DIY FACE SHIELD

FOR UNDER $2

April 6, 2020

Free to distribute

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The claim of cost under $2 does not include the baseball cap or other hat as it is assumed everyone has at least one of these already. It is based on the writer's cost of $21 for 25 pre cut plastic sheets and binder clips at 8 for $1. Your cost will vary.

INTRODUCTION

The goal of this document is to give a typical person the possibility of some additional protection against the Covid-19 (C19) virus. As well it may help if one is unknowingly asymptomatic but contagious from making others ill.

The problem for most people is that factory made professional grade equipment is reserved for medical professionals and rightly so. The surgical masks that are more available are not as effective as N95 masks. Home made cloth masks less so. Anything that can improve things is welcomed by a lot of people. After all, medical professionals routinely wear face shields in addition to masks. By basic reasoning this means face shields should also be helpful for the rest of us. But in purchasing such thing, we would be denying a professional from what is sorely needed for them.

But nothing stops the people from trying to improve on what they can get or make for themselves. In this case it is a given that the shields mentioned in this document will NOT prevent every case of C19. After all, many professionals using professional grade personal protective equipment (PPE) have caught C19 and some have died.

All the contents of this document can do is help you raise your safety level by an unknown amount. NO GUARANTEES OF ANY SORT ARE GIVEN OR IMPLIED. Some people who use these will still catch Covid-19 for some reason or another.

If you are looking for a higher grade of safety, you need something like the outfits to the left and right.

The shields described in this document should be used in conjunction with a face mask of some kind, either a surgical mask or home made mask. There are lots of links online on how to make these. Here is one.

No Sew Mask

More links are given near the end of this document.

This document describes a reusable and very low cost way of possibly improving your chances getting through this. The writer is one of the more vulnerable people in society and not planning on checking out any time soon. I did this to improve my own odds of survival knowing full well that it is only an improvement and not a sure thing. Something is going to get all of us someday. Hopefully later than sooner.

WARNING - This design includes a plastic front part of a material type known to be one where Covid-19 virus is known to survive for several days. If the plastic front is reused, you must wash it with soapy water and then wash your hands at least 20 seconds with soapy water before touching your face or anything else. When in use, touching the plastic must be avoided as much as possible. Further washing instructions are given near the end.

WARNING - These shields are flammable to some degree and MUST NOT be used near open flame or heat above 60C (140F). They will melt and may cause burns if exposed to flame while wearing them. As the writer has no control over the material, or one's likelihood of exposure to flame, one must be aware that these shields will NOT have any sort of UL or CE flame rating and the all risk must be assumed by the wearer. A warning MUST be given to every person you may give a shield you make.

CAUTION - If a shield is too close fitting to the face, the temperature inside the shield may get uncomfortably high. There may also be fogging of the inside of the shield, especially under high exertion that causes heavy breathing. Some gap between the top of the shield and the bill or brim of the hat is needed for ventilation.

This document contains instruction for two versions of face shields. These are for use with baseball caps with a flat bill and ones with a curved bill. Sorry, there is no version for baseball caps with the bill facing to the rear or off to the side. Visors or other types of hats with a stiff brim may also work. The point is to get the center of the face shield out beyond one's nose while having a limited exposure from the top.

The cost of making one of these, excluding the hat, which you likely own already, is under $2 in the USA and Canada. The writer was able to buy baseball caps and visors for $3 at a Dollar+ store. Your cost maybe free if you can scrounge the clear cover from something you already own and acquire a couple binder clips. The writer's first two prototypes were clear covers salvaged from old documents.

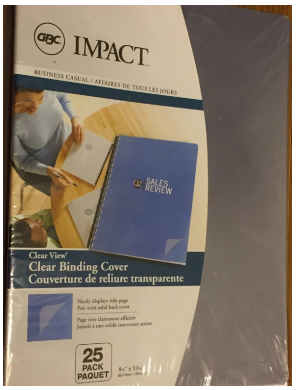
PARTS REQUIRED

HAT

A Hat and a visor with curved bills are shown to the left. A hat with a flat bill to the right.

