Advising patients about the effectiveness or ineffectiveness of strategies for preventing children from developing asthma, including prenatal care, infant feeding and allergen avoidance, and strategies for preventing adult-onset asthma

ABOUT

This PDF is a print-friendly reproduction of the content included in the Prevention – Asthma prevention section of the Australian Asthma Handbook at asthmahandbook.org.au/prevention/primary

Please note the content of this PDF reflects the Australian Asthma Handbook at publication of Version 1.2 (October 2016). For the most up-to-date content, please visit asthmahandbook.org.au

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ABBREVIATIONS

CFC  chlorofluorocarbon  LAMA  long-acting muscarinic antagonist
COPD  chronic obstructive pulmonary disease  LTRA  leukotriene receptor antagonist
COX  cyclo-oxygenase  MBS  Medical Benefits Scheme
ED  emergency department  NIPPV  non-invasive positive pressure ventilation
EIB  exercise-induced bronchoconstriction  NSAIDs  nonsteroidal anti-inflammatory drugs
FEV₁  forced expiratory volume over one second  OCS  oral corticosteroids
FVC  forced vital capacity  OSA  obstructive sleep apnoea
FSANZ  Food Standards Australia and New Zealand  PaCO  carbon dioxide partial pressure on blood gas analysis
GORD  gastro-oesophageal reflux disease  PaO₂  oxygen partial pressure on blood gas analysis
HFA  formulated with hydrofluoralkane propellant  PBS  Pharmaceutical Benefits Scheme
ICS  inhaled corticosteroid  PEF  peak expiratory flow
ICU  intensive care unit  pMDI  pressurised metered-dose inhaler or 'puffer'
IgE  immunoglobulin E  SABA  short-acting beta₂-adrenergic receptor agonist
IV  intravenous  LABA  long-acting beta₂-adrenergic receptor agonist
LABX  LTRA  leukotriene receptor antagonist

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- The Royal Australian College of General Practitioners (RACGP)
- The Australian Primary Health Care Nurses Association (APNA)
- The Thoracic Society of Australia and New Zealand (TSANZ)

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Primary prevention of asthma

Overview

This section contains guidance and information about preventing asthma from developing in people who do not already have a diagnosis of asthma (primary prevention).

Although evidence is emerging about the aetiology of asthma and the role of various predisposing factors, there is currently not reliable evidence for effective interventions to prevent asthma.

For information on preventing asthma symptoms or flare-ups, see

- Managing asthma in adults
- Managing asthma in children

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Prenatal advice for women concerned about their children’s risk of developing asthma

Recommendations

Advise women not to smoke while pregnant, and support them to quit.

How this recommendation was developed
Adapted from existing guidance
Based on reliable clinical practice guideline(s) or position statement(s):

• Prescott and Tang, 2005

Advise pregnant women to use paracetamol when necessary, but to avoid unnecessary use.

How this recommendation was developed
Based on selected evidence
Based on a limited structured literature review or published systematic review, which identified the following relevant evidence:

• Eyers et al. 2011

For pregnant women concerned about their child’s risk of developing asthma, do not recommend inhaled allergen avoidance during pregnancy as an effective way to prevent asthma.

How this recommendation was developed
Adapted from existing guidance
Based on reliable clinical practice guideline(s) or position statement(s):

• Prescott and Tang, 2005

For pregnant women or parents of newborn infants concerned about their child’s risk of developing asthma, do not routinely recommend house dust mite avoidance during pregnancy as an effective way to reducing the child’s risk of developing asthma.

How this recommendation was developed
Adapted from existing guidance
Based on reliable clinical practice guideline(s) or position statement(s):

• Prescott and Tang, 2005

For pregnant women concerned about their child’s risk of developing asthma, do not recommend dietary restrictions during pregnancy as an effective way to prevent asthma.

How this recommendation was developed
For pregnant women concerned about their child’s risk of developing asthma, do not recommend probiotic dietary supplements during pregnancy as an effective way to prevent asthma.

Based on selected evidence

Based on a limited structured literature review or published systematic review, which identified the following relevant evidence:

- Kramer and Kakuma, 2006

How this recommendation was developed

For pregnant women concerned about their child’s risk of developing asthma, do not routinely recommend supplementation with vitamin A, D or E or fish oil during pregnancy as an effective way to prevent asthma.

Based on selected evidence

Based on a limited structured literature review or published systematic review, which identified the following relevant evidence:

- Azad et al. 2013
- Dotterud et al. 2010
- Kalliomäki et al. 2007
- Kopp et al. 2008
- Kuitunen et al. 2009

How this recommendation was developed

More information

Factors reported to be associated with increased risk of developing asthma

Many factors have been associated with asthma risk in observational studies, but none have been shown to cause asthma directly. Avoidance or correction of these risk factors has not been shown to prevent asthma developing.

Allergies

A family history of allergy is associated with a high risk of allergic disease, including asthma. Several population-based studies have observed a positive association between sensitisation to aeroallergens (e.g. house dust mite and cat allergens) and the development of asthma (measured by various outcomes including wheeze, diagnosed asthma, or bronchial hyperresponsiveness), and other allergic diseases including atopic dermatitis (eczema) and rhinitis. Although sensitisation to allergens is associated with development of allergic asthma, it is unclear whether exposure to these allergens actually causes asthma. The combination of sensitisation to aeroallergens and viral infections early in life increases asthma risk. Epidemiological studies have consistently reported an association between exposure to indoor dampness and mould, and increased risk of developing asthma or wheeze.

