude and duration of the effects compared to conventional subcutaneous immunotherapy, the benefit for asthma and the effects on the underlying immunological mechanisms remain to be determined. This form of treatment is not currently recommended.

Indications

All the following criteria need to be met for immunotherapy in asthma:

- A particular aeroallergen is confirmed to precipitate symptoms from the history and allergy testing.
- Asthma is stable and well controlled.
- An effective allergen extract is available.
- Patients or parents/guardians give informed consent.
- Further allergen exposure is unavoidable or only partially reducible.
- When there is significant allergic upper airway or ocular disease this strengthens the indication.

Contraindications

- Concomitant administration of beta blockers.
- Lack of expertise in immunotherapy and/or asthma management and/or equipment to manage acute asthma and/or anaphylaxis.
- Previous anaphylaxis to immunotherapy.
- Poorly controlled or brittle asthma.

Safety

Asthma needs to be monitored prior to, during and after immunotherapy. Spirometry or peak flow monitoring must be performed prior to and 30 minutes after injection. If it is less than 80% of the best recent reading for that patient the injection should be deferred.

Patients should be monitored for at least 30 minutes after immunotherapy.

Adverse reactions

Local reactions at the injection site are common. Systemic reactions are uncommon, but range from urticaria to bronchospasm and/or anaphylaxis (including hypotension, upper airway edema and collapse). The onset of a reaction is usually within 30 minutes of injection although delayed reactions may occur. Rarely, deaths have occurred as a consequence of SIT. These have usually occurred in individuals with asthma, with use of highly purified and potent aqueous extracts or where there has been a divergence from recommended protocols.

The administration of non-sedating antihistamines 1-2 hours before injections has been shown to reduce the risk of adverse reactions to immunotherapy. Nevertheless, dangerous reactions can still occur.

For more detailed information refer to the TSANZ and ASCIA position statement on Immunotherapy and asthma.¹¹⁸

PREVENTING DEVELOPMENT OF ASTHMA

Factors associated with an increased incidence of asthma

Several factors associated with development of asthma have been identified. However, it remains uncertain whether manipulation of these factors can reduce the onset and duration of asthma.

1 Genetics

- a family history of atopy or asthma¹²
- a personal history of atopy or other allergic disease such as atopic dermatitis^{33, 34}
- ongoing asthma at 6 years of age is associated with the presence of atopy and a maternal history of asthma.¹²

2 Allergen sensitisation and exposure

Many studies have shown that sensitisation to environmental allergens is strongly associated with childhood asthma.¹¹⁹⁻¹²⁴ However the potential benefit of allergen avoidance in prevention of asthma is unproven.

- House dust mite avoidance, either alone or in combination with a hypoallergenic diet in breastfeeding mothers and infants, may reduce wheezing illness in the first year of life but does not affect asthma at 3 years of age. This suggests that these measures delay rather than prevent the development of asthma.¹²⁵⁻¹²⁸
- There are conflicting findings regarding the relationship between pet exposure and development of asthma. Some studies have suggested that increased exposure to cats and dogs may be associated with reduced sensitisation and asthma,^{127, 129-131} whilst other studies have not found this to be the case.^{127, 132-135}

It is important to distinguish the application of allergen avoidance measures for primary prevention of asthma development and its use in secondary prevention of symptoms in people with established asthma who are already sensitised to allergen/s.

3 Smoking

Exposure to cigarette smoke and maternal smoking during pregnancy significantly increases the risk of wheezing illness in early childhood but probably does not increase the risk of atopic asthma later in life.^{12, 136, 137}

Factors associated with a reduced incidence of asthma

1 Breast feeding and diet

- Exclusive breastfeeding for 6 months led to reduced incidence of asthma up to 5 years of age and the incidence of allergic disease including asthma for up to 17 years of age.^{138, 139} However, a recent study has questioned these findings.¹⁴⁰
- Use of partially or extensively hydrolysed hypoallergenic formulas as compared with standard cow's milk or soy formula was associated with a reduced incidence of atopy and allergic disease (including asthma) for up to 5 years.¹³⁹⁻¹⁴⁴
- Diets high in omega-3 fatty acids found in fish oils are associated with a reduced incidence of asthma¹⁴⁵
- There is no evidence that dietary elimination during the third trimester of pregnancy is beneficial for the prevention of allergic disease. It may even result in an increased incidence of allergic disease^{146, 147}
- There is no evidence that elimination diet during lactation is of benefit for prevention of asthma.¹⁴⁸

