

Electrospun Nanofibrous Filters Capture 99.9 Percent of Coronavirus Aerosols, Study Finds



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The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the pathogen behind the coronavirus disease (COVID-19) pandemic, continues to spread in many parts of the world. The primary mode of transmission is respiratory droplets expelled when infected people sneeze, cough, speak, or breathe. Recently, scientists found that these droplets can travel over far distances and become suspended in the air as aerosols.

Given the risk of airborne transmission, public health officials tweaked infection control guidelines to protect their populations from the spread of COVID-19. People have been urged to wear face masks in crowded spaces and indoors where there is poor ventilation.

Face masks help prevent the entry of viral particles into the nose and mouth and also help prevent those who are infected from exposing others to the virus.

Researchers at The [George Washington University](#) and the [University of California](#) in the U.S. compared the efficacy of surgical and cotton masks, a neck gaiter, and electrospun nanofiber membranes to capture coronavirus aerosols and prevent airborne transmission.

In the study, published in the journal [Environmental Science & Technology Letters](#), the team found that electrospun nanofiber membranes removed 99.9 percent of coronavirus aerosols. The cotton mask and neck gaiter removed only 45 to 75 percent of the aerosols, while the surgical mask removed 98 percent of the coronavirus aerosols.

Wearing of face masks

Throughout the pandemic, health agencies recommend universal masking or wearing masks whenever in public places or indoor spaces with poor ventilation.

The World Health Organization (WHO) and the U.S. Centers for Disease Control and Prevention (CDC) recognized that airborne transmission plays a significant role in the spread of SARS-CoV-2. Many public health agencies urge the public to wear masks to protect themselves and others.

To choose a face mask, one should consider and check for filtration, breathability, and fit. Also, fabric masks should be made of three layers of fabric, an inner layer of absorbent material, a middle layer of non-woven porous material, and an outer layer of non-absorbent material like polyester.

Wearing masks is essential to prevent SARS-CoV-2 infection. Apart from protecting against respiratory droplets, masks help in preventing the entry of aerosols into the body. People release aerosols whenever they breathe, cough, speak, shout, or sing. Aerosols can also travel faster and last longer in the air.

Nanofiber filter

In the current study, the researchers designed and developed electrospun nanofibrous air filters, which hold promise for applications in personal protection equipment (PPE). The nanofibers, which are less than 300 nanometers in size, have a smaller pore size than surgical and cloth masks.

To produce the nanofiber, the team sent a high electrical voltage through a drop of liquid polyvinylidene fluoride to spin threads about 300 nanometers in diameter, which is about 167 times thinner than a human hair. With the small-sized pores, the fiber can filter particles more effectively.

This procedure is called electrospinning, a cost-effective production technique and can mass-produce nanofiber filters to be used for face masks, air filtration systems, and personal protective equipment.

The team used a coronavirus strain as a SARS-CoV-2 surrogate to produce aerosols for filtration efficacy tests. This way, the researchers were able to compare all the air filters and fabrics. The electrospun air filters showed good performance in the study, capturing 99.9 percent of coronavirus aerosols.

The team also found that the same electrospun air filter or face mask removal removed sodium chloride (NaCl) aerosols equivalently or less effective.

“Our work paves a new avenue for advancing air filtration by developing electrospun nanofibrous air filters for controlling SARS-CoV-2 airborne transmission,” the researchers noted.

Producing face masks with nanofiber filters shows promise due to their high efficacy and feasibility. These masks may protect people from not only SARS-CoV-2 but also other disease-causing pathogens and pollutants.

Read the [original article](#) on News Medical.