Sources of Atmospheric/Chemical Allergens and Irritants

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There are numerous atmospheric allergens and chemical irritants that we are exposure to every day in both the indoor and outdoor environment. Some of these such as sulphur dioxide, nitrogen dioxide, ozone and particulates are produced as a result of fossil fuel combustion, others such as the volatile organic compounds are ubiquitous in our environment appearing in many consumer products as well as building materials and cleaning products.

Exposure to aeroallergens/or chemical irritants can in sensitive/atopic people can produce symptoms such as sneezing, congested nose, cough, itchy eyes, nose and throat, and watering eyes. They can also exacerbate asthma producing symptoms such as cough, wheeze and shortness of breath. Other symptoms produced following exposure to aeroallergens are fatigue, headache, hoarseness of voice and insomnia.

SO$_2$: Sulphur dioxide (Fossil fuel combustion, tobacco smoke, exhaust fumes)

**Location**: Primarily outdoor. Although natural sources such as volcanoes contribute to ambient levels of sulphur dioxide, the combustion of sulphur-containing fossil fuels is the primary source of this gas

Indoor - This gas is present indoors where unflued gas appliances and wood stoves and heaters with indoor leaks are used

**Allergy/Health State**: Respiratory tract irritation, bronchitis, bronchoconstriction. Triggers
asthmatic episodes. Exacerbation of cardiopulmonary diseases. Chest tightness & bronchoconstriction

\[ \text{NO}_2 \text{ Nitrogen oxides. Biomass and fossil fuel combustion, tobacco smoke and exhaust fumes} \]

**Location**: Outdoor and Indoor. This gas is present indoors where unflued gas appliances and wood stoves and heaters with indoor leaks are used. The major source of nitrogen oxides is the combustion of fossil fuels in power stations and motor vehicles. Power plants and gas heaters and stoves can lead to nitrogen dioxide being emitted directly.

**Allergy/Health State**: Eye irritation, Respiratory tract infection (especially in children) Exacerbation of asthma, irritation of bronchi, Asthma requiring hospital admission

**Ozone**: Ozone is a highly reactive gas formed in the lower atmosphere by chemical reactions between nitrogen oxides, oxygen and volatile organic compounds in the presence of sunlight. The pollutants produced are referred to as ‘photochemical smog’ and ozone is the most important pollutant in this group.

**Location**: Outdoor and Indoor. This gas is present indoors where unflued gas appliances and wood stoves and heaters with indoor leaks are used. Secondary pollutant from traffic exhaust, hydrocarbon release, fossil fuel combustion.

**Allergy/Health State**: Eye and respiratory tract irritation, Reduced exercise capacity, Exacerbation of asthma, Asthma requiring hospital admission
**Particulates**: Particles suspended in air are a complex mixture of solids and aerosols and their composition and size depends largely on their source.

**Location**: Outdoor and Indoor.

The sources of particulates are Biological (pollens, bacteria and fungi) and Atmospheric primarily from combustion sources such as power stations, petrol-and-diesel-powered motor vehicles, wood heaters, fireplaces and incinerators, tobacco smoke and exhaust fumes. Sources of fossil fuel combustion products are Indoor heating appliances, cooking appliances, smoke; and Outdoor industrial smoke stack emissions, car exhausts, heating exhausts, fires. These combustion products absorb VOCs and heavy metals.

**Allergy/Health State**: Respiratory tract irritation and infection, allergies Bronchitis, eye irritation, Exacerbation of respiratory and cardiopulmonary diseases, Asthma requiring hospital admission, Lung cancer

**Volatile Organic Compounds (VOCs)**: A mixture of organic compounds (E.g. benzene, toluene, xylene, and aldehydes – formaldehyde) released from various sources including household chemicals and personal care products.

**Location**: Indoor and Outdoor. VOCs are generally present in indoor air at concentrations greater than outdoor air. Homes and offices concentrations are generally much lower than in industrial buildings. There can be up to several hundred in any given sample of indoor air. High indoor levels of VOC's are released in new or renovated buildings and houses.

The various sources of VOCs include personal care products, paints, varnishes, adhesives, solvents, foam installations, glues, fireboard, pressed board, plywood, particle board, carpet backing, and fabrics that contain the volatile organic compound formaldehyde, and paints or
other material that releases isocyanates. For most materials, highest emissions of VOCs occur when products are new, and especially when ‘wet’ products such as paints, adhesives or sealants are used.

Personal care products such as fragrances, colognes, lotions and household chemicals such as detergents, cleaners, air freshener, pesticides and aerosol from paints and hairsprays can cause immediate eye and airway symptoms that may mimic allergy reactions.

VOC’s are also released from:

- New buildings and cars for the first 6 to 12 months after construction.
- Materials such as plastic floor coverings and furniture for several months.
- Cleaning agents and office equipment
- Some wool carpets

**Allergy/Health State:** Irritation of the upper respiratory tract and airways; Allergies – rhinitis/conjunctivitis, bronchitis, and worsen asthma; Headaches, fatigue, nausea

**Environmental Tobacco Smoke (ETS):** ETS is a complex mixture that includes some carcinogens and respiratory irritants such as sulphur dioxide, formaldehyde and ammonia.
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**Location**: Indoor and Outdoor

**Allergy/Health State**: Asthma, upper respiratory irritation, Rhinitis and Asthma is more common among non-smoking adults exposed to ETS than those not exposed. Among people with asthma, higher ETS exposure is associated with a greater risk of severe attacks.

**Formaldehyde**: Formaldehyde, a pungent gas, is found in buildings with high quantities of particleboard, fibreboard and plywood (for example, mobile buildings and caravans). It is found in many households and offices in wood-based panels, furniture, glues, dyes, permanent-press clothes, markers, paints and cigarettes. Sources are as for VOCs above.

**Location**: Indoor and Outdoor

**Allergy/Health State**: Irritant to the eyes and the upper and lower respiratory tract, symptoms range from burning or tingling sensations in eyes, nose and throat to chest tightness and wheezing. Degree and number of symptoms dependent on the level and lengths of exposure. Higher formaldehyde exposure levels are more likely to result in more frequent symptoms. Formaldehyde causes an inflammatory response in the airways of healthy children and may be responsible for respiratory symptoms and declines in lung function.

**Further Information**

More information on other types of environmental toxins, perfumes and pesticides can be found in the ASEHA leaflet series.
For more information on allergic diseases and the prevention of allergic reactions to aeroallergens please visit the following sites.

ASCIA website  http://www.allergy.org.au/content/category/3/48/241/ Provides information about the Allergenic Pollen plants, and what times of the year the plants usually flower all over Australia.

ASCIA  www.allergy.org.au

ASCIA  www.ascia.org.au

Asthma Foundation  www.asthmaaustralia.org.au

National Institute of Allergy and Infectious diseases  http://www.niaid.nih.gov/

World Allergy Association  www.worldallergy.org