Rhinitis is a major risk factor for asthma and often precedes it. Childhood allergic rhinitis increases the probability of asthma developing after childhood and the probability of having persisting asthma from childhood into middle age.
These associations probably reflect the common allergic causes of both conditions, rather than a causal link. Non-allergic rhinitis is also a predictor of adult-onset asthma.\textsuperscript{19} 

**Note:** Although allergic asthma is common, non-allergic asthma also occurs.

### Genetics

Several genes associated with increased risk of asthma have been identified.\textsuperscript{20} However, these genes explain very little of the inherited basis of asthma.

Asthma risk may be increased by the interaction between asthma susceptibility genes and environmental factors.\textsuperscript{21}

### Other influences on immune system

**Exposure to tobacco smoke toxins in utero or in infancy** has been associated with increased risk of developing asthma.\textsuperscript{22}

Observational studies have identified various factors associated with increased risk of developing asthma. However, avoidance of these ‘risk’ factors has not been shown to prevent asthma and is not recommended specifically as a strategy for prevention of asthma (regardless of any other potential health benefits). These factors include:

- delivery by Caesarean section (possibly related to the fact that children born by Caesarean section have modified intestinal bacterial colonisation)\textsuperscript{23}
- the use of broad-spectrum antibiotics (macrolides or cephalosporins) in early childhood or pregnancy\textsuperscript{24, 25}
- the use of paracetamol during pregnancy and infancy\textsuperscript{2, 26, 27, 28, 29, 30}
- some childhood infections (pertussis and measles)\textsuperscript{31}
- respiratory infections during the first two years of life.\textsuperscript{32, 33, 34, 35, 36, 37, 38, 39, 40, 12} Early life viral infection in infants sensitised to aeroallergens is a strong risk factor for acute severe asthma-like symptoms and for developing asthma that persists into adulthood.\textsuperscript{12}

Observational studies have identified various factors associated with reduced risk of developing asthma. However, deliberate exposure to these ‘protective’ factors has either not been investigated in good quality studies, or has not been shown to prevent asthma and is not routinely recommended for asthma prevention. Identified factors include:

- exposure to farm environments and contact with farm animals\textsuperscript{41}
- diets rich in oily fish\textsuperscript{42}
- some childhood viral and bacterial infections\textsuperscript{31}
- regular long-term low-dose aspirin use by adults.\textsuperscript{43}

**Effects of prenatal and postnatal maternal smoking on asthma risk**

Meta-analysis of data from cohort studies suggests that:

- smoking during pregnancy increases the child’s risk of asthma before age 2 years by an estimated 85\%\textsuperscript{22}
- in children aged 0–2 years, the risk of wheezing is increased by an estimated 70% if their mothers smoke.\textsuperscript{22}

Although maternal smoking during pregnancy and exposure to cigarette smoke in early childhood significantly increase the risk of wheezing illness in early childhood, they probably do not increase the risk of allergic asthma later in life.\textsuperscript{44, 45}

Data from a case-control study suggests that smoking during pregnancy not only increases the risk of asthma in children, but also the woman’s grandchildren.\textsuperscript{46}

**See:** Smoking and asthma

**Links between paracetamol and asthma risk**

**Prenatal exposure**

Meta-analyses of data from prospective cohort studies and cross-sectional surveys have identified an association between prenatal exposure to paracetamol and increased risk of asthma and wheeze in children.\textsuperscript{2, 26}

Health professionals can advise pregnant women that there is some evidence from around the world that paracetamol use in pregnancy might increase the baby’s risk of wheezing or asthma, but that paracetamol is still considered the best option for pain relief in pregnant women.\textsuperscript{47}
Paracetamol use in children

Meta-analysis of cross-sectional population studies observed paracetamol use in previous year, and paracetamol use in first year of life, each associated with increased risk of asthma diagnosis in children aged 4–16 years. Some prospective cohort studies have reported an association between paracetamol use in infants, children, or adolescents and increased risk of wheezing or asthma. However, an Australian study observed no association between paracetamol use and asthma risk after adjusting for frequency of respiratory infections.

Inhaled allergen avoidance during pregnancy

The current position statement on the prevention of allergy in children by the Australasian Society of Clinical Immunology and Allergy (ASCIA) does not recommend pregnant women should attempt to avoid inhaled allergens. For updates on ASCIA advice, refer to the ASCIA website (www.allergy.org.au).

Go to: The Australasian Society of Clinical Immunology and Allergy position statement: summary of allergy prevention in children

Dietary restriction during pregnancy for allergy prevention

Avoidance of commonly allergenic foods during pregnancy or lactation has not been shown to reduce the risk of developing asthma during childhood, and may even increase the risks of preterm birth and lower birth weight. Although a combination of maternal hypoallergenic diet during pregnancy and dust mite allergen avoidance strategies (acaricide sprays and mite-impermeable mattress covers) was reported in one study to reduce the risk of asthma in children, overall evidence does not support generally recommending this strategy. Hypoallergenic diets for pregnant women may result in inadequate nutrition, and are not recommended (except when advised by a specialist allergist and supervised by an accredited practising dietitian).

Current guidelines on Infant feeding and allergy prevention by the Australasian Society of Clinical Immunology and Allergy (ASCIA) do not recommend dietary restrictions during pregnancy. For updates on ASCIA advice, refer to the ASCIA website (www.allergy.org.au).