As the hat itself is not altered or harmed in any way, feel free to use your favorite suitable hat.

PLASTIC SHEET



The writer originally used a couple presentation covers salvaged from old corporate documents. Then went to Staples and purchased the ones shown to the right. This is a Canadian link

GBC ClearView Standard Presentation Covers, 8-3/4" x 11-1/4", Round Corners, Clear, 25 Pack

These are 222mm X 286mm (8-3/4" x 11-1/4") The 25 pack was $20.99 CAD on the date of purchase on April 3, 2020.

What appears to be the US equivalent is at this link but is US$28.74. Staples USA also has many other equivalent products. Here is another version for US$18.55 for a 25 pack Also here and here

Any stationary supply company should have these. Unless this document triggers a run on them.

The writer used US/Canadian standard sheets. A4 (210x 279mm) or slightly larger sheets should also be fine. The writer used sheets of 0.25mm (10 mils) thickness but also tried an overhead projector sheet that was 0.1mm (4 mils) thickness that seemed to work well enough.

If a more wrap around shield is desired then consider looking for legal size sheets 216mm x 356mm (8 ½ X 14")
Acetate sheets will also work if sufficiently thick. The writer suggests making sure the sheets are at least 0.1mm (4 mils) thick or thicker up to 0.5mm (20 mils). It is imperative that you assure they are completely clear. One has to be careful as there are milky materials like polyethylene sheet protectors that are not usable.

WARNING - These sheets are flammable to some degree and MUST NOT be used near open flame or heat above 60C (140F). Smoking while using one (or ever) is NOT a good idea. They will melt and may cause burns if exposed to flame while wearing them. The thinner the sheet the faster it may burn. As the writer has no control over the material, one must be aware that these shields will NOT have any sort of UL or CE flame rating and the risk must be assumed by the wearer. A warning must be given to every person you may give a shield you make. In burning these may also emit noxious fumes.

BINDER CLIPS

A pair of binder clips is needed to attach the shield to one's face. The two on the right are from a dollar store. The ones from Staples on the left are in nice assorted metallic colors with nicer handles were [$5.59 for a package of 15]

There are 2 recommended sizes. 19mm (3/4") and 25mm (1") The 19mm ones are less obtrusive but are harder get over the edge of the cap. The 25mm are easier to use but some might think they are too visible. Your call. Ease of use versus style. If you want an industrial look there are also larger ones available. Just note that the 15mm (3/5") binder clips are too small. Regular paper clips are not suitable.

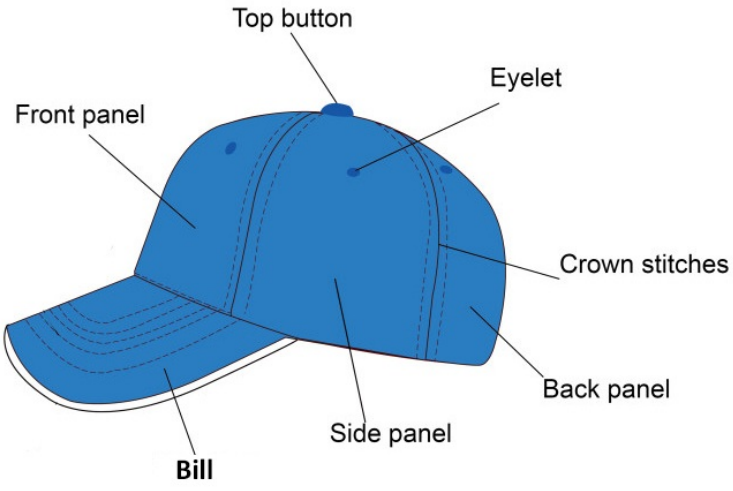
TOOLS REQUIRED

1. Scissors - Regular scissors are fine. The writer used ones from a dollar store.
2. Ruler - For measuring and drawing straight lines.
3. Fine tip marker - For marking lines, etc.
4. Glass cleaner
5. Soft cloth suitable for cleaning glasses
6. Mathematics - For users of Metric Units, Grade 4 skills (adding and division by 2). For users of the US system, Grade 6 skills (adding and dividing by 2 of fractions)

