IISc develops antimicrobial composite material and testing protocols for PPEs

A team from Indian Institute of Science, Bengaluru (IISc) has developed a three-layered antimicrobial composite material of low-cost for making masks.

And another team, including members from IISc, is involved in testing masks and developing a way of recycling them.

Antimicrobial masks

The mask material consists of three layers.

1. The outermost layer is made of polyester fabric A with polymeric nanofibre deposited on it to make it water-repellent.

2. The middle layer is also a polyester fabric on both sides of which polymeric nanofibres containing antiviral and antibacterial agents are deposited. This layer inactivates both bacteria and virus when it comes into contact with it.

3. The innermost layer is a comfort layer consisting of cotton fabric.

The middle layer also has positively charged polymer (polycations) which inactivate the microbes that come in contact with this layer.

The material is designed to cut off particles of the size of 0.3 micrometres to about 95% efficiency.

Testing method

Titers of bacteriophage (a virus that kills bacteria) were made, and the mask material was soaked in it for 30-120 minutes. The liquid was then eluted and poured on a bacterial colony where it was incubated for 24 hours.

If the virus remained, they would have seen plaques. Instead they observed a flourishing lawn of bacteria. This indicated that the samples did not contain virus.

Testing masks normally looks for the following parameters

1. particle filtration efficiency,
2. virus and bacterial filtration efficiency,
3. blood penetration,
4. breathing resistance (difficulty in breathing), and
5. how good a fit to the face the mask is.
Physical parameters

According to Akshay Naik of Centre for Nanoscience and Engineering, IISc, right now, their team tests masks for two factors: efficiency of particle filtration and breathing resistance.

For instance, N95 masks are supposed to filter out 95% of particles of size 0.3 micrometre and above.

Can it be re-used

The team is also working on ways to decontaminate the masks and the number of times it can be recycled. However, they are clear that masks, especially the N95, are meant to be used just once, and reusing them after decontamination is really the last option.