

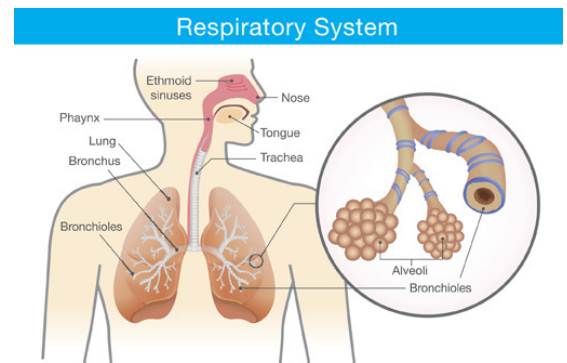
The Importance of Respiratory Protection

Health hazards in the workplace are a major concern for both employers and employees. It is important, though, to remember that hazardous materials only present a health hazard when they encounter your body. Hazardous materials can enter your body in the following ways:

1. **ingestion** (through the mouth),
2. **absorption** (through the skin or eyes)
3. **inhalation** (through the lungs).

The most common route of exposure for most health hazards is **inhalation**. This includes breathing in dust, fumes, oil mist, and vapours from solvents and various gases.

To better understand how harmful substances can enter your body by inhalation, let's take a closer look at the breathing process. Whenever you take a breath, oxygen rich air is taken into your body through your mouth and nose, goes down your windpipe and into the lungs. There are tiny air sacs called alveoli in your lungs. These delicate air sacs transfer oxygen from the air into your blood. At the same time as oxygen is being absorbed into your bloodstream, carbon dioxide is being transferred from your bloodstream into the air sacs. When you breathe out, your body rids of gaseous wastes.



The risk caused by airborne contaminants mainly depends on:

- Physical, biological and chemical properties of the contaminants, their size and form
- Concentration in the ambient air and time of exposure
- Volume of inhaled air (the more rapid respiration, the more airborne contaminants are inhaled)

Types of air contaminants

1. Airborne particles – dusts, fumes and smoke

- Working processes may generate tiny solid particles which are light enough to float in the air, and these are referred to as dusts, fumes and smoke.

- **Dusts** are polydisperse solid aerosols*, generated during processing of organic and inorganic substances. Solid particles can be mineral, metal, coal, wood or crop dust, as well as fibres. They are usually heavy enough to settle slowly to the ground.
- **Fumes** are very tiny solid particles which can remain airborne. They are usually formed when a heated metal has evaporated in the air and then condensed back to a solid form. This occurs in welding and soldering operations.
- **Smoke** is made up of small particles produced by incomplete combustion of any material that contains carbon. Smoke is often produced during processes that require high heat or burning as part of the manufacturing process.
(AEROSOL – a substance consisting of very fine solid particles or liquid droplets suspended in a gas.)*



2. Gases and vapours

- Workplace chemicals can enter the air in several different ways. Simple evaporation is probably the most common way. Organic solvents, such as toluene, methyl ethyl ketone (MEK) or alcohols, generally evaporate faster than water, acids or caustics, though this is not always the case.
- Gases are materials that become airborne at room temperature. Gases may have an odour, but many do not. Some gases can be seen, but again, others cannot. Gases may be heavier or lighter than air, but in any case, they can spread undetected.
- Vapours are substances that are created when a solid or liquid material evaporates. Materials that evaporate easily at room temperature include paint thinner or solvents.



Health hazards caused by airborne particles

When the lungs are exposed to high concentrations of dust, toxic vapours, cigarette smoke, etc., human filtering mechanisms can become overloaded and damaged. Once they are damaged, various bacteria, viruses, etc. are more likely to grow in the lungs, causing infections such as pneumonia. That is why workers in dusty occupations (bauxite and coalminers, asbestos workers, flour mill workers, furniture makers, etc.) are known to be more susceptible to tuberculosis, bronchitis and other respiratory diseases than workers in non-dusty occupations

Our respiratory system has very effective mechanisms for filtering out normal pollutants from the air we breathe. Filtering system in the nose and mouth prevent large foreign particles (like coarse dust) from getting into the body, where they can cause health hazards.

Non-respirable particles (usually in excess of 100 μm) can be filtered out of the respiratory system by the upper respiratory tract (mouth, nose, windpipe)

Respirable particles in the size range less than 10 μm are difficult to trap. They can reach the delicate parts of the lungs where they can cause serious respiratory problems. How far the particles break through depends on their size – the smaller the size the more harmful they are.

