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GENERAL INFORMATION

Scientists still disagree on the exact routes along which the coronavirus spreads. Through a drip infection, contact infection or also via aerosols in the air we breathe. Several virologists support the theory of pure drip infection. They assume that it is impossible, for example, to get infected in the supermarket. This could therefore only be done through direct contact with an infected person. Meanwhile, however, there is growing evidence that the coronavirus remains in the air much longer than previously believed. If someone coughs, talks or sneezes, they spray a beam of drops and aerosols of different sizes that are scattered in the air. If a person is infected with corona, all these drops and aerosols may contain viruses.

In several projects, researchers at TU Berlin have now investigated whether and how quickly these particles sink to the ground, how far they spread, whether they remain in the air or whether they are falling down somewhere. This theorem is confirmed by more and more scientists. “In various projects, we investigate the presence of pathogens in the air under the most diverse conditions,” explains Prof. Dr. Martin Kriegel. He is head of the Hermann Rietschel Institute at Berlin University. Spread depending on size and preconditions “For the coronavirus, it seems that both drip infection and air transmission, i.e. via aerosols, are relevant,” Kriegel said. The drip infection occurs via viruses that are transmitted directly to another person’s mucous membranes from a drop of saliva. In the case of an infection via aerosols, on the other hand, the virus particles end up directly in the airways. The size of the carrier aerosols determines the behavior of viruses in the air. But also important is the space climate, the air conditioning and the way the rooms are ventilated. “Larger particles sink to the ground faster. Smaller particles track airflow and can stay in the air for a long time.”

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According to the scientists, the distribution in space takes place in two steps. First, a particle stream is created by coughing or sneezing, which enters the air into space and then mixes with it more and more. The course of this beam depends on different preconditions. Speed, turbulence, temperature difference between the beam and the ambient air and the difference in humidity. "As soon as the beam is completely mixed with the ambient air, the distribution takes place," kriegel explains.

"The smaller particles largely track the air flow in space, while the larger particles drop to the ground. The fact that people only emit very large particles when they sneeze is often ignored. Normal speech and coughing occur almost exclusively small aerosols." The researchers therefore also measured the so-called sedimentation time (deposition time) of particles of different size classes. It turned out that small particles (0.5 to 3 µm) were still almost completely present in the air after a measurement time of 20 minutes. No or only a very small deposition of these particles could be detected. Of the medium particles (3 to 10 µm) more than 50 percent were present in the air after 20 minutes. And another study showed that even larger droplets (greater than 60 µm) can spread far into space under certain conditions. As people slowly return to work, the researchers simulated particle distribution in an office with four people, with and without mechanical ventilation. "This shows that smaller particles under 50 µm in particular spread far into space without mechanical ventilation and stay there for a long time. On the other hand, particles between 5 and 20 µm spread less widely in a room with mechanical ventilation and are largely drained," kriegel says.

The decisive questions that the scientists then want to clarify are: "how large should the SARS-CoV particles be in order to still be contagious and how can the stay time of this particle size be affected by targeted air supply and air drainage systems or even by easy ventilation of spaces", kriegel stresses.

"The space climate also plays a role here, because aerosols become smaller very quickly and behave differently due to evaporation. In principle, it can be argued that in case of a typical air change in residential and office buildings, the pathogens stay in the room for hours. Any increase in the supply of fresh air is therefore generally sensible". The above shows that spread through the so-called "aerosols" is a bigger problem than is now thought. Several studies, including within the netherlands, have shown that spreading corona through Aerosollen is a much bigger problem than direct infection by touch.

https://www.youtube.com/watch?v=jhM9Zt5tZjY
An interesting study – please watch this video!

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Problematic events & public gatherings

Within the events sector and all the public gatherings such as churches etc, the issue of air quality is seldomly paid attention to. This is also often not a problem if the temperature and oxygen supply is sufficient In the current changed situation, we will have to take care of a new way of thinking: It is therefore of the utmost importance for the events industry to pay attention to this. Having an accptable indoor climate extends beyond temperature and humidity. In the normal presence of large groups of people in a closed environment, we know standard metrics used to purify air.

