Researchers Create a Textile Coating that Repels Viruses. By Kathlyn Swantko

Combatting COVID-19

As scientists throughout the world a scramble to develop an effective vaccine, help is also coming from an unexpected source. Researchers at the University of Pittsburgh Swanson School of Engineering's Laboratory for advanced Materials (LAMP Lab) have created a textile coating that not only repels liquids such as blood and saliva, but can also prevent viruses from adhering to the surface of the fabric.

Under the leadership of Paul W. Leu, director of LAMP, and Anthony Galante, PhD student in industrial engineering and lead author of the study, the project initially began in the summer of 2019. The project began as a focus to create reusable textiles that are mechanically durable and resistant to various viruses, such as those that cause conjunctivitis and acute respiratory disease. However, the researchers have pivoted their effort to work on SARS-CoV-2, the virus that causes COVID-19.

Galante led the experimental process of creating the virus-resistant textiles using a piece of nonwoven polypropylene microfiber cloth, which is the most common material used in medical PPE fabrics.

The cloth's coating is created through a two-step process: 1) Using a drop casting method from a syringe to saturate the fabric, a layer of polytetrafluoroethylene nanoparticles is coated onto the exterior of the fabric; and 2) a heating treatment is used to fuse the nanoparticles to the cloth's surface, which increases the stability of the coating. The team believes that a spaying or dipping method could also be used for larger pieces of material or finished gowns.

The illustration shows the treated textile's ability to repel fluids.

As research progressed, the team noticed a major discrepancy in the outer layer of some viruses versus others. The adenoviruses they had been using to test the textile's resistance are surrounded by a protein shell, while the SARS / CoV-2 have a lipid envelope around the shell. This envelope could potentially affect the binding property interaction with the textile.

"We have already demonstrated that the adenovirus is repelled by the textile coating," explained Eric Romanowski, Research Director at Pitt's Campbell Microbiology Laboratory. "What we don't know is whether the envelope of the coronavirus will interact with the textile causing it to adhere. We are hopeful that the textile coating will repel the enveloped coronavirus similarly to the non-enveloped adenovirus. If it does not, we will do a similar study with the coronavirus, as we did with adenovirus, to test the ability to repel the coronavirus."

Project Testing

The next step for the project will be to test the effectiveness against betacoronaviruses, like the one that causes COVID-19. The team collaborated with researchers at the University of Pittsburgh Medical Center to test against adenoviruses, which are a common virus that is spread through respiratory droplets. Both treated and untreated textiles were submerged in a medium with the virus for 30 minutes. Any viruses that attached to the textiles were removed and quantified through plaque-forming assays. To determine the virus-resistant properties of the textiles, a test was performed to count plaque-forming units (potent virus cells per unit of volume).

The testing also included multiple ultrasonic washes, which scour the fabric with an abrasive sponge. It was found that the coated fabric can withstand more than 100,000 cycles of scrubbing.

If the treated fabric is able to repel betacoronaviruses (SARS or COV-2), this could have a huge impact on the development of virus-repellent, reusable PPE and scrubs for healthcare workers, and even protective clothing for the general public. ●

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