Health hazards caused by gases and vapours

Gases and vapours can also enter the body through the respiratory system. Some chemicals have damaging local effects on the lungs, others are absorbed into the bloodstream and have potentially damaging effects on various target organs. Target organs are those parts of the body that particular chemicals always affect, the central nervous system (brain and spinal cord), the heart, lungs, kidneys and liver.

Local effects

- **Lungs** – Asbestos silica, cotton dust, cadmium, diesel emissions, bagasse dust, bauxite dust
- **Gastrointestinal tract** – Asbestos, nitrosamines, welding fumes, lead SKIN Acrylis, epoxy resins, nickel, coal tar, benzene

Systemic effects

- **Brain and nervous system** – Organophosphorus, pesticides, lead (pb), mercury, manganese, arsenic
- **Heart and circulatory system** – Carbon monoxide, vinyl chloride, trichlorethylene, benzene, toluene
- **Liver** – Carbon tetrachloride, vinyl chloride, trichlorethylene
- **Kidneys and bladder** – Benzidine dyes, betanaphthylamine, coke oven emissions, mercury
- **Bones** – lead

Health hazards of toxic substances

Although some of the medical terms may be unfamiliar to you, it is important to understand the body's reaction to toxic materials. Toxic substances can cause four types of effects on the body: local, systemic, acute and chronic.

1. Local effects

- Only a localized effect on one part of the body – where the hazardous agent comes into contact with or enters the body. Some substances like ammonia, chlorine, welding fumes and exhaust fumes can cause local irritation to the lungs when they are inhaled.

2. Systemic effects

- Systemic effects can occur in the blood when the substance is absorbed into the bloodstream, and in the organs that either store the toxic material (such as the bones and the brain), neutralize it (such as the liver), or remove it from the body (such as the kidney and bladder). A typical systemic effect in the blood is anaemia (a shortage of red blood cells) which can be caused by several chemicals, including lead, beryllium, cadmium, mercury compounds and benzene. Benzene can damage the cells that form blood, leading to leukaemia. Liver can be damaged by toxic substances because it tries to break down many of them once they have entered the body. Some chemicals known to damage the liver are: benzene, DDT, dioxane, phenol and trichloroethylene. Vinyl chloride monomer, used in the plastics industry, is known to cause a rare form of liver cancer. Kidneys and bladder also can be affected by many toxic substances because they are major routes of exit out of the body.

3. Acute effects

- Acute effects are usually immediate, obvious, short-term responses to exposure to a hazard. They can be localized to one part of the body, or they can be systemic.

4. Chronic effects

- Chronic effects develop over the time. Chronic conditions can result from a short exposure, or from the repeated contact with a substance or work process. Like acute effects, chronic effects can be localized to one part of the body (such as chronic lung disease which develops over years), but they can also be systemic.

Occupational lung diseases

Occupational lung diseases are the leading cause of work-related illness in terms of frequency, severity, and preventability. Most occupational lung diseases are caused by repeated, long-term exposure, but even a severe, single exposure to a hazardous agent can damage the lungs. Occupational lung diseases are preventable!

Symptoms of an occupational lung disease

The most common symptoms of lung diseases, regardless of the cause are as follows. However, everyone may experience symptoms differently. Symptoms may include:

- coughing
- shortness of breath
- chest pain
- chest tightness
- abnormal breathing pattern
- The list contains examples of chemical substances or processes where workers may be exposed to the concentration level that cause various adverse effects in respiratory system.

Facts to remember about inhalation

- Hazardous agents get into the human body mostly by inhalation than by any other way.
- Although human body can filter many of the normal pollutants from the air you breathe, it cannot eliminate each type of contaminant.
- Small particles are difficult for the body to eliminate and can get deep into the lungs where they can cause respiratory problems.
- Workers in dusty occupations are more susceptible to respiratory diseases than workers in non-dusty occupations.
- Chemicals, in their various forms, can be inhaled and damage various target organs, mainly the lungs.
- It is important to notice warning signals, such as smelling chemical odours. It is also important to notice if you stop smelling a chemical odour that you used to smell – you may be “accustomed” or used to the smell and do not know that you are being exposed to the chemical.

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