

CHAPTER 8

BENEFITS OF FACE MASKS

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INTRODUCTION

A face mask is a covering that is worn over the face to prevent oneself from breathing bad air or from spreading germs or to protect face when one is in a dangerous situation. . Wearing a face mask will help prevent the spread of infection and prevent the individual from contracting any airborne infectious germs. When someone coughs, talks, sneezes, they could release germs in to the air that may infect others nearby. Face masks are part of an infection control strategy to eliminate cross-contamination.

It is an effective and humble tool to win the battle against infectious diseases. The practice of wearing the most affordable protection against viruses or pollution, the face mask, is not a new one. It has its roots in the history of medicine and science dating back to the spread of the 'Manchuria' epidemic in China. Later, face masks were used during the "Spanish- Flu" that cost over 40-million lives all over the world and the "Bombay Fever" during 1919-20. For over a century now, it has remained an effective and humble tool to win the battle against infectious diseases. Microorganisms may cause a health risk, furthermore protection against infectious micro-organisms has been of great importance. Here comesthe role of effective masks to provide protection against these micro- organisms.



FACE MASKS: A SIMPLE PROTECTION TOOL.

In the human population, social contact acts as a key for transmission of bacteria and viruses. The use of face masks seems to be critical to prevent the transmission, in which therapeutic interventions are lacking. Masks are designed to prevent the escape of a significant number of droplets expelled from our nose and mouth. A cough can produce as many as 3000 droplets and many spray thousands of microscopic droplets as one utters the phrase-'Wear a mask'.

In fact, the main purpose of using masks is to prevent inhalation and to trap the airborne particles (natural or man-made), the biological organisms (bacteria, viruses, prions, fungi. Airborne particles of natural origin (dust, storms, volcanic eruptions) and man-made (such as industrial emissions) are on a nanometer scale. Also, inhalation of these particles (particles smaller than 2.5µm) resulted in an 8.9 million deaths. Thus masks mainly keep you from unknowingly spreading the disease to others, but some studies indicate that they may help protect you from large droplets and serve as an indirect reminder to avoid touching your face. Controlling a respiratory infection at source by a face mask is a well-established strategy. For example, symptomatic patients with cough or sneezing are generally advised to put on a face mask, and this applies equally to patients with pulmonary tuberculosis (airborne transmission) and influenza (predominantly droplet-transmitted) with the large number of asymptomatic patients unaware of their own infection, the comparable viral load in their upper respiratory tract, droplets and aerosol dispersion even during talking and breathing and prolonged viral viability outside our body, there is an important role for the universal use of face mask as a means of source control in public places.

Achieving a mask with higher capacity, optimal comfort, as well as high efficiency in eliminating bio-aerosols and optimal filtration of airborne particles has always been one of the goals of studies conducted in this field. For this purpose, the factors affecting the determination of the final mask quality have been focused on increasing and improving the efficiency of the mask in the center of attention. In general, the filtering ability of a mask is influenced by the specification of the mask filter and external factors.

On the other hand, modelling and clarifying the mechanism of bio-aerosols penetration into the mask has high importance. This becomes important when contaminated particles and

microorganisms that have fallen on it, the contaminated particles can penetrate the mask by various mechanisms such as capillaries.

Masks should be cleaned after every wear. This frequency will vary depending on how often you need to wear the mask. The CDC recommends using a machine washer and dryer for proper cleaning.

TYPES OF MASKS

The different types of masks are:

Recommended

- Mask that fit properly (properly around the nose and itching with youknow larger gaps around the sides of the face)
- Mask made with the breathable fabrics (such as cotton)
- Mask made with the tightly woven fabric(that is fabric that do not allowlight to pass through when held up to a light source)
- Mask with two or more layer

Non-recommended

- Masks that do not fit properly (large gaps, too loose or too tight)
- Mask with exhalation valves or vents
- Mask made from loosely woven fabric or that are knitted that is fabrics that let light pass through.
- Wearing a scarf/ski mask as mask.

BANDANA

A bandana is a triangular or square piece of cloth that is often worn as a head or neck covering. Tying a bandanna over your mouth and nose is a timehonoured way to keep dust and other particles out of the respiratory system(that is why the Cowboys used them during round ups). Bandana provides some protection against droplets and cough or sneeze related pray.

Disposable surgical mask

These flat thin paper like masks are usually white and light blue. Surgical face masks can filter out about 60 percent smaller, inhaled particles.