The air we exhale contains 100 times more CO2 than the air we breathe. Since an adult inhales an average of 0.5 litres of air at a frequency of 12 to 15 times per minute (sitting, without effort), we arrive at the following numbers: 0.5 * 12 * 60 = 360 liters per hour.
The volume of air would then be: 360 * 100 = 36.000 l/u, of 36 m3 per hour per person

This is the arithmetic value on the basis of which we have calculated air use/exchange. With the new situation that has arisen, we need to look at a new “polluter” of the air being the Corona Virus... or better - viruses in general.

WHAT IS AN AEROSOL
An aerosol is a colloidal mixture of dust particles or liquid droplets in a gas. Their size is in the order of 0.2 to 200 micrometers. Clouds and fog are examples of an aerosol; they both consist of verysmall droplets of water in air. Source Wikipedia If we assume that the corona virus, or viruses in general, bind to these types of aerosols then it is a necessity, if we want to prevent spread, we purify these aerosols with viruses, from the air. In fact, aerosols are nothing more like “particulate matter” to which a virus can bind... Particulate matter is the carrier of viruses that are spread through the air. Particulate matter is a form of air pollution.
Particulate matter is particulate matter smaller than 10 micrometers. These particles are of different size, origin and chemical composition. Epidemiological and toxicological data show that particulate matter is harmful to health when inhaled. For example, in people with respiratory diseases and cardiovascular diseases, it leads to worsening of their symptoms, and disadvantages the development of the lungs in children. Source Wikipedia This means that we can eliminate virus spread, as mentioned in this first part of this argument, by filtering particulate matter from the environment.

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SOLUTION THAT CAN BE TAKEN INTO ACCOUNT IN PROTOCOLS

If we want to make public gatherings in confined spaces possible again, we need to ensure that the air quality is at a level to minimise the spread of the viruses. Of course we have to ensure social behaviour that we all have to adhere to, but we will also have to take care of an air climate in which the spread via the Aerosols is limited. It will be important for the permitting of events to ensure a high degree of air quality! This assured, organizing events on a large scale depend on people's social behaviour; that is a factor that we can control to some extent. The quality of air becomes a very relevant factor in allowing events!

WHAT CAN WE DO?

In order to guarantee this within a temporary/semi permanent locations, we can offer systems that provide such air purification on site.

THE TECHNIQUE

The technique stems from the desire to filter particule matter from the air in industrial environments. The requirements for this are becoming increasingly strict. For this purpose, VFA has developed a filtering technique called ASPRA. ASPRA air cleaning from Pronorm Air is an effective filtration and cleaning system that removes airborne viruses, germs and dust particles from the air. Viruses, bacteria and fungi are biological particles. In the device, these particles are guided through an electric field, where most of them are killed off or deactivated. The viruses, bacteria and other pathogens are then captured in the collector (the filter) and permanently removed from the air. Which reduces the risk of spread.

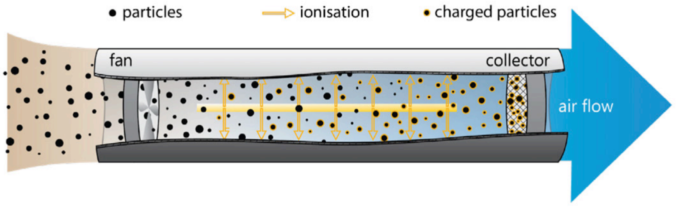
CERTIFIED

The products of the ASPRA series have been tested by various independent institutes such as TNO, VITO and ECN. Results show that the air cleaning efficiency of this technique is up to 99% of atmospheric particles between 10 and 0.1 microns (PM10, PM2.5, PM1, PM0.1/ ultrafine).

HOW DOES THE ASPRA TECHNOLOGY WORK

Polluted air is directed into the ASPRA air purifier using a built-in fan or an existing air flow in a ventilation duct. In the first part of the ASPRA air purifier, the air is exposed to an ionizer. The ions load the particles that are in the air (from partical matter to microbiological contaminants). All charged particles are then collected by an ASPRA collector at the end of the device, bringing clean, healthy and cleaned air out of the device.