Go to: ASCIA’s guidelines for Infant feeding and allergy prevention

Dietary supplementation during pregnancy and in newborns

Folic acid

Observational studies have reported conflicting findings on the association between folic acid supplementation during pregnancy and asthma. Various studies have reported either that folic acid supplementation late in pregnancy (but not early) was associated with increased risk of childhood asthma, that folic acid supplementation early in pregnancy (but not late) was associated with increased risk of childhood wheeze, or no association between folic acid supplementation and infant wheeze.

Note: folic acid supplementation before and during pregnancy is recommended for the prevention of neural tube defects.

Probiotics

Probiotic or prebiotic supplementation of mothers during late pregnancy and lactation, or of non-breastfed infants, does not appear to prevent asthma, although infant feeding with prebiotics may reduce atopic dermatitis (eczema) risk. Supplementation with probiotics during pregnancy and breastfeeding cannot be recommended to reduce risk of allergies or asthma in infants because there is not enough evidence to identify the optimal choice of species and dose.

Vitamins

A meta-analysis of observational cohort studies observed that high maternal dietary vitamin D and E intakes during pregnancy were associated with reduced risk of wheezing. However, there is insufficient evidence from intervention studies demonstrating protective effects of vitamins to recommend supplementation.

Fish oil

Fish oil has a range of anti-inflammatory properties.
Overall, evidence from studies assessing the effectiveness of fish oil supplementation in preventing allergy suggest that protective effects are probably greatest in pregnancy (i.e. earlier in development).\(^{57}\) Epidemiological studies suggest that dietary fish oil in pregnancy and early childhood may protect against asthma and allergic disease.\(^{57, 58}\) However, there is insufficient evidence from randomised controlled intervention studies to determine whether supplementation during pregnancy should be recommended to reduce asthma risk in children. Studies in which fish oil supplementation was commenced in early childhood have not shown reductions in asthma risk.\(^{57, 59}\)

### Allergen avoidance in children

#### Exposure to pets

Pooled analysis of a large set of data from 11 European birth cohorts suggests that living with a furry or feathered pet during infancy neither increases nor decreases the risk of asthma or allergic rhinitis at ages 6–10 years, compared with no exposure to pets.\(^{60}\)

#### House dust mite avoidance in newborns

House dust mite avoidance measures alone are unlikely to prevent a child developing wheezing or asthma, based on the findings of randomised controlled trials in prenatally recruited infants at risk of allergies and asthma due to family history or demonstrated sensitisation,\(^{41, 62, 63, 65, 66, 64, 67, 68, 69, 70}\) including an Australian study that compared house dust mite avoidance (acaricide and impermeable mattress covers) with simple advice on cleaning, vacuuming, dusting and maintaining adequate ventilation and followed children from 18 months to 11 years.\(^{65, 66, 64, 71}\)

In one randomised controlled trial of prenatally recruited infants at high risk of allergies and asthma (both parents atopic), prenatal and postnatal house dust mite avoidance (mite-impermeable mattress, pillow and quilt covers, HEPA filter vacuum cleaner, replacement of carpet with vinyl flooring, custom cot and basinet mattresses, washable soft toy, hot washing of bed linen, acaricide) was associated with reduced rates of wheezing during the first year of life compared with usual care,\(^{69}\) but respiratory symptoms at age 3 years did not differ between intervention and control groups.\(^{70}\)

#### Multi-allergen avoidance in newborns

While interventions involving a single strategy have not been successful in reducing asthma risk, multifaceted interventions that involve dietary allergen reduction and environmental allergen avoidance from birth or prenatally may reduce asthma risk.\(^{72}\) A systematic review and meta-analysis of randomised controlled trials assessing allergen avoidance commenced prenatally or at birth found that reduction of exposure to multiple allergens reduces the likelihood of a current diagnosis of asthma in children (at ages younger than 5 years, and 5 years and older), compared with usual care.\(^{72}\) The risk of doctor-diagnosed asthma at age 5 and over was approximately halved.

In a randomised controlled clinical trial that compared the combination of hypoallergenic infant diet (extensively hydrolysed formula or breastfeeding with mothers on low-allergen diet) and house dust mite avoidance strategies (acaricide and impermeable mattress covers) with standard advice,\(^{51, 73, 74, 75, 76, 77}\) the intervention group showed lower rates of asthma at ages 1 year,\(^{75, 77}\) 8 years,\(^{74}\) and 18 years,\(^{73}\) but no difference between intervention and control group in asthma rates at 2 years\(^{75, 76}\) and 4 years.\(^{75}\) The reduction in asthma prevalence at 18 years and overall prevalence was mainly due to a reduced rate of asthma that developed in childhood and persisted to 18 years.\(^{73}\)

### References


Infant feeding and asthma prevention

Recommendations

Recommend breastfeeding where possible for its health benefits, but do not advise prolonged exclusive breastfeeding (as recommended in the past for allergy prevention) specifically for the purpose of reducing the child’s risk of developing asthma. Instead, recommend the introduction of a variety of solid foods at around 6 months (but not before 4 months), while continuing to breastfeed.

How this recommendation was developed
Adapted from existing guidance
Based on reliable clinical practice guideline(s) or position statement(s):

- Australasian Society of Clinical Immunology and Allergy, 2016

For infants at high risk of asthma (e.g. family history of asthma and allergies), do not recommend the use of hydrolysed formula or soy formula in preference to breast milk for the purpose of reducing the child’s risk of developing asthma.

How this recommendation was developed
Based on selected evidence
Based on a limited structured literature review or published systematic review, which identified the following relevant evidence:

- Australasian Society of Clinical Immunology and Allergy, 2010
- Osborn and Sinn, 2006
- Osborn and Sinn, 2006
- Prescott and Tang, 2005
- Scott et al., 2012
- Szajewska and Horvath, 2010

Do not recommend dietary restrictions for breastfeeding women for the purpose of reducing the child’s risk of developing asthma.

How this recommendation was developed
Based on selected evidence
Based on a limited structured literature review or published systematic review, which identified the following relevant evidence:

- Kramer and Kakuma, 2006
- Prescott and Tang, 2005

Do not routinely recommend dietary supplements (e.g. probiotics, vitamins, fish oil) for breastfeeding women or infants specifically for the purpose of reducing the child’s risk of developing asthma.

How this recommendation was developed
Based on selected evidence
Breastfeeding and allergy prevention

Earlier evidence suggested that the risk of asthma was reduced by exclusive breastfeeding in the first months of life. The reduction in risk was thought to be greatest in children at high risk of asthma, but small in other children. However, recent studies did not confirm that prolonged exclusive breastfeeding protected against development of asthma, allergic rhinitis, or other allergic disease such as atopic dermatitis (eczema).

Limited evidence from observational or poor quality studies suggests that breastfeeding while solid foods are introduced may help reduce the infant’s risk of developing allergies. The Australasian Society of Clinical Immunology and Allergy (ASCIA) current guidelines for Infant feeding and allergy prevention recommend breastfeeding for at least 6 months for its range of benefits, with complementary foods introduced at around 6 months (but not before 4 months) while continuing to breastfeed. Exclusion of allergenic foods from the maternal diet has not been shown to prevent allergies. ASCIA does not recommend maternal dietary restrictions while breastfeeding.

ASCIA’s guidelines for Infant feeding and allergy prevention contain practical advice for mothers. For updates on ASCIA advice, refer to the ASCIA website (www.allergy.org.au).

Hypoallergenic infant formula and allergy prevention

Infant formulas available in Australia

Hydrolysed formulas are cow’s milk-based formulas that have been processed to break down most of the proteins associated with allergies. They include partially and ‘extensively’ hydrolysed formulas. Partially hydrolysed formulas (usually labelled ‘HA’ or ‘hypoallergenic’) are no longer recommended by the Australasian Society of Clinical Immunology and Allergy (ASCIA) as part of allergy prevention, if breastfeeding is not possible. In Australia and New Zealand, extensively hydrolysed formulas are only available on prescription, and only for children with cow’s milk allergies or enteropathies.

Partially hydrolysed formula

Meta-analyses of randomised controlled trials suggest that infant feeding with partially hydrolysed formula does not reduce the risk of wheeze or asthma in children, compared with control formulas.

Extensively hydrolysed formula

Hypoallergenic formulas have also been combined with other allergen avoidance measures in multifaceted interventions. Extensively hydrolysed formula (or breastfeeding with mothers on low-allergen diet) was one component of allergen avoidance (along with house dust mite avoidance strategies) in a randomised controlled clinical trial which recorded asthma and atopy rates at ages 1, 2, 4, 8 and 18 years. Compared with a control group whose mothers received standard advice, the intervention group showed a lower prevalence of asthma at age 18 years, and a lower overall prevalence over the entire follow-up period (taking into account children who had developed asthma that did not persist to age 18).
However, there is not consistent or sufficient high-quality evidence that extensively hydrolysed formula is effective in preventing asthma, eczema, food allergy or allergic rhinitis in infants or children.\textsuperscript{1}

**Soy formula**
A meta-analysis of studies assessing soy-based formulas found that these were not protective against asthma during infancy or childhood.\textsuperscript{4}

**Goat’s milk**
Goat’s milk has not been shown to reduce the risk of allergies, compared with cow’s milk.\textsuperscript{1}

**General recommendations for allergy prevention**
Current ASCIA guidelines on *Infant feeding and allergy prevention* recommend that, if breastfeeding is not possible, infants can be fed conventional cow’s milk formula.\textsuperscript{1}

ASCIA’s guidelines on *Infant feeding and allergy prevention* contain practical advice for mothers.\textsuperscript{2} For updates on ASCIA advice, refer to the ASCIA website (www.allergy.org.au).

-- Go to: ASCIA’s guidelines on *Infant feeding and allergy prevention*

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**Dietary supplementation during pregnancy and in newborns**

**Folic acid**
Observational studies have reported conflicting findings on the association between folic acid supplementation during pregnancy and asthma.\textsuperscript{20} Various studies have reported either that folic acid supplementation late in pregnancy (but not early) was associated with increased risk of childhood asthma, that folic acid supplementation early in pregnancy (but not late) was associated with increased risk of childhood wheeze, or no association between folic acid supplementation and infant wheeze.\textsuperscript{20}

Note: folic acid supplementation before and during pregnancy is recommended for the prevention of neural tube defects.\textsuperscript{21}

**Probiotics**
Probiotic or prebiotic supplementation of mothers during late pregnancy and lactation, or of non-breastfed infants, does not appear to prevent asthma,\textsuperscript{9, 22, 14, 13, 12, 10, 16} although infant feeding with prebiotics may reduce atopic dermatitis (eczema) risk.\textsuperscript{16}

Supplementation with probiotics during pregnancy and breastfeeding cannot be recommended to reduce risk of allergies or asthma in infants because there is not enough evidence to identify the optimal choice of species and dose.\textsuperscript{1}