They are primarily intended to stop droplets, sprays and splatters and studies have shown that diligently wearing surgical mask in public spaces can significantly reduce the spread of respiratory infection.

Cone style maskers

Manufactured cone style face mask are moulded masks that fit over the mouth and nose. Usually there is also a strip of metal at the top, so the wearer can secure the mask at the bridge of the nose.

N95 and other respirators

N95 face respirators offer the most protection against novel Corona virus and other respiratory disease. N95 protect the person wearing the mask because they filter out 95% particles from the air breathed in. Even more effective than N95 respirators are the N99 (99% filtration), N100 (99.97% filtration), R95 (95% filtration), P95 (95% filtration), P100 (99.97% filtration).

Homemade cloth mask

Single-layer cloth masks may only provide 1% particle filtration. A two-layer cotton mask filters out about 35% of small particles, so they offer personal protection to the wearer. Cotton face masks can decrease droplet spray from 8 feet to 2 1/2 inches, which reduces the amount of potentially virus containing particles you release into the air. The effectiveness of a homemade cloth face mask largely depends upon its construction. Single layer fabric masks are less effective than double layer masks which may be less effective than triple layer masks.

Neck gaiters and balaclavas

Outdoors enthusiasts often have neck gaiters (essentially, a tube of fabric that's worn around the neck and can be pulled up or down, as needed, to protect the face and neck) or balaclavas (tight-fitting garments that cover the head and neck) on hand. These can be used

as mouth and nose coverings and may provide some protection against spread of the novel coronavirus. Note: many gaiters are made of synthetic fabric, and synthetic fabric doesn't seem to be as effective in preventing the spread of small particles as natural fibers, such as cotton. What's more, a recent study found that neck gaiters made of synthetic fleece may do more harm than good because they aerosolize the wearer's respiratory droplets.

Cloth masks with filter

Some store-bought masks come with filter pockets; you can also make cloth masks with a pocket for a filter. You can use folded facial tissues as a filter. Simply slip the folded tissue into the filter pocket. Change the tissue filter daily. In an NPR report, May Chu, an epidemiologist at the Colorado School of Public Health, recommends using a filter of polypropylene material, a durable synthetic fabric often used in upholstery that can hold an electrostatic charge (which helps it trap small particles). Adding a polypropylene filter to a two-layer cloth mask can increase filtration efficiency from 35% to nearly 70%.

Store bought cloth mask

The effectiveness of a store-bought cloth mask will depend on its construction. According to Johns Hopkins Medicine, you should look for a mask with at least three layers of fabric; ideally, you want a mask constructed from tight-weave 100% cotton cloth. A typical cloth face mask "is probably at least 50 percent" protective, while "high quality masks could be 80-95 percent protective, and even low-quality masks made of very thin materials could still be 10-20 percent protective," according to Steffen Eikenberry, a postdoctoral scholar at Arizona State University studied the effectiveness of masks.

T shirt mask

Numerous online tutorials show how to craft a face mask from an old T-shirt. T-shirt masks are cheap and easy to make, but they're not the most effective. According to a 2013 study published in *Disaster Medicine and Public Health Preparedness*, T-shirt masks are one-third as effective as disposable surgical masks. The upside of T-shirt masks: they're comfortable, as the slightly stretchy material conforms to the face. You may be able to increase the effectiveness of a T-shirt mask by using more than one layer of material.

Benefits of mask wearing

It is not just others you are protecting. You are also protecting yourself when wearing a mask. It will reduce your own exposure to other people's respiratory droplets. Wearing

face masks is one of the most effective prevention measures people can take to protect themselves and others from becoming infected. How well it protects you from breathing in the virus likely depends on the fabrics used and how your mask is made (e. g, the type of fabric, the number of layers of fabric, how well the mask fits).

FACTORS AFFECTING THE EFFICIENCY OF FACE MASKS

Size of Respiratory Droplets

It is important to note that viral particles are expelled from the respiratory tract as relatively large droplets whenever an infected individual talks, coughs, or sneezes, less so by simply breathing. Larger droplets fall to the ground while smaller droplets are generally suspended in the air then evaporate a few seconds later, downsizing to smaller droplets of about 5-10 micrometers that can float longer in the air. Therefore, masks to be efficacious, they must be able to filter particles of the aforementioned sizes. It is therefore important to consider the type of material used to make the face masks and what each is approved for filtering.