ASPRA technical principle



The ASPRA technique charges particles in the device, making it possible to use an open structure filter (a collector) instead of a conventionally dense filter. As a result, the devices uses significantly less energy to move the air through the collector, while at the same time achieving very high efficiency. Replacing the saturated collector is very easy and can be carried out safely by anyone. The difference between ASPRA and other air purifiers and ionisators Clean air is possible by tackling source but also cleaning the air. There are many different air purifiers on the market. These are often equipped with a standard filter. But there are also newer, efficient techniques, such as air purifiers with ionization. We explain what the difference is and what to look out for. Air purifier with standard filter With a standard air purifier, a fan is used to trigger an airflow. The air flow is then passed through a filter, which captures air pollutants and improves air quality. The smaller the particulate matter, the denser filters have to be used to capture the (risk) particles. In addition, the filters need to be cleaned/replaced regularly. They fill up and the pollution accumulates, the fan has to work harder and that results in more energy consumption, lower capacity and noise pollution. In addition, many filters are made of moisture-containing materials such as textiles or fibres, in which bacteria can grow.

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Air purifier with ionization Ionization is a newer technique with many developments. It is an increasingly common innovation, including added benefits such as sustainability and energy saving. There are many air purifiers on the market that use ionization. There is a difference between air purifiers that use positive ionization and negative ionization. Ionization (the positive or negative electrical charging of atoms or molecules) creates ions that, when attached to dust particles, produce charged dust particles. Charged dust particles then attach much more easily to all kinds of surfaces. In addition, there is another difference in air purifiers with ionization, namely air purifiers that electrically charge particles (without a filter) and air purifiers that electrically charge particles, but also capture them directly. The first is called open ionization (1) and the latter is called closed ionization (2).

OPEN IONISATION

Here the charged particles are dispersed across space and they seek a surface to attach. So they attach to all surfaces in the room such as furniture, ceiling, walls, appliances, but certainly also our lungs. These systems create many charged particles, but also free ions, which are often negatively charged. This is then called negative ionization. Negative ionization also creates unwanted byproducts such as ozone, free radicals and free ions. Although they contribute to reducing odour, they are also harmful to health. Research shows that charged particles can attach up to 5 times more easily in lungs than uncharged particles.

CLOSED IONISATION

Here, the charged particles are captured on a special surface in the system itself, so that no particles are blown into space and therefore cannot precipitate on other surfaces. Closed ionisation may involve both positive and negative ionization. The capture surface can be made of various materials, such as conventional filters, metal plates or special open structure filters. The advantage for air purifiers that capture particles with a special open structure filter is that it does not become clogged and less energy is needed to move the air through this filter. A good example of air purifiers with an open structure filter are the ASPRA air purifiers from VFA Solutions B.V. Some of the odors are removed by the capture of particles. For specific and targeted odour removal, VFA Solutions additionally applies an additional special gas adsoprtion filter directly behind the ASPRA open structure filters. This gas filtration section has been specially selected based on the type and concentration of gases and odours present and may vary by industry and even to customer. By placing VFA gas filters behind the ASPRA particle filters, the gas filters are protected from dust, making them more effective and have a longer life span.

TEMPORARY LOCATIONS AND AIR

If we take the information cabove and we want to limit the coronavirus and its spread, then it is therefore necessary to take the issue of air cleaning into account when designing temporary locations. In this way, several people could be present simultaneously in a temporary room without the risk of virus spread in general. Arithmetically, it should work like this: As outlined earlier, it would be sufficient to enable a refresh capactity of 35m3 per hour per person. In order to build in a safety margin, we would suggest a 25% overcapacity into this. This means that approx. 45 m3 per hour per person in cleaning capacity is required to ensure virus-free air. This does NOT mean that new fresh air must be continuously supplied that needs to be filtered. We can re-circulate the air inside resulting in no energy loss (warm air or cooled air). The solution therefore consists of mobile units that are placed in such a way to enable to most effectively re-circulate the air. The proposed version of the air unit depends on the required capacity.