**Vitamins**
A meta-analysis of observational cohort studies observed that high maternal dietary vitamin D and E intakes during pregnancy were associated with reduced risk of wheezing.\textsuperscript{15} However, there is insufficient evidence from intervention studies demonstrating protective effects of vitamins to recommend supplementation.\textsuperscript{15, 17}

**Fish oil**
Fish oil has a range of anti-inflammatory properties.\textsuperscript{23}

Overall, evidence from studies assessing the effectiveness of fish oil supplementation in preventing allergy suggest that protective effects are probably greatest in pregnancy (i.e. earlier in development).\textsuperscript{23} Epidemiological studies suggest that dietary fish oil in pregnancy and early childhood may protect against asthma and allergic disease.\textsuperscript{23, 24} However, there is insufficient evidence from randomised controlled intervention studies to determine whether supplementation during pregnancy should be recommended to reduce asthma risk in children.

Studies in which fish oil supplementation was commenced in early childhood have not shown reductions in asthma risk.\textsuperscript{23, 11}

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**References**


Asthma prevention in children at risk of developing asthma

Recommendations

Advise parents to ensure babies and children are not exposed to cigarette smoke.

How this recommendation was developed
Adapted from existing guidance
Based on reliable clinical practice guideline(s) or position statement(s):
- Prescott and Tang, 2005

If a family already has pets, it is not necessary to remove them unless the child develops evidence of pet allergy and this is confirmed by skin-prick testing.

How this recommendation was developed
Adapted from existing guidance
Based on reliable clinical practice guideline(s) or position statement(s):
- Prescott and Tang, 2005

In children without demonstrated specific hypersensitivities, do not routinely recommend allergen avoidance measures for the purpose of reducing the child’s risk of developing asthma.

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):
- Arshad et al. 1992
- Arshad et al. 2003
- Arshad et al. 2007
- Brunekreef et al. 2002
- Corver et al. 2006
- Custovic et al. 2001
- Halmerbauer et al. 2003
- Hide et al. 1994
- Hide et al. 1996
- Horak et al. 2004
- Koopman et al. 2002
- Maas et al. 2009
- Marks et al. 2006
- Mihrshahi et al. 2003
- Peat et al. 2004
- Scott et al. 2012
- Woodcock et al. 2004
Advise parents of children at risk of asthma that damp, mouldy home environments may increase asthma risk in children with genetic predisposition to asthma and should be avoided if possible (e.g. by ventilation and mould removal), but that there is not clear evidence that anti-mould strategies will prevent asthma.

Note: Exposure to potentially harmful fumes from chemicals in cleaning products (e.g. chlorine bleach) should also be avoided.

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):
- Mendell et al. 2011\textsuperscript{19}
- Quansah et al. 2012\textsuperscript{20}
- Tisher et al. 2011\textsuperscript{21}
- Tisher et al. 2011\textsuperscript{22}

Advise parents that children’s risk of developing asthma may be increased by various types of indoor and outdoor pollution (e.g. unflued gas heaters, traffic pollution).

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):
- Bernstein, 2012\textsuperscript{23}
- Gasana et al. 2012\textsuperscript{24}
- Lanphear et al. 2001\textsuperscript{25}

Advise parents to give children paracetamol at recommended doses when necessary to reduce fever (according to current guidelines for managing fever) and for pain relief when needed (according to current guidelines for managing pain in children), but to avoid unnecessary or frequent paracetamol use.

How this recommendation was developed
Based on selected evidence
Based on a limited structured literature review or published systematic review, which identified the following relevant evidence:
- Amberbir et al. 2011\textsuperscript{26}
- Bakkeheim et al. 2011\textsuperscript{27}
- Etminan et al. 2009\textsuperscript{28}
- Foliaki et al. 2008\textsuperscript{29}
- Kreiner-Møller et al. 2012\textsuperscript{30}
- Kurukulaaratchy et al. 2012\textsuperscript{31}
- Lowe et al. 2010\textsuperscript{32}
- Wickens et al. 2011\textsuperscript{33}

In children with atopic dermatitis or allergic rhinitis, manage according to current guidelines (using antihistamines, if indicated) but do not prescribe or recommend long-term antihistamine use specifically for the purpose of reducing the child’s risk of developing asthma.

How this recommendation was developed
Consensus
Factors reported to be associated with increased risk of developing asthma

Many factors have been associated with asthma risk in observational studies, but none have been shown to cause asthma directly. Avoidance or correction of these risk factors has not been shown to prevent asthma developing.

Allergies

A family history of allergy is associated with a high risk of allergic disease, including asthma.\(^1\) Several population-based studies have observed a positive association between sensitisation to aeroallergens (e.g. house dust mite and cat allergens) and the development of asthma (measured by various outcomes including wheeze, diagnosed asthma, or bronchial hyperresponsiveness), and other allergic diseases including atopic dermatitis (eczema) and rhinitis.\(^25\)

Although sensitisation to allergens is associated with development of allergic asthma, it is unclear whether exposure to these allergens actually causes asthma.\(^35\) The combination of sensitisation to aeroallergens and viral infections early in life increases asthma risk.\(^36\)

Epidemiological studies have consistently reported an association between exposure to indoor dampness and mould, and increased risk of developing asthma or wheeze.\(^19, 20, 21, 37\)

Rhinitis is a major risk factor for asthma and often precedes it.\(^38, 39, 40\) Childhood allergic rhinitis increases the probability of asthma developing after childhood and the probability of having persisting asthma from childhood into middle age.\(^39\) These associations probably reflect the common allergic causes of both conditions, rather than a causal link. Non-allergic rhinitis is also a predictor of adult-onset asthma.\(^40\)

Note: Although allergic asthma is common, non-allergic asthma also occurs.