Mode of The Expulsion of Respiratory Droplets

Earlier studies suggested that virus was spread mainly through coughing, but recent studies suggest that talking is also an important mode of transmission. The louder you speak, the more droplets are expelled and therefore there is a higher viral load transmission and an increased chance of transmitting the virus. Coughing will force droplets into the air at more considerable force, allowing them to travel further distances and widening the infectious perimeter around the infected party

Material of Face masks

Center for Disease Control and Prevention. National Institute for Occupational Safety and Health (NIOSH) and the Occupational Safety and Health Administration (OSHA) regulate N95 respirators. They are tested for fluid resistance, filtration efficiency (particulate filtration efficiency and bacterial filtration efficiency), flammability and biocompatibility. Non-medical masks are made from different materials and designs with or without filter papers. The combination of material, amount of layers, the presence of filter and how tightly the material is woven will affect the efficiency of the face mask.

Fit of Face masks

The fit of the masks is very important to consider for protecting yourself against covid-19. It should fit tightly enough to create a seal but comfortably enough to prevent frequent repositioning.

“In general, a mask is less helpful or counterproductive if it is not covering the nose and mouth, such as worn down around the neck for extended periods of time or if it is poorly fitting to the point that it requires frequent adjustment, which brings your hands close to your face repeatedly ”said Dr. George Anesi, director of the Medical Critical Care Bio response team at Penn Medicine(Covid-19 Dashboard by the center for Systems Science and Engineering (CSSE) at Johns Hopkins University .

THE TECHNIQUE USED IN DONNING, REMOVING AND REUSING FACEMASKS:

WHO recommends extended use (up to 6 hours) over reuse but in extenuating circumstances, such as short supply, face masks can be re- processed and reused. Extended use is accepted if the face mask is damaged, soiled or wet. For non-medical settings, cloth masks should be washed frequently for the most effective outcome.

The masks have always been mentioned as an effective tool against environmental threats. They are considered as protective equipment to preserve the respiratory system against the non-desirable air droplets and aerosols such as viral or pollution particles .The aerosols can be pollution existence in the air or the infectious air borne viruses initiated from the sneezing, coughing of the infected people. The filtration efficiency of the different masks against these aerosols are not the same, as the particles have different sizes, shapes and properties. Therefore, the challenge is to fabricate the filtration masks with higher efficiency to decrease the penetration percentage at the nastiest conditions. To achieve this concept, knowledge about the mechanisms of the penetration of the aerosols through the masks at different effective environmental conditions is necessary.

CONCLUSION

Face masks have long been used in health care, often for the simple reasons that they protect doctors and nurses from splashes of body fluids during procedures but also for the purpose of blocking the transmission of respirator droplets. Acute respiratory infections are prevalent and pose a constant threat to the society. The use of face mask has proven to be an effective barrier to curb the aerosol spread of such diseases. Masks should be used as a part of comprehensive strategy of measures to suppress transmission of infections and save lives. The appropriate use, storage and cleaning or disposal of masks are essential to make them as effective as possible. Proper fit and use of certain materials are also important for achieving the level of effectiveness.

REFERENCES

- Brooks. J.T., Beezhold D.H., Noti J.P.2021. Maximizing fill for cloth and medical procedure mask to improve performance and reduce SARS- Covid -2 transmission and exposure.Published online 2021.February. 10.doi:10.15585/mmwr.mm7007e1 .
 - Chughtai. A.A., Seate. H., Macintyre. C R.2020.Effectiveness of cloth masks for protection against severe acute respiratory syndrome corona virus.Emerging Infectious Disease.2020,26(10)
 - Davies .A.,Thompson.K A., Girik kafatos.G., Walker .J., Benenett .A.2019.Testing the efficiency of homemade masks, would they protect in an influenza pandemic, 413-418
 - Gandhi.M., Marr. L.C.2021.United infectious disease and physical science principles of face mask for covid -19 med, 29-32
- Konda .A., Prskash. A., Moss .G.A., Scimoldt .M., Grant.G.D. Guha S.2020. Aerosol filtration efficiency of common fabrics used, in respiratory cloth masks. ACS Nano,6339-6347.
- Leung .N.H.L., Chu DEW.T., Shia EYC.2020.Respiratory virus shredding in exhaled breath and efficiency of face masks. Nat med, 679- 680.