Drexel University - Amerinova LLC Collaboration Results in Improved Protective Masks Against Flu

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As swine flu threatens to reach the World Health Organization's pandemic phase of alert, work being done at Drexel University on protective masks may become an important step in protecting public health and health care workers.

The development of these masks is a collaborative effort of Dr. Yury Gogotsi, Trustee Chair Professor of Materials Science & Engineering, Amerinova, LLC, and its affiliate company Global Protection, manufacturer and distributor of surgical masks, N95 particulate respirators, filters, gas masks, protective suits and a variety of equipment used for protection against chemical, biological, and nuclear threats.

Gogotsi's team has developed an effective and inexpensive treatment process that can improve the protective properties of commercial masks in two ways. First, they offer a much higher surface area to trap even the smallest viruses and bacteria. The higher surface area is provided by a network of fibers of about 100-200 nanometers in diameter, about 300 times thinner than a human hair. These fibers are produced from an environmentally friendly polymer made from renewable resources.

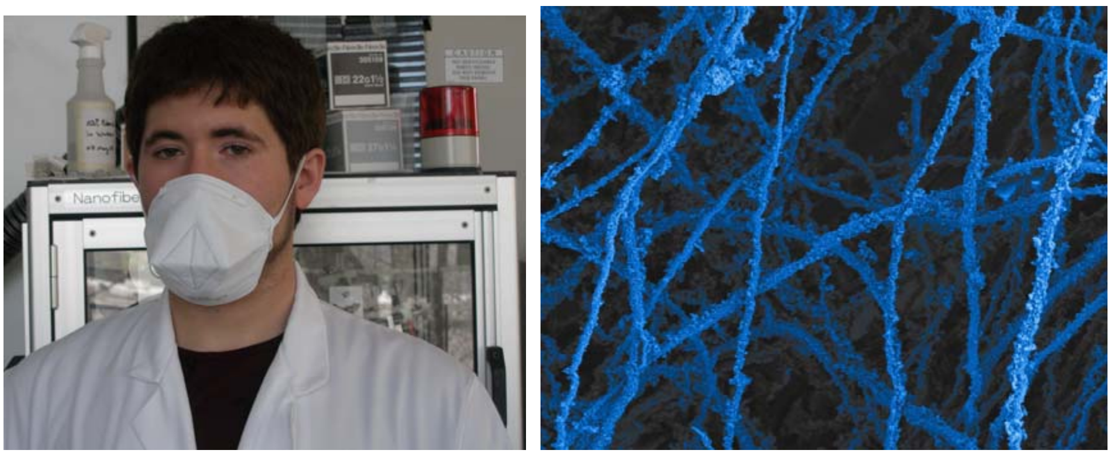
Second, the nanofiber mesh is coated with a layer of specially formulated titanium dioxide particles about 10-20 nanometers in diameter, which are known to have bactericidal properties and a photocatalytic effect on biological molecules, including viruses and bacteria, through the generation of free radicals in the presence of UV light and other mechanisms. These particles effectively kill flu virus, as preliminary tests conducted at Drexel University by Dr. Barry W. Ritz, Research Assistant Professor of Biology, and his research team, have demonstrated.

"Our preliminary results show that these nanoparticles, when exposed to UV light, reduce the amount of time the flu virus can survive on the masks. Thus, the nanofiber masks kill flu virus more rapidly than the non-coated control masks," Ritz said.

"Since our entire approach was to find a nanoparticle solution that would kill the bird flu and other dangerous strains of flu, we believe that it would be just as effective on the swine flu," said Steve Guarino, President of Amerinova, a south New Jersey corporation. "The formula that kills viruses on contact, thereby diminishing the possibilities of catching and spreading the disease, is expected to work on any new strain, since all viruses have basically the same genetic make-up, differing by various mutations."

"This is a prime example of how engineering and nanotechnology in particular can benefit society," said Gogotsi, who is also Director of the A.J. Drexel Nanotechnology Institute, a University-wide initiative with the goal of developing and promoting Drexel's nanotechnology activities.

“Our nanofiber-nanoparticle material can be applied as a coating on the outside of the mask. Although the nanofibers are bonded to the fabric, there is no risk if inhaled, ingested or exposed to the skin. In fact, this proprietary constructed (patent pending) nanoparticle formulation uses ingredients that are known to be harmless to people” Gogotsi continued. “The nanofiber coating, being just a micrometer thick, does not affect air flow and does not increase size or weight of the filter or mask, significantly improving protective properties. The manufacturing process is very versatile and the coating can be applied to any surface, helping to preserve the health of people year round.”



At left is Drexel University student Travis Longenbach wearing a protective mask (picture by Amanda Pentecost). At right is a colored scanning electron micrograph of the mask surface magnified about 50,000 times (picture by Dr. Byung-Yong Lee). Polymer nanofibers on the mask’s outer surface capture viruses; the nanoparticles covering the surface of the fibers destroy the trapped viruses. The nanofibers in this image are about 300 times thinner than a human hair.

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