Genetics

Several genes associated with increased risk of asthma have been identified.\(^41\) However, these genes explain very little of the inherited basis of asthma.

Asthma risk may be increased by the interaction between asthma susceptibility genes and environmental factors.\(^42\)

Other influences on immune system

Exposure to tobacco smoke toxins in utero or in infancy has been associated with increased risk of developing asthma.\(^43\)

Observational studies have identified various factors associated with increased risk of developing asthma. However, avoidance of these ‘risk’ factors has not been shown to prevent asthma and is not recommended specifically as a strategy for prevention of asthma (regardless of any other potential health benefits). These factors include:

- delivery by Caesarean section (possibly related to the fact that children born by Caesarean section have modified intestinal bacterial colonisation)\(^44\)
- the use of broad-spectrum antibiotics (macrolides or cephalosporins) in early childhood\(^45\) or pregnancy\(^46\)
- the use of paracetamol during pregnancy and infancy\(^47, 28, 27, 30, 33, 32\)
- some childhood infections (pertussis and measles)\(^48\)
- respiratory infections during the first two years of life.\(^49, 50, 51, 52, 53, 54, 55, 56, 57, 36\) Early life viral infection in infants sensitised to aeroallergens is a strong risk factor for acute severe asthma-like symptoms and for developing asthma that persists into adulthood.\(^36\)

Observational studies have identified various factors associated with reduced risk of developing asthma. However, deliberate exposure to these ‘protective’ factors has either not been investigated in good quality studies, or has not been shown to prevent asthma and is not routinely recommended for asthma prevention. Identified factors include:

- exposure to farm environments and contact with farm animals\(^58\)
- diets rich in oily fish\(^59\)
- some childhood viral and bacterial infections\(^48\)
• regular long-term low-dose aspirin use by adults.  

Effects of prenatal and postnatal maternal smoking on asthma risk

Meta-analysis of data from cohort studies suggests that:

• smoking during pregnancy increases the child’s risk of asthma before age 2 years by an estimated 85%.

• in children aged 0–2 years, the risk of wheezing is increased by an estimated 70% if their mothers smoke.

Although maternal smoking during pregnancy and exposure to cigarette smoke in early childhood significantly increase the risk of wheezing illness in early childhood, they probably do not increase the risk of allergic asthma later in life.

Data from a case-control study suggests that smoking during pregnancy not only increases the risk of asthma in children, but also the woman's grandchildren.

Allergen avoidance in children

Exposure to pets

Pooled analysis of a large set of data from 11 European birth cohorts suggests that living with a furry or feathered pet during infancy neither increases nor decreases the risk of asthma or allergic rhinitis at ages 6–10 years, compared with no exposure to pets.

House dust mite avoidance in newborns

House dust mite avoidance measures alone are unlikely to prevent a child developing wheezing or asthma, based on the findings of randomised controlled trials in prenatally recruited infants at risk of allergies and asthma due to family history or demonstrated sensitisation, including an Australian study that compared house dust mite avoidance (mite-impermeable mattress, pillow and quilt covers, HEPA filter vacuum cleaner, replacement of carpet with vinyl flooring, custom cot and basinet mattresses, washable soft toy, hot washing of bed linen, acaricide) with simple advice on cleaning, vacuuming, dusting and maintaining adequate ventilation and followed children from 18 months to 11 years.

In one randomised controlled trial of prenatally recruited infants at high risk of allergies and asthma (both parents atopic), prenatal and postnatal house dust mite avoidance (mite-impermeable mattress, pillow and quilt covers) was associated with reduced rates of wheezing during the first year of life compared with usual care, but respiratory symptoms at age 3 years did not differ between intervention and control groups.

Multi-allergen avoidance in newborns

While interventions involving a single strategy have not been successful in reducing asthma risk, multifaceted interventions that involve dietary allergen reduction and environmental allergen avoidance from birth or prenatally may reduce asthma risk. A systematic review and meta-analysis of randomised controlled trials assessing allergen avoidance commenced prenatally or at birth found that reduction of exposure to multiple allergens reduces the likelihood of a current diagnosis of asthma in children (at ages younger than 5 years, and 5 years and older), compared with usual care. The risk of doctor-diagnosed asthma at age 5 and over was approximately halved.

In a randomised controlled clinical trial that compared the combination of hypoallergenic infant diet (extensively hydrolysed formula or breastfeeding with mothers on low-allergen diet) and house dust mite avoidance strategies (mite-impermeable mattress covers) with standard advice,  the intervention group showed lower rates of asthma at ages 1 year, 8 years, and 18 years, but no difference between intervention and control group in asthma rates at 2 years and 4 years. The reduction in asthma prevalence at 18 years and overall prevalence was mainly due to a reduced rate of asthma that developed in childhood and persisted to 18 years.

Effects of pollutants on asthma risk

Exposure to a range of indoor and outdoor airborne pollutants has been associated with increased asthma risk in cross-sectional surveys.

Exposure to the following during early childhood has been associated with increased risk of wheezing or asthma:

• the use of gas stoves or ovens in homes.
Various indoor and outdoor pollutants have also been associated with increased risk of adult-onset asthma. These include airborne substances used in the home (e.g. cleaning sprays) and many airborne substances encountered in workplaces. 

