

## **Aeroallergens and the Lower respiratory tract**

### **Allergic and Non-allergic/Irritant Asthma**

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The previous articles have dealt with the effects of aeroallergens/irritants on the upper respiratory system (nasal cavity, sinuses and eyes) and the (throat) larynx where the vocal cords are situated. This last article in the series on aeroallergens provides information on their effects on allergic and non allergic (irritant) asthma. There are many more forms (phenotypes) of asthma that are not dealt with here. If you suspect you have allergies and/or asthma visit a medical practitioner.

### **Asthma**

Asthma is a chronic inflammatory lung condition. The symptoms of asthma are triggered by inflammation and narrowing of the lower respiratory airways (bronchospasm) following exposure to allergens. The chronic inflammation leads to bronchial hyperresponsiveness to triggers including infections, allergens and non-specific irritants. Asthma attacks can range from mild to life threatening.

Allergic asthma is the most common form of asthma involving an immune mediated allergic trigger. The mechanism involved in non- allergic/irritant asthma is not been established but it is thought to involve 'non-immune' inflammatory mechanism. Reactive Airway Disease Syndrome (RADS) is a subset of irritant induced asthma and is characterised by sudden onset due to exposure to high levels of irritants. Localised airway inflammatory response and/or reflex bronchoconstriction are likely to be involved.

Asthma and other allergy conditions such as allergic rhinitis frequently co-exist. Asthma severity can be affected by co existing sinusitis, rhinitis, GERD, some medications (including aspirin and related NSAIDS), viral respiratory infections.

### **Asthma Symptoms**

- Wheezing
- Irritable cough
- Difficulty breathing
- Shortness of breath
- Tightness and heaviness in the chest
- Wheezing or coughing with exercise
- There can be a late phase response where reactions evolve over hours

### **Characteristics of allergic and non-allergic/irritant asthma**

## Allergic

## Non allergic/ Irritant asthma

### Mechanism/ risk factors

- Immune mediated allergic trigger where IgE levels are raised
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- Strong family link to atopy (a familial tendency to produce IgE antibodies to low levels of allergens)
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- Allergen sensitisation is one of the most significant factors leading to the development of asthma
  
- Mechanism does not involve the immune system and does not proceed via allergic sensitisation.
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- Maybe caused following a single exposure to the irritant, or intermittent high levels, or chronic low

## Symptoms

Cough

Wheezing

Shortness of breath

Cough

Wheezing

Shortness of breath

**Onset of disease**

Can be at any age but generally onset is at a young age

Often adult onset

**Co-existing diseases**

Often other allergies co-exist such as allergic or non-allergic rhinitis, urticaria, and/or eczema

May co-exist with other non allergic or allergic conditions such as rhinitis and VCD

**Triggers**

Common allergens such as

- Dust mites
- Animal dander
- Pollen
- Mold

Chemical Irritants

Physical factors – exercise and cold air.

Irritant exposure – chemicals, gases or fumes, smoke

## **Triggers for allergic and non allergic asthma**

Triggers maybe physical, biological, and/or chemicals that can be present in both indoor and outdoor air, see previous articles for more information.

Triggers provoke asthma by generating inflammation and narrowing of the small airways. The response (symptoms, duration and severity) to triggers are variable and individual.

Low levels exposure to irritants or allergens can exacerbate asthma regardless of whether the asthma is due to allergic or irritant mechanisms.

**Allergic asthma**, is triggered by many of the same allergens that trigger other respiratory allergic conditions such as allergic rhinitis and conjunctivitis. Triggers include aeroallergens such as pollen, dust mite, animal dander, mould and irritants such as Environmental Tobacco Smoke, formaldehyde, NO<sub>2</sub>, VOC's, perfumes. Irritants can increase the sensitivity to allergens when there are co-exposures.

**Nonallergic/irritant asthma** is triggered by substances that aggravate/irritate the nose and airways, but do not necessarily trigger allergies. These irritants include smoke, strong odors such as perfumes or household cleaners, airborne particles such as coal or chalk dust, changing weather conditions and strenuous physical exercise.

**Common chemical, biological and physical triggers are shown in the table below.**

<b>Chemical triggers</b>
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**Biological triggers**

**Physical triggers**

- Fumes
- Dust
- VOCs\*
- Air pollution
- Tobacco smoke
- Fragranced consumer products \*\*
- PVC plastics\*\*\*

**Allergens such as plant or animal products**

- mold,
- pollen,
- animal dander,
- cockroach allergen

**Respiratory viral infections**

- Exercise
- Overexertion
- Cold, heat, humidity

\* Sources of VOC's include solvents, adhesives, paint, cleaning products, furnishings, polishes and air fresheners.

\*\* Fragranced consumer products are those products that contain fragrance or scent and include air fresheners, deodorisers, laundry detergent, hand sanitisers, personal care products, baby shampoo and cleaning products.

\*\*\* PVC plastics leach, migrate or gas out phthalate compounds that can be detected in indoor air and house dust. Most exposure to phthalates is through the diet but inhalational exposure is also a route of entry. There is some evidence that phthalates may have an adverse effect on the airways and immune system provoking asthma attacks in susceptible individuals.

### Incidence/Prevalence

Data from the Australian Society of Clinical Immunology and Allergy website ( [www.allergy.org.au](http://www.allergy.org.au) ) states that the incidence of allergic disease in Australia is 40%, with over 2 million Australians currently diagnosed with asthma, 11-13% are children and 9-11% adults. Of those with asthma > 80% have evidence of allergic sensitisation i.e. immune mediated. Approximately 10% of adult onset asthma is caused by occupational exposure.

The Australian Government's Australian Institute of Health and Welfare released a report in 2010 on Australia's health that can be accessed at their website [www.aihw.gov.au](http://www.aihw.gov.au) . In 2010 it was estimated that asthma will be the 10th leading contributor to the overall burden of disease in Australia

- 10% of the surveyed population reported they had current asthma 2007-08.
- Of these 10.9% were female, and 8.9 % male (2007-2008)



- Highest prevalence of asthma at 15.1% was in males 5-9 years

### Asthma in young children

- First 3 years of life - 17% of infants experience asthma or wheeze. Note that not all wheeze qualifies as asthma, most wheezing illness resolve by 6 years of age
- By age 2-3 years incidence of wheeze was 15.4%, and incidence of asthma 6.4%.
- By age 4-5 yrs 21% of children were diagnosed with asthma.
- 4% of the children with no asthma diagnosed by 4-5 yrs, went on to be diagnosed with the condition over the next 3 years.

### Treatment

Allergic asthma can be treated with medications and environmental control measures to reduce exposure to allergic and non allergic triggers. Non allergic asthma does not respond to asthma medications. Reduction of exposure to asthma triggers has been shown to reduce asthma symptoms and need for medication in both allergic and irritant asthma.

### Diagnosis

If you suspect you have allergies or asthma visit a medical health practitioner for diagnosis and treatment. Diagnosis requires a complete medical history and diagnostic laboratory and physical tests such as lung function tests, skin prick tests and IgE levels (RAST).

### Further reading/More information

The Australasian Society of Clinical Immunology and Allergy Information on allergy and asthma ASCIA [www.allergy.org.au](http://www.allergy.org.au) .

National Asthma Council. The National Asthma Council website contains information on asthma and has links to other asthma sites. [www.NationalAsthma.org.au](http://www.NationalAsthma.org.au)

Asthma [www.health.gov.au](http://www.health.gov.au)

Health Institute [www.healthinsite.gov.au](http://www.healthinsite.gov.au)

Asthma Foundations of Australia. [www.asthma.org.au](http://www.asthma.org.au)

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