OPTIONS

7. Defogging solution or spray - This can be purchased or you can make your own.[1] In some cases, if the shield is too close to your face, fogging may occur. Or if you physically exert yourself.
8. Paper Punch - If you want to punch vent holes. Vent holes may be a good idea as wearing a face shield can get warm. Expect your face to be exposed to air about 10C (18F) or more above ambient temperature.
9. Utility knife - Alternate way to make vent slots.

Baseball Hat Parts for reference. The "bill" is mentioned several times.



[1] Do an internet search for "defogging solution" or "homemade defogging solution". You can purchase solutions in most pharmacies or make your own with a 25% solution of white vinegar.

BEFORE STARTING

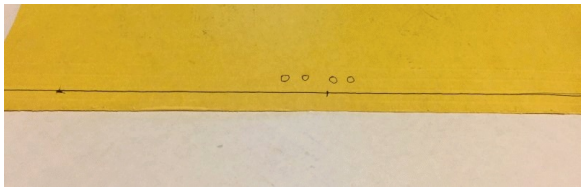
ATTENTION In making these instructions it was found that pictures made with clear plastic were difficult to see. Like this one to the right. Therefore yellow cardboard from a file folder has been used in some of the pictures just to make the material easier to see. You will use clear material.

The wearing of soft plastic or cloth gloves is recommended to avoid soiling or scratching the plastic. Wash your hands as per C19 prevention guidelines. If the shield is to be used by someone other than you, wear a mask and shield as well as gloves to avoid contaminating the shield just in case you have caught the C19 virus and are asymptomatic and contagious.

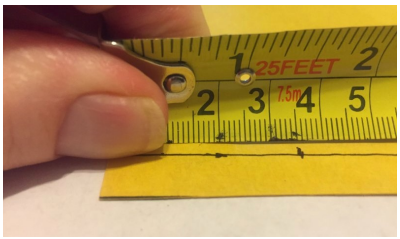
A soft surface should be used to avoid scratching the plastic material. Laying down a cleantowel or the like is suggested.

FLAT BILL HAT INSTRUCTIONS

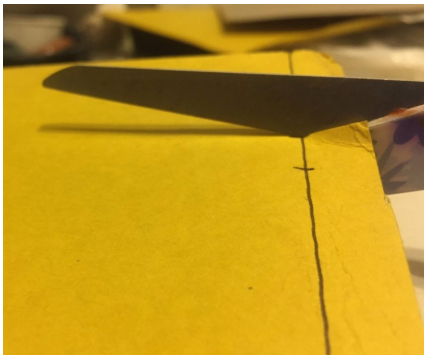
1. If the sheet has 2 rounded corners place those so they will be at the bottom of the finished shield.
2. Measure 10mm (3/8") from the long edge in 2 two places and make a dot.
3. Draw a line across the long edge of the sheet.



4. If you want to punch ventilation holes in the sheet, mark their position and use a paper punch to make them. They should be made from the side where you are bending the tabs upwards.

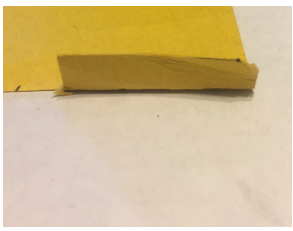


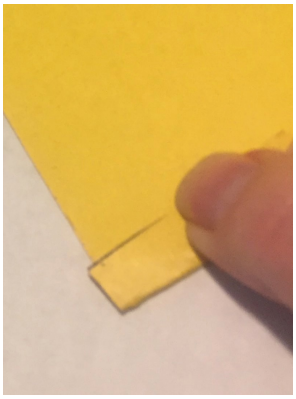
5. Measure from each end of the line 35mm (1 ½") and make a dot there. This length controls the arc of the shield and you may want to try different measurements. But longer tabs are stronger tabs.