See: Work-related asthma

Links between paracetamol and asthma risk

Prenatal exposure

Meta-analyses of data from prospective cohort studies and cross-sectional surveys have identified an association between prenatal exposure to paracetamol and increased risk of asthma and wheeze in children. Health professionals can advise pregnant women that there is some evidence from around the world that paracetamol use in pregnancy might increase the baby’s risk of wheezing or asthma, but that paracetamol is still considered the best option for pain relief in pregnant women.

Paracetamol use in children

Meta-analysis of cross-sectional population studies observed paracetamol use in previous year, and paracetamol use in first year of life, each associated with increased risk of asthma diagnosis in children aged 4–16 years. Some prospective cohort studies have reported an association between paracetamol use in infants, children or adolescents and increased risk of wheezing or asthma. However, an Australian study observed no association between paracetamol use and asthma risk after adjusting for frequency of respiratory infections.

Children’s diets and asthma risk

In observational studies, various dietary factors have been associated with increased asthma risk. For example:

- ‘Western’-style fast food intake has been shown to increase asthma risk in children
- consumption of a ‘westernised’ diet has been associated with increased asthma risk, compared with an ‘Asian’ diet
- a diet high in fast foods has been associated with increased childhood asthma prevalence
- a ‘Mediterranean’ diet (high in fish, fruits and vegetables) may provide some protection against wheeze and asthma in childhood.

Further research is needed to determine if these associations are due to causal links between food choices and asthma risk, and randomised controlled trials are needed to show whether changes in eating patterns can improve asthma or reduce the risk of developing asthma.

Supplementation with probiotics (Lactobacillus rhamnosus) in children aged 6 months to 2 years may reduce sensitisation to aeroallergens, but has not been shown to reduce risk of developing asthma, based on the findings of one randomised clinical trial.

Specific allergen immunotherapy (desensitisation)

Options available in Australia

Two forms of specific allergen immunotherapy are available:

- sublingual immunotherapy
- subcutaneous immunotherapy.

Both forms of specific allergen immunotherapy require at least 3 years of treatment and should be prescribed by an allergy specialist (allergist or clinical immunologist) where possible. Once immunotherapy has been successfully initiated by the specialist, co-management with the patient’s GP can be considered.

Commercial allergen preparations for immunotherapy are available in Australia for aeroallergens including house dust mite, pollens (e.g. grass, tree and weed pollens), animal dander and moulds.

Go to: ASCIA’s Allergen Immunotherapy fact sheet for patients
Go to: ASCIA’s Allergen immunotherapy e-training for health professionals
Sublingual immunotherapy

Sublingual immunotherapy is effective in:74

- reducing asthma symptoms in adults and children
- reducing allergic rhinitis symptoms in adults and children
- improving disease-specific quality of life in patients with asthma or allergic rhinitis
- reducing medication requirements, particularly in patients allergic to grasses or house dust mite.

However, most studies have been in mild asthma, and few studies have compared immunotherapy with inhaled corticosteroid therapy, or have assessed standardised outcomes such as flare-ups.

Local adverse effects include an unpleasant taste, localised swelling in the mouth, and abdominal pain and nausea.75 Local adverse effects are common in children receiving sublingual immunotherapy.76

Anaphylaxis is extremely rare. The rate of serious systemic adverse reactions has been estimated at 1.4 serious adverse events per 100,000 doses.76,75,74 The majority of adverse events occur soon after beginning treatment.75

The extract must be held under the tongue without swallowing for 2 minutes (liquid extracts) or 1 minute (tablets).

Asthma

Acarizax (house dust mite) is indicated for adults 18–65 years with house dust mite allergic asthma that is not well controlled by inhaled corticosteroids and is associated with mild-to-severe house dust mite allergic rhinitis.77 It is contraindicated in patients with FEV₁ < 70% predicted after adequate treatment, and for patients who have experienced a severe flare-up within the previous 3 months.77

Allergic rhinitis

Several commercial preparations of aeroallergens for sublingual immunotherapy in patients with allergic rhinitis are used in Australia, including:

- Acarizax (house dust mite) – indicated for adults 18–65 years with persistent moderate to severe house dust mite allergic rhinitis despite symptomatic treatment.77
- Actair (house dust mite) – indicated for the treatment of house dust mite allergic rhinitis with or without conjunctivitis in adults and adolescents over 12 years diagnosed with house dust mite allergy.78
- Oralair tablets (mix of grass pollens) – indicated for adults and children over 5 years with grass pollen allergic rhinitis.79

Various single allergens and/or multiple allergen mixes are available for use as advised by the treating allergist, available as liquid extracts. Age restrictions vary between products.

Note: PBS status as at October 2016: Treatment with sublingual immunotherapy specific allergen preparations is not subsidised by the PBS.

Subcutaneous immunotherapy

Subcutaneous immunotherapy involves injections in which the dose is gradually increased at regular intervals (usually weekly), or until a therapeutic/maintenance dose is reached. This can take approximately 3–6 months.90

Subcutaneous immunotherapy is administered under medical supervision, either in a hospital or at a doctor’s office where appropriate facilities to manage potential systemic reactions are available.

Subcutaneous immunotherapy is associated with local adverse effects which may occur in up to 10% of patients (e.g. injection-site swelling) and, less frequently, serious systemic adverse effects (e.g. anaphylaxis).76,75

Subcutaneous immunotherapy is generally not suitable for younger children (e.g. less than 7 years) because they may not be able to tolerate frequent injections.

