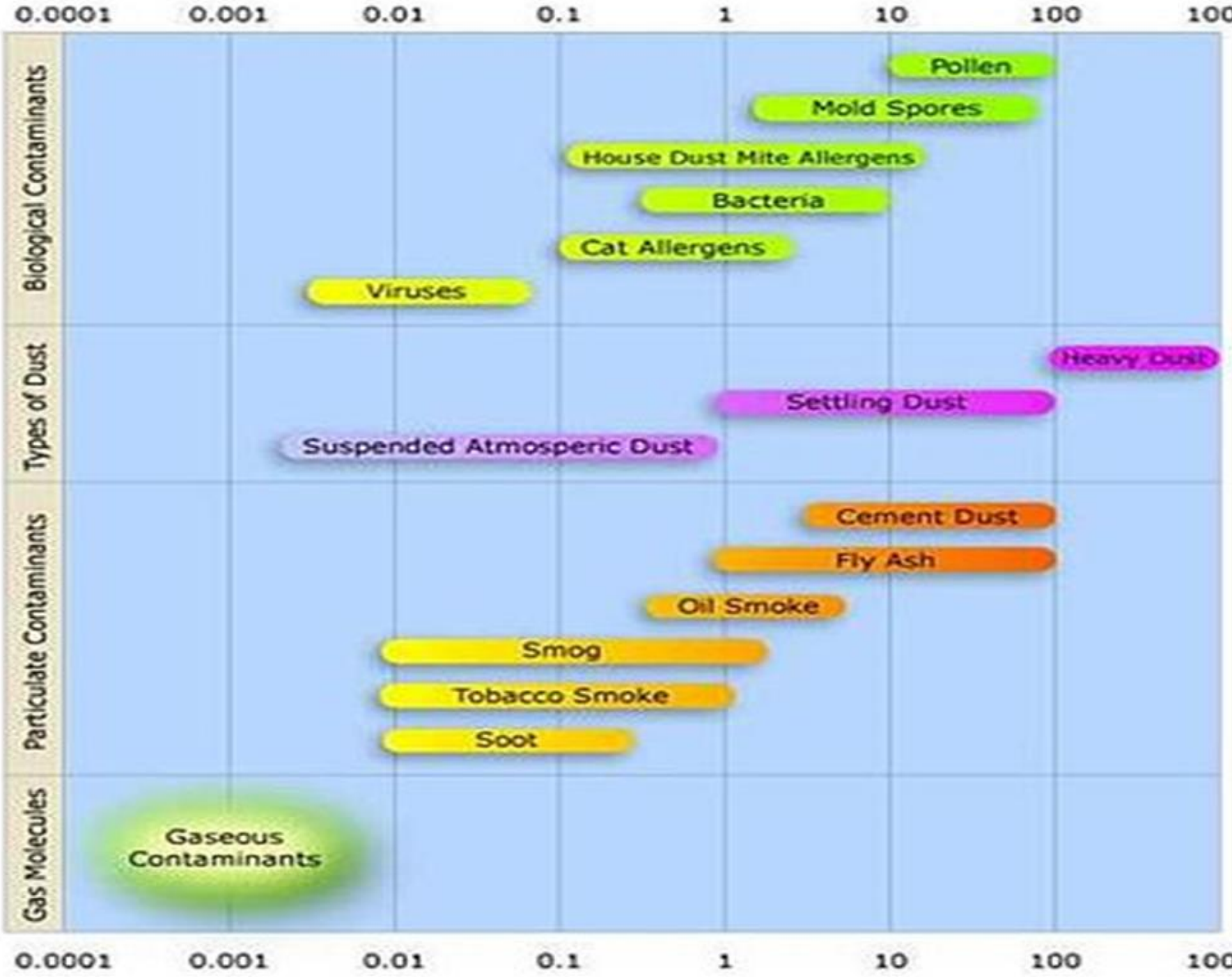
Aerosol

An aerosol: is a **colloid** of fine **solid** particles or **liquid** droplets, in air or another **gas**.[1] Aerosols can be natural or artificial. Examples of natural aerosols are **fog**, forest **exudates** and. Examples of artificial aerosols are haze, dust, particulate **air pollutants** and **smoke**.[1] The liquid or solid particles have diameter mostly smaller than 1 μm or so; larger particles with a significant settling speed make the mixture a **suspension**, but the distinction is not clear-cut. In general conversation, *aerosol* usually refers to an **aerosol spray** that delivers a consumer product from a can or similar container. Other technological applications of aerosols include dispersal of **pesticides**, **medical treatment** of respiratory illnesses, and combustion technology.[2] **Diseases can also spread** by means of small droplets in the **breath**, also called aerosols.

Aerosol science covers generation and removal of aerosols, technological application of aerosols, effects of aerosols on the environment and people, and a wide variety of other topics.[1] his article is about particles suspended in air.

below diagram shows types, and size distribution in **micrometres**, of atmospheric particulate matter

Gray shows where the sensor did not collect data.


