

## Understanding Indoor Air Quality and Pollution

### Why indoor air quality matters

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In the open air, 'Hydroxyl Radical Cascades' are continuously created by the complex chemical interactions that occur naturally in the atmosphere. Hydroxyls are the powerful but entirely safe and natural air cleaning agent, often referred to by scientists as 'Nature's Detergent', which continuously decontaminates the air and gives 'fresh air' that clean and refreshing feel that we all love.

Indoors, the natural atmospheric ingredients that continuously create hydroxyl radicals don't exist and allergens remaining active, smells remain smelly and bacteria and viruses constantly build up in the air and on surfaces.



Indoor air is therefore generally much more polluted than outdoor air, yet until recently it has received far less public attention. We often spend up to 90% of our time indoors (at home, work or at school), so exposure to indoor air pollution is potentially much more damaging to our health.

That is why the World Health Organisation considers indoor air pollution as one of the main health threats today, and states that around 3% of the global burden of disease is directly attributable to it.

## **Indoor air pollution**

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Indoor air pollution is a complex mixture of microbes and substances in the air that are potentially harmful to health. The composition of this indoor air pollution can vary greatly depending, for example, where you live and on the contents of your home.

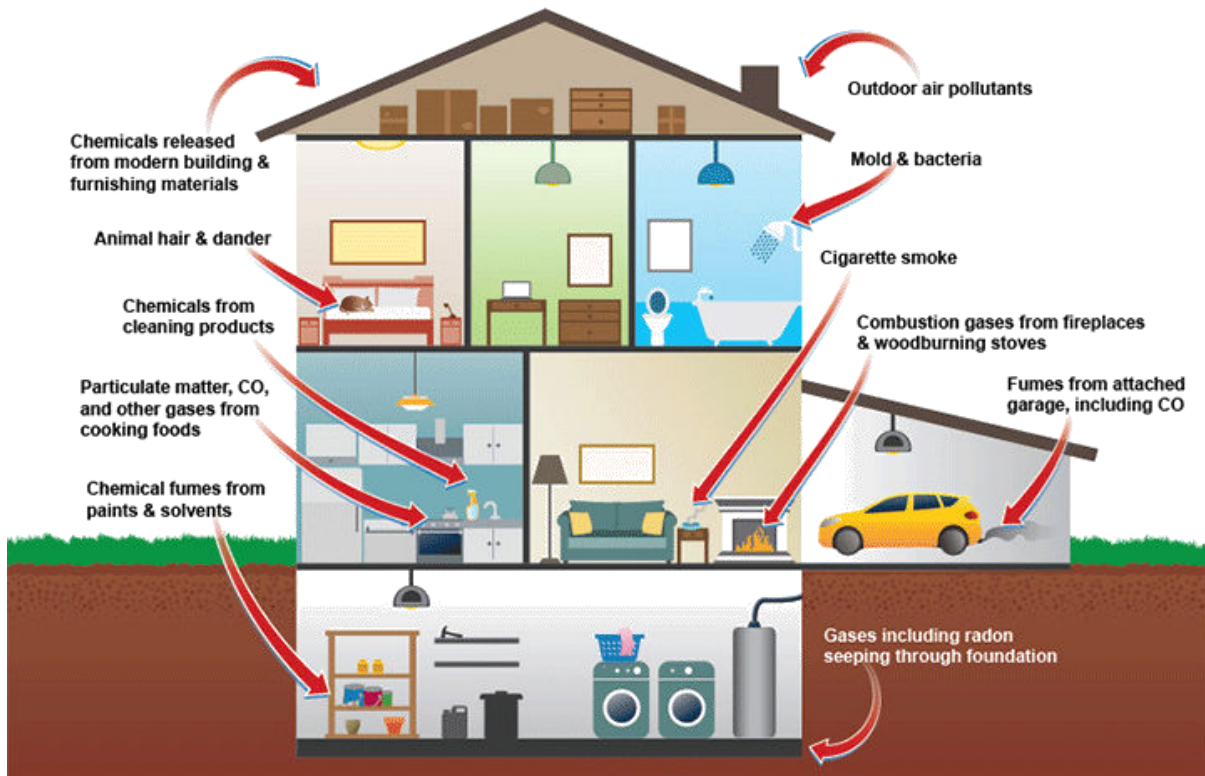
In a home in a non-urban setting for example, house dust mite, pollen and mould spores can be a major cause of indoor air pollution and related health problems. In a new-build home or office, fumes from paints and insulation, new carpet and furniture can significantly contribute to the pollution. Especially in industrial or built up areas, traffic and industry pollution also play an increasing part in indoor air pollution.

In our homes the build up of both bacteria and viruses in the air is much greater than outside.

## **Sources of pollution**

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The size of the particles found in indoor air pollution range from 100 microns to smaller than 0.01 microns. The heavier particles tend to settle as dust but are easily stirred up again when someone walks through a room or when a surface is dusted. Damp dusting, not just dry dusting, is needed to reliably remove dust rather than just spreading it around. Most carpets are a major reservoir for dust and for every six rooms in a house around 40 pounds of dust is generated in a single year, much of which is human skin as we regularly shed our outer layer of skin as part of a continuous renewal process.