Several commercial preparations of aeroallergens for subcutaneous immunotherapy are available in Australia, including various single allergens and/or multiple allergen mixes for use as advised by the treating allergist. Age restrictions vary between products.

Note: PBS status as at October 2016: Treatment with subcutaneous specific allergen immunotherapy preparations is not subsidised by the PBS.

Antihistamines in children with allergies

Long-term antihistamine treatment has been investigated as a strategy for preventing the development of asthma in children with allergies.
In a multi-country, double-blind, randomised, placebo-controlled trial in children aged 1–2 years with atopic dermatitis, 18 months’ treatment with cetirizine (0.25mg/kg twice daily) did not reduce the risk of developing asthma, compared with placebo. However, in the subgroup of children sensitised to grass pollen or house dust mite, cetirizine treatment was associated with a reduction in the rate of new asthma diagnoses, compared with placebo.

References


Asthma prevention in adults

Recommendations

Advise people who work with airborne sensitisers or irritants that many airborne substances can damage respiratory health and may cause asthma.

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Heederik et al. 2012
- Baur et al. 2012

Warn sportspeople, particularly elite athletes, that training while exposed to airborne pollutants or cold, dry air may increase the risk of developing asthma.

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Anderson and Kippelen, 2008
- Parsons et al. 2013
- Sue-Chu et al. 2010
- Weiler et al. 2010

More information

Effects of pollutants on asthma risk
Exposure to a range of indoor and outdoor airborne pollutants has been associated with increased asthma risk in cross-sectional surveys.

Exposure to the following during early childhood has been associated with increased risk of wheezing or asthma:

- the use of gas stoves or ovens in homes
- living in damp or mouldy environments
- high exposure to traffic pollution.

Various indoor and outdoor pollutants have also been associated with increased risk of adult-onset asthma. These include airborne substances used in the home (e.g. cleaning sprays) and many airborne substances encountered in workplaces.

See: Work-related asthma

Prevention of work-related asthma within the workplace
Work-related asthma is potentially preventable. Preventive measures focus on controlling workers’ exposure to respiratory irritants and sensitisers at the workplace, and must be undertaken by employers.

An Australian report has recommended that employers should minimise exposure to sensitisers and irritants for all workers in high-risk workplaces. Actions by employers should be guided by occupational health and safety authorities and specialists with expertise in work-related asthma.

Prevention strategies currently in use include:

- elimination of the substance from the workplace (e.g. substituting the substance, remote control handling)
- reducing exposure (e.g safety procedures, training)
- isolating the substance (e.g. changed work processes, segregation of areas)
- ventilation
- wearing personal respirators, protective clothing and masks.

The most effective strategy is to eliminate or minimise exposures at the source or in the environment. Avoiding the use of powdered latex gloves (e.g. substituting with low-protein, powder-free natural rubber latex gloves or latex-free gloves) reduces natural rubber latex aeroallergens, natural rubber latex sensitisation and natural rubber latex asthma in healthcare workers.

There is limited evidence that the use of respirators is effective in preventing occupational asthma. Most studies have measured effects of respirators on exposure, not asthma incidence. Limited evidence suggests that the risk of developing asthma among workers using hexahydrophthalic anhydride in epoxy resin manufacture may be reduced by wearing respirators. A combination of information and training, exhaust ventilation, and wearing of respirators while handling of powdered bread improvers may reduce the risk of symptomatic sensitisation to flour and fungal amylase in bakers. Small studies suggest that respirators can reduce exposure to isocyanates among spray painters if they are well designed, fitted and maintained, and workers are trained to use them correctly.

If an employee develops work-related asthma, this should be considered as a warning that other workers may be at risk and that control measures at the workplace should be reviewed.

Aetiology of exercise-induced bronchoconstriction

Both genetics and environment may contribute to exercise-induced bronchoconstriction. Exercise-induced bronchoconstriction occurs when a person’s ventilatory rate is high and their airways must heat and humidify a large volume of air in a short time. Dehydration of the airway leads to release of inflammatory mediators within the airway and contraction of airway smooth muscle. Dry air is one risk factor.

Exercise-induced bronchoconstriction in athletes who do not have chronic asthma may have different pathogenesis and presentation than exercise-induced bronchoconstriction in people with asthma. Elite athletes often report onset of exercise-induced bronchoconstriction after age 20 years and after many years of high-level training.

In elite athletes, exercise-induced bronchoconstriction is probably due to chronic injury to airway epithelium associated with long-term frequent prolonged high ventilation rates in the presence of environmental exposure to cold air, dry air, and airborne pollutants such as ozone, particulate matter:

- The high prevalence of exercise-induced bronchoconstriction in ice-rink athletes has been linked to inhalation of cold dry air in combination with airborne pollutants from fossil-fuelled ice resurfacing machines
- Exercise-induced bronchoconstriction in skiers and other winter athletes has been linked to injury of airway epithelium due to conditioning large volumes of cold dry air
- The high prevalence of asthma and exercise-induced bronchoconstriction reported among competitive swimmers has been associated with exposure to chlorine in indoor swimming pools
- The increased prevalence of exercise-induced bronchoconstriction among distance runners, compared with the general population, has been attributed to exposure to high levels of airborne allergens and ozone
- Certain airborne viruses inhaled during exercise may also contribute to exercise-induced bronchoconstriction.

References


