

THE ESSENTIAL GUIDE TO

AIR PARTICLES

PureTM wellness

The Essential Guide to **Air Particles**

We tend to think about the air around us as empty space. In reality, however, this air is not only made up of oxygen molecules. It also contains countless microscopic particles that we continuously inhale along with that essential oxygen.

Most of these particles are harmless but they can have adverse health effects, especially in high concentrations. This makes it important to understand the types of particles that are in the air, the risk they pose to our health, and the ways we can limit or reduce their presence. Controlling indoor air quality will not only prevent the transmission of disease and exposure to harmful particles but will also help create healthier and more breathable air for everyone.

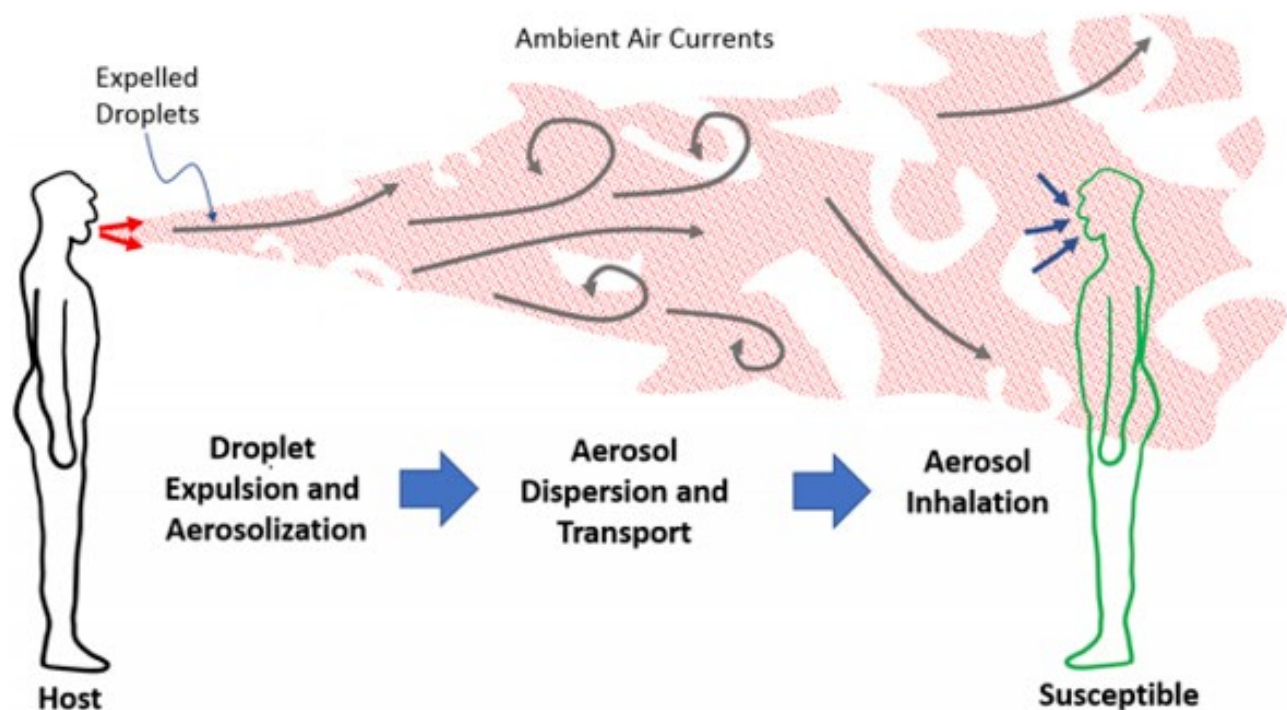


What is an Aerosol?

The Centers for Disease Control define an aerosol as “a suspension of tiny particles... in the air, such as dusts, mists or fumes.” These particles can float through the air for an extended period of time without being noticeable.

A person may come into contact with an aerosol through what is called “aerosol transmission.” Aerosol transmission is distinct from droplet transmission, which describes more direct and immediate contact with a substance, such as when another person coughs or sneezes in our vicinity.

Many harmful particles such as viruses, bacteria and allergens are small enough and light enough that they can hang in the air and linger. It is this quality of some particles--their ability to both become suspended and remain harmful--that makes aerosols a health concern.



Why Does It Matter?

While droplet transmission can be prevented with simple measures such as covering your mouth when you cough, wearing a mask and maintaining social distance, aerosol transmission is more difficult to avoid. Anyone spending time in an environment where these particles are present is susceptible to aerosol transmission through their nose, mouth and eyes.