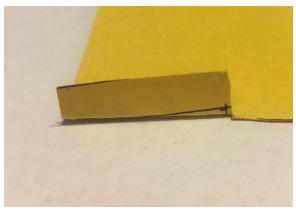
6. Make two small cuts into the long edge of the sheet to these dots

7. Cut out the section between the two tabs.
8. Bend the tabs over. The angle of the bend controls the amount of gap between the shield and the bill on the cap when it is put on. A 90 degree bend will result in a small ventilation gap between the shield and the bill of the cap as gravity will pull the shield away from te bill of the cap by a few millimetres.

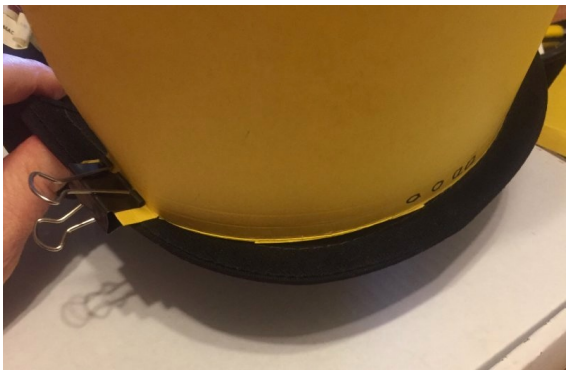




9. A bend at an outward angle will narrow the gap between the shield and the bill of the cap but will also cause there to be less ventilation. Experiment to see what you like the best.

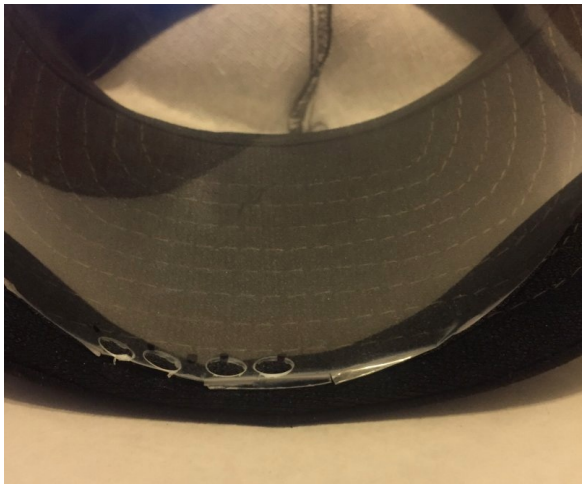


10. Use glass cleaner and a soft cloth to clean off any marks on the plastic.
11. Apply the anti-fogging solution if you choose to use any.



12. Use the binder clips to clip the shield to the bill of the cap. Adjust it so that the shield is as far away from your face as possible. The further away it is, the less hot the shield will be and the less likelihood of fogging.

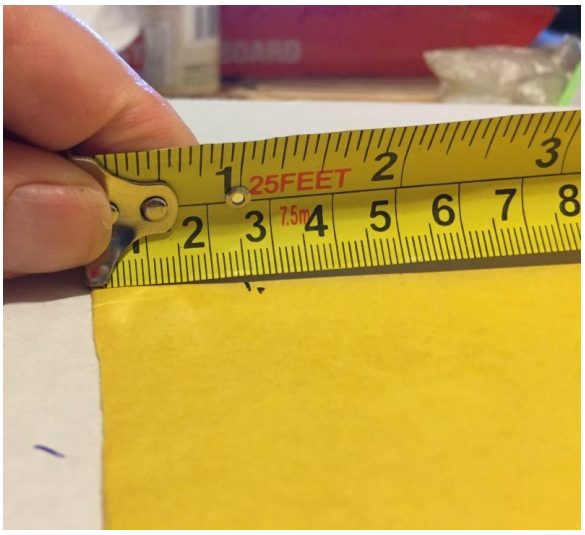
13. This is the writer's first prototype with ventilation holes.