0.0001
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Biological Contaminants
Pollen
Mold Spores
House Dust Mite Allergens
Bacteria
Cat Allergens
Viruses
Types of Dust
Heavy Dust
Settling Dust
Suspended Atmosperic Dust
Particulate Contaminants
Cement Dust
Fly Ash
Oil Smoke
Smog
Tobacco Smoke
Soot
Gas Molecules
Gaseous Contaminants
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Atmospheric particulate matter

also known as particulate matter (PM) or particulates – is microscopic solid or liquid matter suspended in the Earth's atmosphere. The term **aerosol** commonly refers to the particulate/air mixture, as opposed to the particulate matter alone.[3] Sources of particulate matter can be man-made or natural. They have impacts on climate and precipitation that adversely affect human health.

Subtypes of atmospheric particle matter include:

1-Suspended particulate matter (SPM). .

2-Respirable suspended particle (RSP), which are [coarse] . particles with a diameter of 10 micrometres or less, also known as PM_{10}

3-Fine particles with a diameter of 2.5 micrometres or less, .

4-Ultrafine particles4- .

5-Soot. .

Particulates are the deadliest form of **air pollution** due to their ability to penetrate deep into the lungs and blood streams unfiltered, causing permanent **DNA mutations**, **heart attacks**, and **premature death**.

Black carbon

Black carbon (BC), or carbon black, or elemental carbon (EC), often called soot, is composed of pure carbon clusters, skeleton balls and **buckyballs**, and is one of the most important absorbing aerosol species in the atmosphere. It should be distinguished from organic carbon (OC): clustered or aggregated organic molecules on their own or permeating an EC buckyball.

Effects of particle matter on health

Size, shape and solubility matter

The size of the particle is a main determinant of where in the respiratory tract the particle will come to rest when inhaled. Larger particles are generally filtered in the **nose** and **throat** via cilia and mucus, but particulate matter smaller than about 10 micrometers, referred to as PM_{10}, can settle in the bronchi and **lungs** and cause health problems.

The 10 micrometer size does not represent a strict boundary between respirable and non-respirable particles, but has been agreed upon for monitoring of airborne particulate matter by most regulatory agencies. Because of their small size, particles on the order of ~10 micrometers or less (PM_{10}) can penetrate the deepest part of the lungs such as the bronchioles or alveoli.

Similarly, so called fine PM, particles smaller than 2.5 micrometers, ***$PM_{2.5}$***, tend to penetrate into the **gas exchange** regions of the lung (alveolus), and very small particles (< 100 nanometers) may pass through the lungs to affect other organs.

Penetration of particles is not wholly dependent on their size; shape and chemical composition also play a part. To avoid this complication, simple nomenclature is used to indicate the different degrees of relative penetration of a PM particle into the **cardiovascular** system. Inhalable particles penetrate no further than the **bronchi** as they are filtered out by the **cilia**. Thoracic particles can penetrate right into terminal bronchioles whereas PM which can penetrate to **alveoli**, the gas exchange area, and hence the **circulatory system** are termed respirable particles. In analogy, the inhalable dust fraction is the fraction of dust entering nose and mouth which may be deposited anywhere in the respiratory tract. The thoracic fraction is the fraction that enters the thorax and is deposited within the lung's airways. The respirable fraction is what is deposited in the gas exchange regions (alveoli).

The smallest particles, less than 100 nanometers (**nanoparticles**), may be even more damaging to the cardiovascular system. **Nanoparticles can pass through cell membranes and migrate into other organs, including the brain**. Particles emitted from modern **diesel engines** (commonly referred to as **Diesel Particulate Matter**, or DPM) are typically in the size range of 100 nanometers (0.1 micrometer). These **soot** particles also carry **carcinogens** like **benzopyrenes** adsorbed on their surface. **Particulate mass is not a proper(correct) measure of the health hazard, because one particle of 10 μm diameter has approximately the same mass as 1 million particles of 100 nm diameter, but is much less hazardous, as it unlikely to enter the alveoli.**

Legislative(Lawmaking) limits for engine emissions based on mass are therefore not protective. Proposals for new regulations exist in some countries, with suggestions to limit the particle ***surface area*** **or the** ***particle count*** **(numerical quantity) instead.**

The site and extent of absorption of inhaled gases and vapors are **determined by** their **solubility** in **water**. Absorption is also dependent **upon air flow rates** and the **partial pressure of the gases in the inspired air**.

The fate of a specific **contaminant is dependent** upon the form in which it exists (**aerosol or particulate)**. Inhalation also depends upon the breathing rate of the subject.

Another complexity not entirely documented is **how the shape of PM** can affect health, except for the needle-like shape of asbestos which can lodge(chalet) **itself in the lungs**. **Geometrically angular shapes** have **more surface area** than **rounder shapes**, **which in turn affects the binding capacity of the particle to other, possibly more dangerous substances**.

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