2 Viral and bacterial infections

Study findings suggest that an increased incidence of infections in infancy may protect against the development of asthma. The 'hygiene hypothesis' has been proposed to explain this. The hypothesis suggests that reduced exposure to infections results in persistence of 'pro-allergy' immune responses that in turn lead to an increased susceptibility to allergic disease.^{149, 150}

3 Exposure to farm environments

Studies have shown that early exposure to farming environments and farm animals may prevent development of allergic disease including asthma. However, further studies are required before conclusions can be made.¹⁵¹⁻¹⁵⁵

4 Gut flora and probiotics

In a prospective, randomised, placebo controlled study, Lactobacillus GG given to pregnant women during gestation and to their infant offspring for the first 6 months of life protected against the development of atopic eczema in the first year of life.¹⁵⁶ The effect on development of asthma is yet to be shown.

Current suggestions

The following suggestions for preventing development of asthma are based on a summary of the evidence (page 12).

It is important to note that even if these suggestions are carried out, there is still a significant risk that high risk infants will develop asthma.

1 Breastfeed exclusively for the first 6 months of life.

If a mother is unable or does not wish to breastfeed, use a partially hydrolysed formula in the first 6 months of life. These are available from most pharmacies and supermarkets.

2 Avoid smoking and exposure to smoke during pregnancy and infancy.

House dust mite avoidance measures in infants may be considered. However, it is unlikely this will influence wheezing or childhood asthma beyond the first year of life.

No recommendations can be made regarding exposure to pets or farm animals, dietary restrictions in pregnancy or lactation and probiotics for preventing the development of asthma at this time, as study findings are inconclusive.

Levels of evidence

- I** evidence obtained from a systematic review of all relevant randomised controlled trials.
- II** evidence obtained from at least one properly designed randomised controlled trial.
- III-1** evidence obtained from well-designed pseudo-randomised controlled trials (alternate allocation or some other method).
- III-2** evidence obtained from comparative studies with concurrent controls and allocation not randomized (cohort studies), case-control studies, or interrupted time series with a control group.
- III-3** evidence obtained from comparative studies with historical control, two or more single-arm studies, or interrupted time series without a parallel control group.
- IV** evidence obtained from case series, either post-test or pre-test and post-test.

These levels of evidence ratings have been adapted from US Preventive Services Task Force (1989), Guide to clinical preventive services: an assessment of the effectiveness of 169 interventions, (ed M Fisher), Williams and Williams, Baltimore, Appendix A, p388.

Source: NHMRC

A guide to the development, implementation and evaluation of clinical practice guidelines.

Further information

This brochure is based on published evidence and editing by medical specialists who are members of the Australasian Society of Clinical Immunology and Allergy. ASCIA is the peak professional body for clinical immunologists and allergists in Australia.

Representatives from the National Asthma Council, Asthma Foundations of Australia and Australian Government Department of Health and Ageing were involved in the editorial process.

The Australasian Society of Clinical Immunology and Allergy

For reliable and up to date information on allergy and asthma visit the website of ASCIA www.allergy.org.au which also includes the references for this brochure.

National Asthma Council

The National Asthma Council website contains information on asthma and has links to other asthma sites.

www.NationalAsthma.org.au

Asthma www.health.gov.au/pq/asthma

HealthInsite www.healthinsite.gov.au

Asthma Foundations of Australia

Patients can contact their local Asthma Foundation on **1800 645 130** or visit their websites:

www.asthma.org.au

www.asthmansw.org.au

www.asthmasa.org.au

www.asthmawa.org.au

www.asthmatas.org.au

www.asthmant.org.au

www.asthmaqld.org.au

www.asthmaaustralia.org.au

This series on Asthma Topics for Health Professionals comprises eight separate titles:

1 Asthma and Allergy

2 Asthma and Lung Function Tests

3 Asthma and Pain Relievers

4 Asthma and Air Pollution

5 Asthma and Complementary Therapies

6 Asthma and Infant Bedding

7 Asthma and Diet in Early Childhood

8 Asthma and Wheezing in the First Years of Life

To access these documents log on to:

www.NationalAsthma.org.au or contact the

Department of Health and Ageing on **1800 500 053**.