14. In the picture to the right, the tabs were bent at an angle and the shield is tight against the bill of the cap.

Curved Bill Cap or Visor

1. Set the cap at the edge of a surface in order to measure the curvature of the bill at the center. The measurement in this case was 20mm (3/4").
2. You will need to remember or record your measurement.



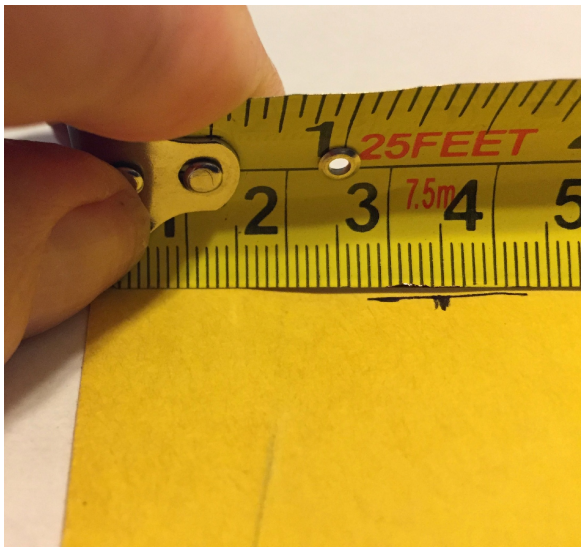
3. Add a fudge factor to that measurement.
4. 0. 5mm (1/4") will do. As a result of my cap having a bend of 20mm (3/4") my result for dimension X was 25mm (1"). We will call this sum dimension X. You likely did not realize there would be math involved.
5. Make a mark on the sheet at your dimension X (in my case 25mm) from the long edge and about 35mm (1.5") from the short edge of the sheet.

6. Make another mark on the sheet at dimension X from the long edge and about 35mm (1.5") from the other short edge of the sheet.

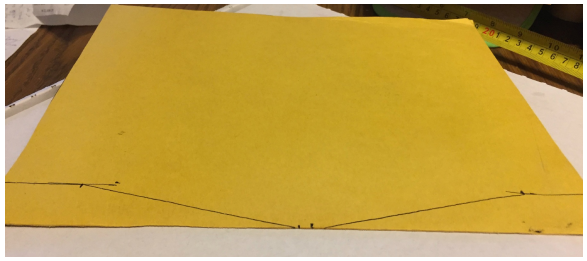
7. Measure the length of the long edge of the sheet. In this case it was 286mm (11 1/4").
8. Divide that measurement by 2. My result was 143 mm (5 5/8"). Your measurement and dimension will likely be different. If you use inch measurements I hope you remember how to do your fractions.

9. Make a mark there to indicate the center of the long edge of the sheet.

10. Where one made the other marks on the sheet line up the ruler and make a mark 3.5mm(1 ½") from the short edge. Draw a line from the mark to the short edge of the sheet at both ends.

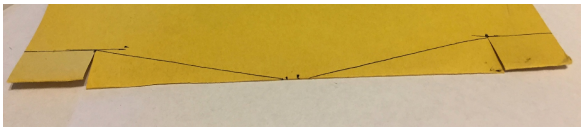


11. Do the same from the other short edge.

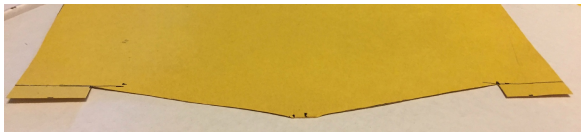


12. From the marks near the short ends of the sheet draw lines to the center point of the sheet as you can see to the left. In this case I drew them slightly off the center point so the point would be slightly rounded.

13. Cut from the long edge of the sheet to the points at Dimension X and 35mm (1.5") from the short edges like you see to the right.

