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Tech cotton researcher develops COVID-19 protection

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Seshadri Ramkumar, a professor for the Department of Environmental Toxicology, displays his invention called the FISOR filter on Aug. 19, 2020 at the Reese Technology Center.

Mandi McDonald

When thinking of COVID-19 defenses, one may not think about a fiber that can be found across the state. For one Texas Tech professor, cotton is a key component to developing effective masks.

Seshadri Ramkumar, professor of advanced materials in the Tech Department of Environmental Toxicology, has been researching the use of cotton in filtration processes for many years. With the presence of the COVID-19 pandemic, he now is using his knowledge of

filtration and cotton fibers to develop more efficient masks.

After COVID-19 cases started to appear across Texas and other parts of the nation in the spring, Ramkumar said he regrouped with his international collaborators and started focusing on cotton's filtration capability for particles, such as COVID-19 particles.

"And that's what Texas Tech should be doing: being a public institution to be of service to society and the entire world, and that is what we're doing," Ramkumar said. "But my research did not just start because of COVID. Twenty-two years, this is what I've been doing at Texas Tech."

To protect oneself from the virus, Ramkumar said simple face coverings may not be efficient.

"The work is focused toward how to improve face coverings toward efficiency while all the way not compromising the comfort," he said.

There are different categories of face masks including filtering facepiece respirators, such as N95 masks, surgical masks and any kind of face covering, Ramkumar said. Each of these categories work differently when protecting one from virus particles.

One challenge when developing a mask with filtration properties is figuring out a way for air to go through the mask.

"Your filter may be an efficient filter. If you keep adding layers or you make the pores smaller, then you will be able to trap finer particles," he said. "But when you keep on adding layers, then the comfort aspect becomes difficult."

When adding a filter to a face covering, Ramkumar said the covering's filtration efficiency will be better.

"We have come up with a new category called FISOR, which is a filter component added to your face covering," he said.

Another challenge that needs to be dealt with is being able to optimize the thickness and weight of the filter, so there is a balance between filtration and breathability.

Although, Ramkumar said data from one set of tests through international collaborations shows filters using cotton as an integral component have promising results. Tests continue to be conducted.

In addition to research regarding personal protective equipment, Ramkumar said he has and will continue teaching a graduate-level course this fall that focuses on personal protective equipment and its use combating infectious diseases, such as COVID-19.

Whether it be through his research or teachings, Ramkumar's work has allowed him to meet different people within the cotton and textile industry.

Kanti Jasani, president of Performance & Technical Textile Consulting, said he has known Ramkumar for over 20 years.

"He is a very dedicated person doing everything he can in the cotton textile industry, promoting that industry," he said.

In addition to research in using cotton for masks, Jasani said Ramkumar has utilized cotton for other issues, such as developing a wipe for the oil and medical industry.

"Now, the opportunity came for him to utilize the same technology for developing masks," he said, "and I think it's absolutely the most critical thing right now in the COVID-19 situation that it is available to as many people in the world as possible."

Developing masks is the number one precaution amid the pandemic, Jasani said. Although, for people to obtain masks, one must have the knowledge to properly make them.

"[Ramkumar] being involved with nonwovens for many, many, many years becomes a really important ingredient for a mask," he said.

In addition to Ramkumar, Jasani said there are multiple researchers and institutions working toward similar research goals.

"I think it is absolutely paramount that we have people like him and other scientists who are really doing this work," he said.

Kater Hake, vice president of agricultural and environmental research at Cotton Inc., said Cotton Inc. funds research, such as Ramkumar's research, and other labs. There are three roles Cotton Inc. plays: promoting the use of cotton as a fiber, which is the biggest role, being the only organization doing large-scale cotton textile research and funding research to solve U.S. production problems.

"We're funding about 280 different university or USDA labs," he said. "[Ramkumar] would be just one of those, [Noureddine Abidi, Leidigh Professor in the Tech Department of Plant and Soil Science] would be another, [Eric Hequet, Horn professor in the Department of Plant and Soil Science] would be a third, and actually there's quite a few at Texas Tech who we're funding."

Ramkumar impacts how the use of cotton is perceived in the textile industry, Hake said.

"One of the important things that Ram does is he connects the university to the growers," Hake said, "and so, he doesn't miss an opportunity to interact with growers and relate to them and talk to them."

During the pandemic, Hake said people are getting an increased awareness of personal health and safety, which may warrant more people to want to wear a mask for protection.

"What [Ramkumar] is doing is he's strengthening cotton's connection with growing concern," he said. "Cotton has always had a strong role in personal safety and health because of its moisture management, and [Ramkumar's] a real leader in that area."

Ramkumar is having an impact in his field, Hake said. Ramkumar will play an important role in making sure cotton can contribute to combating the pandemic in the long-term.

Regardless of the current progress of the cotton filtration research, the end result is one aspect some people may be hopeful for.

"What I hope will come out of this research is that people will really understand the importance of face masks, and people will utilize face masks as much as possible if not within the household, the moment they step out of the house," Jasani said, "and this technology that Dr. Ram has developed and many others have developed, many other industries have developed, are able to control COVID-19 and hopefully limit it and get rid of it."