The main components of dust which can affect your health indoors are:

- house dust mite
- mould spores
- pollen
- soot
- pet dander (including cat saliva)
- particulate cigarette smoke
- bacteria and viruses

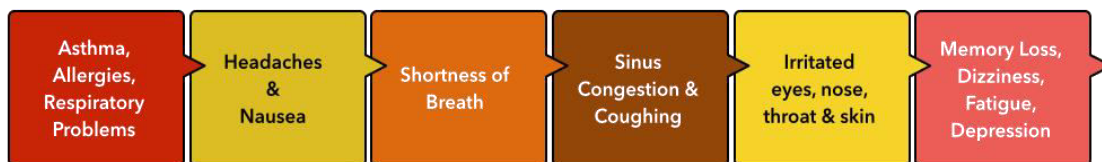
From 0.1 microns and smaller, pollution falls into the nanoparticle and molecular size range and includes:

- the gaseous, that is non-particulate, components of cigarette smoke
- combustion products such as carbon monoxide and nitrogen oxides from boilers and cookers
- volatile organic compounds (VOCs):

- such as formaldehyde, which slowly seeps out from carpet or medium-density fibreboard often used in DIY or flat pack furniture
- as found in a wide range of household products including cleaning solutions, air fresheners, aerosol toiletries and paint
- ozone, which at too high a level is a known lung irritant
- radon is a radioactive gas that can be found in homes in certain areas if they are built on rocks containing uranium which naturally decays to radon

## Health effects

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- exposure to indoor air pollution can trigger attacks of asthma, hay fever, rhinitis and other allergic conditions
- airborne human pathogens (bacteria and viruses) can cause colds, flu and much worse

Asthmatics and others with breathing problems will be well aware of the complications and difficulties that lung and throat infections cause.

- the adverse health effects of second hand tobacco smoke, including triggering asthma and increasing the risk of lung cancer, are well known.
- the health effects of VOCs can vary greatly, depending on the nature of the VOC, the level of exposure, and the length of exposure:
  - long-term exposure to significant concentrations of VOCs can cause damage to the liver, kidneys, and central nervous system
  - short-term exposure to VOCs can cause eye, nose and throat irritation, headaches, nausea, dizziness, fatigue and allergic skin reactions
  - exposure to VOCs is thought to contribute to 'Sick Building Syndrome' and 'Multiple Chemical Sensitivity' which are poorly understood chronic conditions marked by a wide range of symptoms including headaches, lack of concentration and fatigue

- research has also shown that exposure to combustion products from wood burning stoves and gas cookers can have a number of adverse effects on heart and lung health

## **Prevention of indoor air pollution**

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It is always better to try to prevent indoor air pollution occurring before attempting to reduce or remove it.

- if you smoke, it is best to do so outside and to ask smoking visitors to do likewise
- If you suspect you live in a radon-affected area, get the radon level in your home tested and take appropriate corrective advice and action
- check any DIY products or household aerosols or air fresheners for VOC content

Read the label and note whether the product should not be used in an enclosed space and remember that there are often more 'environmentally-friendly' alternatives to conventional paints, glues and similar products, so choose wisely.

- avoid MDF and other products which release formaldehyde into an enclosed environment
- getting rid of clutter, which attracts dust, will help reduce mould spores, bacteria and house dust mite
- carpet is a prime reservoir for house dust mite - consider replacing your carpets with hard flooring
- invest in a leakage free HEPA vacuum cleaner
- keep humidity low to discourage mould and house dust mite

Where the main source of pollution is internal rather than external then letting fresh air into your home to displace internally polluted air is a good way of improving indoor air quality.

Where the main source of pollution is internal rather than external, it is helpful to open windows after bathing, showering or cooking so that damp and mould don't build up.

## **Air Purifiers**

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An effective air purifier can play an essential part in reducing indoor air pollution in your home or place of work.

The key word here is 'effective' and the unfortunate truth is that most traditional air purifiers are not at all effective!

Various types of traditional air purifier focus on different pollutants, typically pollens, spores and other particles or on gaseous pollutants. Some combine technologies to address more than one type of pollutant.

But all have the same drawback, they only clean the air passing through the device and rely, to only limited effect, on a high throughput of air to draw in pollution from the ever changing air in the room. However good the filter mechanism, they will only ever clean a modest proportion of pollutants from the air in a room because constant air changes, re-contamination, re-circulation and eddy formation means that there are always significant airborne pollutants in a room which have not been drawn into the device.

There is now however a new generation of air purifiers of which the Airora 4-in-1 is the first (and currently only!) one. These air purifiers use the naturally occurring 'hydroxyl radical cascade' process found in the outside atmosphere to clean internal air (and exposed surfaces) of the full range of pollutants; allergens and irritants, pollutant gasses, bacteria and viruses and smells.