

COVID- 19 Crisis- A paradigm shift in the development of Facemasks

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Introduction

Recently all the global healthcare systems are menaced by novel COVID pandemic. With the prolong increasing rate of infection there was also increase in demand for clinical equipment like gloves, mask, ventilator and valves. Suppliers and manufacturers weren't able to meet up the spike in demand. Various 3D printing startup companies pitched in their technology to dispose off this strain. Three-dimensional printing technology entails manufacturing technique to build a structure of any imaginable shape. This technology has revamped medicinal arsenal. In this article we had outlined an edge that 3D printing mask holds over conventional or cloth mask. We have also noted down different type of 3D printed mask available like copper 3D printed, ViriMask and silicone cast. Our studies helped us to infer that 3D printing with its new trend in healthcare has led a manufacturing renaissance and a shield to fight against COVID crisis.

3D printing or three-dimensional printing is a process in which 3D objects are produced by fusing in material like ceramic, plastic, metal or even living cells. With this technology we can produce object of any imaginable shape or size using computer aided designs (CAD). 3D printing has revolutionized healthcare sector by expanding its medical application, which are both potential and actual. There are several evidence of wonders 3D printings has done they include anatomical model, implants, customized prosthetics and tissue fabrication. It was apparently found that 3D printing has upper hand in medicines as they include benefits like cost effectiveness, increase productivity, personalization and customization of medical equipment, products and drugs. Today, world is facing its worst nightmare in form of Corona virus- A pandemic which apparently challenge global healthcare system. With everyday spike in infection rate huge strain on healthcare system is inevitable. It is reported that hospitals are running out of stocks for essentials like masks, ventilator, gloves and valves as supplier aren't able to deliver in require timeline. 3D communities are volunteering resources and time for life-saving supplies like oxygen valve, mask, shields and ventilator. In this article we had elaborate on 3D printed mask, providing its benefits over conventional and its widespread application.

Conventional Facemasks and its drawbacks

A sudden shortage of facemasks has been observed due to the COVID-19 pandemic. The increasing global demand is resulting in

companies running out of masks. As a consequence of this, people are preparing their own masks from the old clothes available. A study conducted by University of Massachusetts Amherst last year showed that cloth masks can protect particulate matter of 2.5 μm only marginally. They are capable of removing only 15% of particulate matter emitted from diesel combustion. Hence, a false sense of security is provided by such masks. A most common type of conventional masks is the surgical mask which has the capacity of blocking the physical particles but not necessarily the airborne particles. There is a problem with conventional masks is that a high viral load could be trapped within millimeters of our nose at the end of the day, hence chances of exposure to deadly microbes increases. Surgical masks are used to prevent large droplets splashing out from person's mouth. Also masks with filters such as N95 and N99 shows efficiency only when worn properly to remove particles of 0.3 microns or larger with filter capacity of 95% and 99% respectively. N95 and N99 masks has been used usually to combat infections like tuberculosis and it has been observed that they can block particulate matter only when air-leaks are prevented properly. A good fit of face-mask may be hindered by different facial structures, beards or facial hair because of which contaminated air would be let in. Moreover, these N95 and N99 masks that are particulate specific provide no or ineffective protection against gases such as carbon monoxide, sulfur dioxide, nitrogen dioxide that are responsible for intoxicating the lungs and causing asthma and irritation to eyes. According to United States Food and Drug Administration (USFDA), the surgical masks that are designed provide poor protection from the microbial germs as well as other contaminants because of their loose fit. Furthermore, these conventional masks are single used devices that are required to be cautiously disposed. Hence, its demand increases tremendously in such time of COVID-19 crisis. Modification of N95 masks can be used to expand its lifetime using 3D (3 dimensional) printing technology. 3D printing is expected to revolutionize the healthcare system and expand its horizons for medical applications.

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Conflict of Interest

The author has no potential conflicts of interest.

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