Several factors contribute to the probability that a particle will be spread through aerosol transmission. These include:

- *The concentration of the particle in the atmosphere*
- *The particle's ability to remain harmful while suspended in the air*
- *The likelihood that the particle will enter the body*
- *The size of the particle*

This last point is especially important for preventing aerosol transmission. The size of a particle is directly related to our ability to control it and to our strategy for eliminating it.



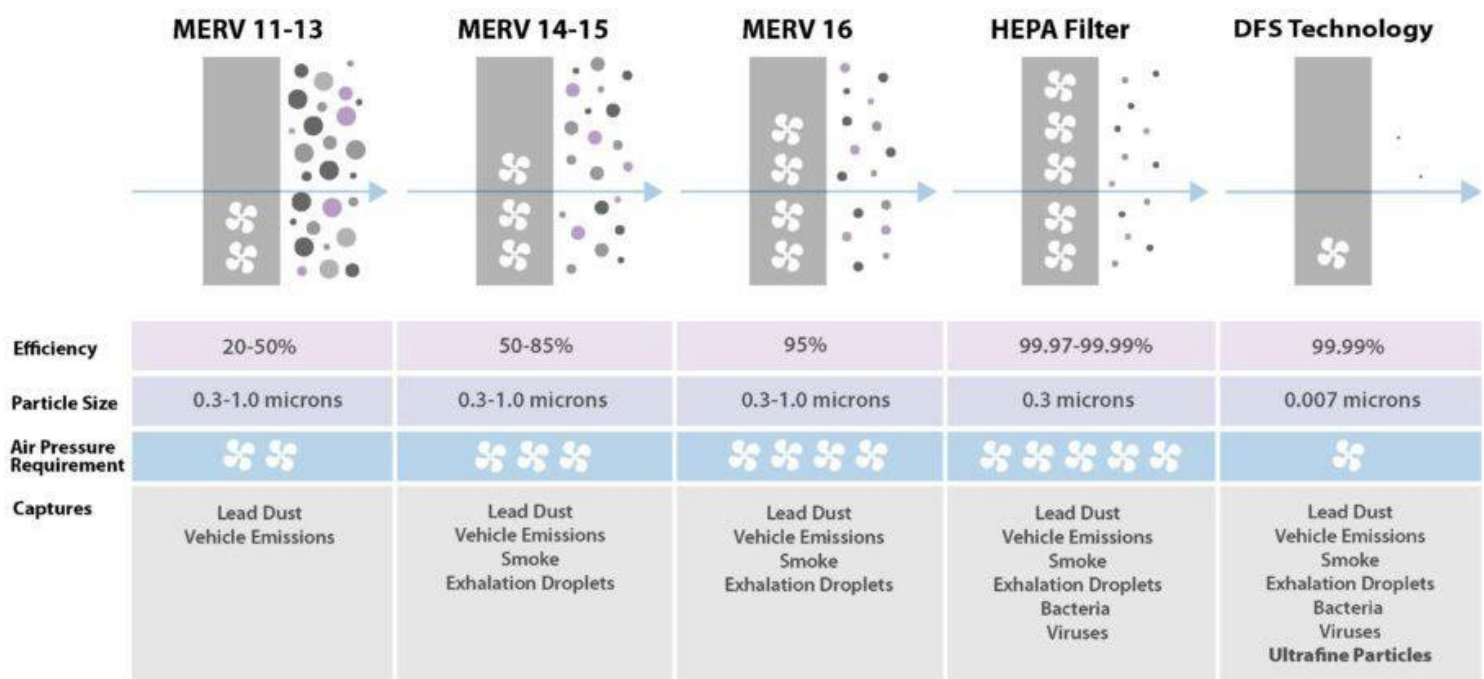
Types of Aerosols: Particulate Matter

This is a catch-all term for both organic and inorganic particles that are capable of spreading through the air. As such, particulate matter can vary greatly in size, from 0.01 microns (smog and tobacco smoke) to over 100 microns (heavy dust).

Outside of the developed world, concentrations of particulate matter in the air are a serious health problem. The World Health Organization has identified indoor air quality as one of the world's greatest health threats, primarily from toxic chemical pollutants and the indoor combustion of fossil fuels for cooking.

However, particulate matter remains a concern in Europe and North America as well. Air pollution, second-hand smoke, and dust are still present in the air we breathe and can pose long-term health effects, even in relatively low concentrations.

Filtration Efficiency / Particle Size



Allergens

An allergen is any substance that triggers an undesirable response from the immune system. By definition, an allergen is harmless on its own. When the immune system falsely identifies it as a threat, however, this triggers a cascade of responses that lead to the well-known symptoms of an allergic reaction, including congestion, sneezing, itchy and watery eyes, etc.

Anything to which a person is regularly exposed in high concentrations can become an allergen. However, the most common environmental allergens include:

- *Tree pollen*
- *Ragweed*
- *Mold or mildew*
- *Dust mite particles (often called “dust allergies”)*
- *Pet dander*



These are listed in order of size from largest to smallest. Pollen from evergreen trees is too large to be inhaled but allergenic tree pollens can still measure up to 100 microns. Cat dander, on the other end of the spectrum, may be as small as 0.1 microns and requires very fine filtration to remove from the air.

While allergens are not immediately harmful to people who are not allergic, they still pose significant health risks to everyone. Exposure to high concentrations can cause allergies, especially in children, and can also lead to chronic respiratory disease over the long-term.



Bacteria

These single-celled organisms are all around us: on surfaces, on our skin, in our stomachs and also in the air we breathe. While bacteria can cause disease, new research has shown that bacteria actually play an important role in our immune health and may also provide a variety of positive health benefits.

It is not possible to avoid exposure to bacteria entirely and, for the reasons described above, doing so is not even a desirable goal. However, because we are exposed to so much bacteria in our daily lives, it is beneficial to reduce our exposure to them through the air. Reducing concentrations of environmental bacteria will lower the risk of exposure to foreign, harmful types of bacteria.

Airborne bacteria range in size from 0.5 microns to about 10 microns. The smallest of these bacteria require High Efficiency Particulate Air (HEPA) filtration to be effectively removed from the environment.

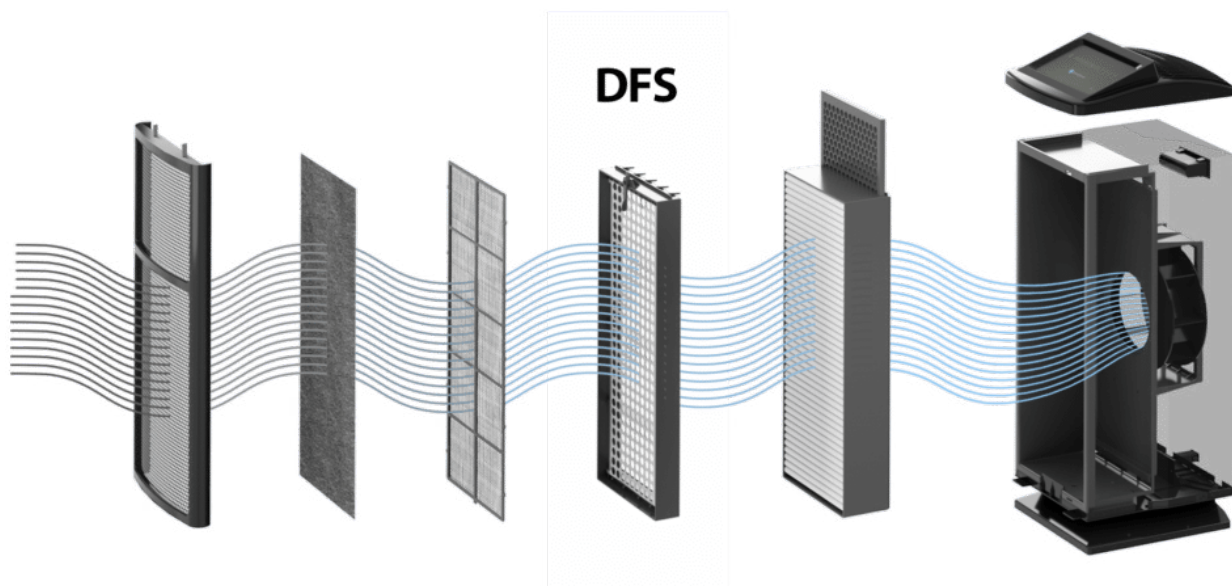
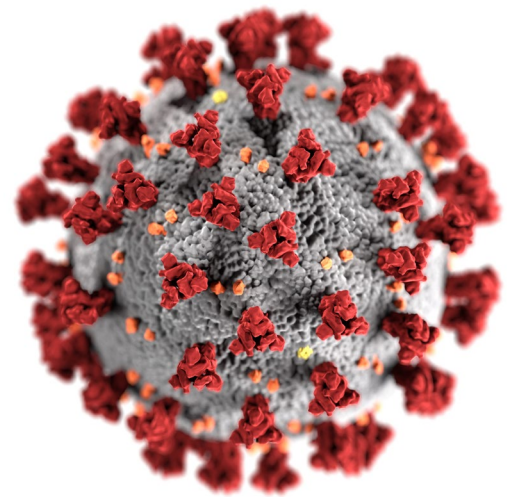
Viruses

These are among the smallest air particles and the most difficult to filter from the air. For this reason, viruses are some of the most concerning air particles.

