

Modifying Cotton Fabric Surface to Immobilize and Inactivate COVID-19: A New Chemical Strategy

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ABSTRACT

Since it emerged for the first time in Wuhan city of China in December 2019, coronavirus has become a global pandemic. COVID-19 virus is reported to be a new member of the beta coronavirus genus and is closely related to severe acute respiratory syndrome-coronavirus (SARS-CoV) and several bat coronaviruses. Indeed, CoVs are positive-stranded RNA viruses with a crown-like appearance. It contains four structural proteins, namely envelope small membrane protein (E), spike glycoprotein (S), membrane protein (M) and nucleoprotein (N). The S, M and E proteins together form the envelope of the virus. The M protein is the most abundant, mostly responsible for the shape of the envelope. The E protein is the smallest structural protein.

Till some appropriate vaccine or medicine is developed, the best way to prevent ourselves from this virus is to maintain physical distancing and using masks and hand gloves. The face mask prevents the virus to enter into the human body through the eyes, mouth and nose. As a chemist, I propose to prepare hand gloves that could retain the virus, followed by its death in alkaline soap solution. The cotton gloves are proposed to be treated with dilute solution of Chitosan, a semi-synthetic linear polysaccharide composed of randomly distributed β -(1 \rightarrow 4)-linked D-glucosamine (deacetylated unit) and N-acetyl-D-glucosamine (acetylated unit). If the mask is treated with Chitosan solution, it will be absorbed into cotton matrix (i.e. a cellulosic network). Now, we propose to treat this chitosan-entrapped mask with aqueous solution of CuSO₄, resulting in strong coordination of Cu with protonated-NH₃⁺ groups. Now this mask can be used to retain virus. The proposed mechanism involves binding of available active site of Cu atom with nitrogen atom present in proteins, particularly S and M proteins. This strong attachment will retain the virus on the surface of mask. Now, the mask can be immersed in a soap solution which will finally destroy the virus. The major advantage of using this mask is that it will destroy virus unlike present masks that just prevent it from getting in human body. In the video talk, a detailed account of preparation and mechanism of action of proposed masks and gloves shall be presented.

Keywords: COVID-19, COVID-19 prevention, Physical distancing, Chitosan

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