

# Why disinfecting your mask with alcohol or bleach is almost certainly a bad idea

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Improper use of disinfectants can have negative effects on your health and the environment. That's always been true. But the pandemic has introduced a new wrinkle: some disinfectants could also hurt the efficacy of your face mask.

In a recent paper, researchers from North Carolina State University

reviewed the scientific evidence on the potential long-term impacts on human health and the environment from improper use of disinfectants. The review also discussed the impact certain disinfectants can have on N95s and cotton face masks and other fabrics, as well as [plastic surfaces](#). They published their findings in the journal *ACS Chemical Health & Safety*.

The Abstract spoke with lead author Januka Budhathoki-Uprety, assistant professor of textile engineering, chemistry and science at NC State, and the first author Hannah Dewey, a graduate student at NC State, about disinfectants and how they could affect the usefulness of our face masks during the pandemic.

## **The Abstract: What are quaternary ammonium compounds and how do they work against viruses like SARS-CoV-2, which causes COVID-19?**

Januka Budhathoki-Uprety: Quaternary ammonium compounds (QACs) are a group of chemical compounds that serve as [active ingredients](#) in hospital and household cleaners, fabric softeners, preservatives, surfactants, cosmetics and other products. Studies have shown that QACs deactivate certain bacteria and viruses that have an envelope made of phospholipids like SARS-CoV-2.

Hannah Dewey: Research has shown that QACs cause membrane disruption in bacteria and enveloped viruses by binding to the phospholipids. That causes the membrane disruption, and that means leakage of the intracellular components.

**TA: Does what type of cloth you use matter when you're using cleaning products with QACs as active**

## ingredients?

Dewey: Yes. You may want to steer clear of cotton. In one study, researchers used cotton and synthetic wipes to wipe surfaces with QAC disinfectants. They reported that the use of cotton fabrics decreased the efficiency of disinfectants compared to [synthetic materials](#). The researchers noticed a decrease in the available QAC concentration by an average of 85 percent, resulting in a decreased efficacy against bacteria.

## **TA: What do alcohol cleaning products and bleach do to N95 masks or cotton face coverings?**

Budhathoki-Uprety: N95 masks are effective because the materials are combined to provide mechanical and electrostatic entrapment of particles. Use of chemical disinfectants is not a standard method of N95 mask decontamination. If someone were to attempt to decontaminate an N95 mask with a chemical disinfectant or sanitizer with alcohol, bleach or other disinfectants, it could have a huge impact on the mask performance.

There is a study that found decontaminating face masks using alcohol and bleach can reduce N95 masks' filtration efficiency, mainly due to reduction of charge density on N95 filters. Studies have also found that some types of fabrics, including cotton, used in face masks can be destroyed by bleach, and reduce the covering's efficiency.

We also think trying to decontaminate an N95 with a disinfectant that has QACs as the active ingredients could have an impact on the mask performance. For example, electrostatic interactions between positively charged QACs and N95 masks' filters could impede the functions and reduce the filtration efficacy of those masks.

Overall, the decontamination of face [masks](#) needs to be looked at closely, and what you use to decontaminate them need to be considered.

## **TA: What are the impacts of bleach on plastics and why is that important?**

Budhathoki-Uprety: Polycarbonates, polystyrenes and polyethylene are used to make different items in our homes like water bottles, food containers, phone cases, eye glass lenses or safety glasses etc. Plastics made up of those polymers can be degraded by chemical disinfectants such as bleach and QACs.

Bleach has an oxidative effect on plastics via a chemical process where the plastic polymers change their properties. Not all, but some plastic materials are susceptible to degradation upon prolonged exposure to bleach. There are concerns for the plastic degradation, potentially releasing additives, and shedding micro-plastics into the environment.

Research has shown that if you frequently clean plastic materials and surfaces with certain disinfectants that contain QACs, it can cause damage done to those plastic materials, including surface damage resulting in scratches, where microbes, such as viruses, can hide for a longer period of time.

## **TA: What do you want people to take away from the article?**

Budhathoki-Uprety: The use of disinfectants has increased during the pandemic. Many types of [disinfectant](#) chemicals are frequently used to reduce viral transmission. But repeated exposure to disinfectants can cause long-term adverse health impacts. If these disinfectants are not used properly, or if they are overused, we can be exposed to these

chemicals through absorption, inhalation and ingestion. The proper and careful use of these chemicals is extremely important while we are fighting the pandemic to protect our long-term health and the environment.

**More information:** Hannah M. Dewey et al, Increased Use of Disinfectants During the COVID-19 Pandemic and Its Potential Impacts on Health and Safety, *ACS Chemical Health & Safety* (2021). [DOI: 10.1021/acs.chas.1c00026](https://doi.org/10.1021/acs.chas.1c00026)

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