A virus is a microscopic organism that requires a host to survive. They are parasitic because they can only replicate inside the living cells of an organism. Outside of a host's body, viruses lack the ability to thrive and will eventually die. They can, however, survive over a period of time while they remain on surfaces or suspended in the air.

Unlike bacteria, viruses present no benefits to humans or animals: they are simply benign or malignant. Many viruses either cannot survive in the human body or are stamped out by the immune system. In cases of infection, however, viruses gain a foothold, replicate and cause a range of adverse effects, from the common cold or flu to more serious viral infections like a novel coronavirus.

Viruses can be as small as 0.005 microns but most are within the 0.01 to 0.1 spectrum. The COVID-19 virus, for example, is approximately 0.125 microns in size. The microscopic dimensions of viruses mean that they cannot be filtered from the air even by systems that use HEPA filtration.



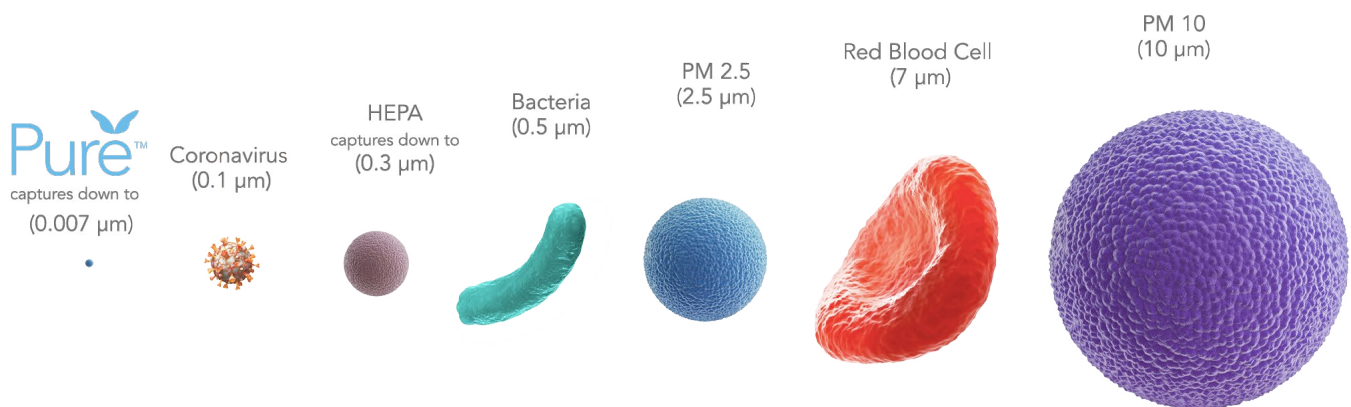
Ways to Prevent Aerosol Transmission

Strategies for reducing the level of air particles in the atmosphere vary based on the type of particle and the environment. In warm weather, the best solution is to spend time outdoors or to keep a room well-ventilated. This allows the concentration of air particles to become diluted, greatly reducing the chances of coming into contact with these particles.

In other contexts, adequate air filtration is required to remove these particles and prevent aerosol transmission. Air filtration systems work by pulling from the environment while the filter functions much like a very fine mesh: the smaller the holes in the mesh, the smaller the particles and the greater number of particles that will be trapped and removed.

There are a wide variety of filtration systems available but those that use High Efficiency Particulate Air (HEPA) filters have been the gold standard since the 1950s. These are distinguished for their ability to work with a filter that can remove particles as small as 0.3 microns. Systems that are not HEPA-compatible will not function properly with a HEPA filter due to a loss of suction, overheating and other mechanical failures.

While HEPA filters are capable of removing many of the air particles described above, they are not fine enough to filter out the smallest particulate matter, including dust mite allergens, pet dander, tobacco smoke and even some bacteria. HEPA filters are not effective in capturing viruses of any size.



Fortunately, there are more advanced air filtration systems available that can help eliminate even the smallest particulate matter. Newer systems use ultrafine filters with the ability to capture and eliminate particles as small as 0.007 microns. This ultrafine filtration makes them effective at removing:

- *Smoke and other fine particulate matter*
- *Allergens, including dust mite particles and dander*
- *Microscopic bacteria*
- *Most viruses, including COVID-19*

Outside of highly specialized research, military and medical applications, ultrafine filtration systems are the best on the market today. These systems have been scientifically proven to eliminate almost all air particles and are the best solution for managing indoor air quality.



Pure Wellness Deluxe Air Purifier featuring DFS technology



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