Effect of Isopropyl Alcohol on the Prolongation of Surgical Mask's Lifespan During Covid-19

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A highly demanded PPE during the COVID-19 pandemic, surgical masks effectively prevent virus transmission. However, discarding masks after a single use is costly and environmentally detrimental: downstream processing releases toxic chemicals and carbon dioxide, disproportionately affecting impoverished communities. In this project, I investigated whether spraying 70% isopropanol on surgical masks will extend their lifespan while preserving their impermeability and electrostatic storage. I evaluated the refurbished masks based on their aerosol particle and air impermeability under cobalt chloride and vane anemometer tests, respectively. Differences in stored electrostaticity between brands and mask conditions were gauged using an electricity sensor to test the melt-blown layer. Rates of masks' electrostatic decay were measured under varying charging methods, time periods, and environments. Changes in masks' impermeability of aerosol particles were insignificant regardless of inhalation speed. Rates of color change in cobalt chloride were unaffected within twenty hours of my reusing and recycling the masks. Initial storage of masks' electrostaticity and charge densities was found to vary between brands. Heat-drying was discovered to be the most effective recharging method, with the lowest electrostatic decay within a day. Moreover, recycled masks all resulted in lower decay rates compared to that of the control group. The exact period of a surgical mask's lifespan is unpredictable due to brand specificity, users' ambient humidity, and respiratory frequency. This study showed that the frequency of mask replacement will be reduced if a mask is reused, leading to increased mask longevity and less pollution, especially noteworthy in lower-income and highly polluted nations.

Awards Won: