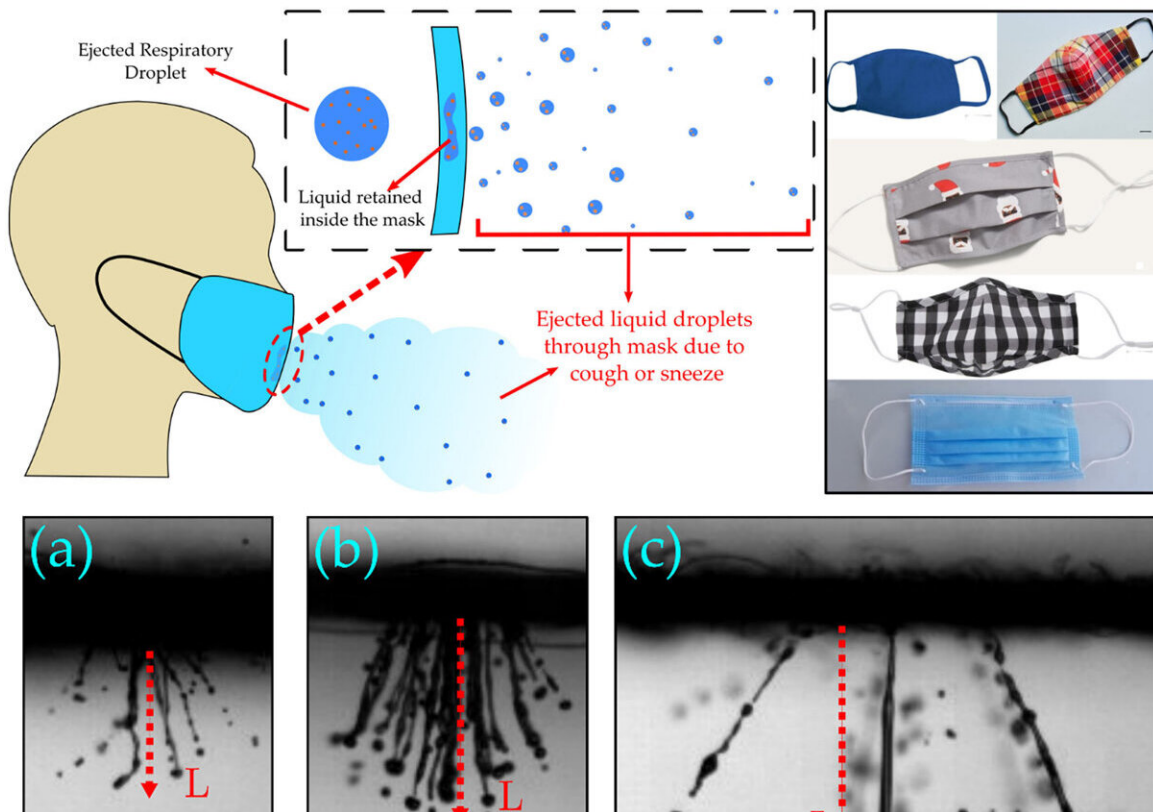


Homemade face masks work; effectiveness varies depending on how they are made

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Penetration and atomization of cough droplets through single layer homemade mask fabrics. Credit: Bal Krishan

Since the spread of virus causing COVID-19 continues, experts recommended wearing homemade facemasks when surgical or N95

masks are not available to prevent the spread of the pandemic. While such makeshift masks are more economical and accessible in low-capita countries, the effectiveness of cloth masks has not been studied in depth.

In *Physics of Fluids*, researchers from the Indian Institute of Science studied the fate of a large-sized surrogate cough droplets at different velocities, corresponding from mild to severe, while using various locally procured fabrics as masks.

"Our results show cotton, towel-based fabrics were most effective among the considered fabrics and must be stitched together as multiple layers for making homemade facemasks," said author Saptarshi Basu. "A three or more-layered homemade mask is recommended, since it can suppress aerosolization significantly."

The researchers analyzed the effect of washing on mask effectiveness, and results showed a negligible influence of washing on mask efficacy for up to 70 wash cycles.

Using a piezoelectric-based droplet dispenser, the researchers created surrogate cough droplets that impacted a single layer of different [fabric](#) samples at different velocities. The fabrics used in the research included single layers of summer stole, handkerchief, cotton towel, and surgical masks.

The specific cotton-fabric materials were selected based on their daily usage and the propensity of people to cover their face using these cloth materials. The researchers used high-speed imaging to quantify the threshold for penetration and amount of droplet penetration at different velocities.

The researchers looked at how fabric properties, like [pore size](#) and

porosity, influences droplet penetration through the mask.

The results are relevant for many groups including [policy makers](#) investigating how to counter aerosol generation through secondary atomization of cough droplets as they penetrate the mask fabric. For mask fabricators and the [general population](#), it is helpful to know that N95 and surgical masks are most effective, but when those aren't available, some specific cotton materials or homemade fabrics are suitable for effective makeshift face masks.

The findings also could be applicable in applications ranging from agriculture to [medical practices](#), where placing a wire mesh or perhaps an engineered cellulose mesh of variable porosity can reduce the momentum of incoming spray from a nozzle, thereby ensuring optimal spread of nutrients or pesticides to crops or better disinfection in hospital

The article, "Efficacy of homemade face [masks](#) against human coughs: Insights on penetration, atomization and aerosolization of cough droplets," is authored by Bal Krishan, Dipendra Gupta, Gautham Vadlamudi, Shubham Sharma, Dipshikha Chakravorty, and Saptarshi Basu. The article will appear in *Physics of Fluids* on Sept. 14, 2021.

More information: "Efficacy of homemade face masks against human coughs: Insights on penetration, atomization and aerosolization of cough droplets," *Physics of Fluids* (2021).

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