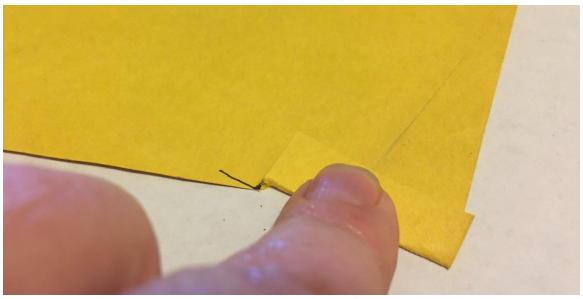


14. Trim the tabs so they will be about 10mm (3/8") wide

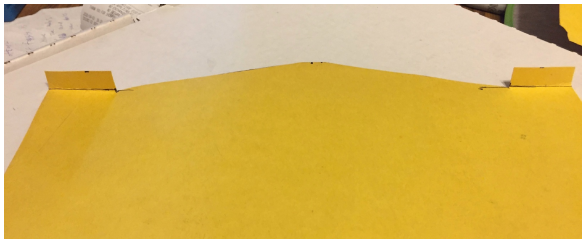


15. Cut the plastic with scissors or a knife from the points near the short edge to the center of the long edge of the sheet. The final piece will look like the shape to the left.

16. Bend the tabs over but slightly outwards on each side the vertically. This it make sure the peak of the shield will just touch the bill of the cap. The angle of this bend will determine how much vent space there is at the top of the shield.



17. If you want to punch ventilation holes in the sheet, mark their position and use a paper punch to make them. They should be made from the side where you are bending the tab upwards.
18. Use the glass cleaner and the cloth to clean off any marks.
19. Apply the anti-fogging solution if you choose to use any.



20. The picture to the left is the finished piece ready to clip onto the cap.

21. As attached to the cap. There will be a sight gap in places but that is needed for ventilation

22. The real thing as attached to the cap with binder clips.

If you adjust the clip a little further from the cap it may possible to flip back the clip handles so they do not stick out.

When the pandemic is over, you can unclip the face shield and you still have a perfectly good hat.

USE AND CARE OF THE FACE SHIELD

When using your face shield:

1. Avoid exposure to high heat.
2. Handle gently to prevent drops and scratches.
3. The shield must be replaced if it becomes hazy or causes visual distortion.
4. Do not wear a face shield when driving or heavy operating machinery in case visual distortion or fogging occurs.

In use perhaps the biggest benefit is that the shield prevents you from casually touching your face. We tend to do it a lot and if nothing else this would be a way to train yourself to not touch your face as much.

As well the writer noticed that living in Canada, when there was a cold breeze, the face shield made them a lot more comfortable.

In professional use they often use a new face shield every day unless supplies are short. However this is not always possible in many other applications. The decision to reuse the face shields has to be the user's and only the user's. The writer cannot recommend reuse but also will not deny that they do reuse them themselves as their shields do not see a lot of exposure.

Therefore the following guidelines are suggested if you reuse it and do not have access to an autoclave.

5. After you have completed one day of use, always assume that the surfaces inside and out are contaminated. Just because there are no visible droplets do not assume it is uncontaminated.
6. Do not touch them with your hands when taking it off then touch your face afterwards. Wear gloves if you can.
7. Wash the entire surface inside and out with soapy water.
8. Wash your hands as per Covid-19 protection guidelines.
9. Pat dry with a soft towel. Put this towel in the laundry and do not reuse it on your face.
10. If a soapy film remains on the surface, clean it again with glass cleaner and a soft cloth.
11. Reapply anti fog coating on the inside surface if you chose to use one.

Other sanitizers known to work on most plastics:

12. 70% Ethanol
13. 70% Isopropyl Alcohol
14. 6% Bleach (May leave a residue on the face shield)
15. 3% Hydrogen Peroxide (The writer's preference to shortages of alcohol based sanitizers.)

Test these on a corner of the shield to make sure no hazing or other damage occurs.

Medical professionals could try to use an Autoclave to clean the shields.

Here are some other versions of a DIY face shield you may also want to look at. These are neither tested nor endorsed by the writer.

How to make a DIY protective face shield l GMA Digital

How To Make Your Own Face Shield: DIY in 5 Simple Steps

How to Make a Face Shield for COVID-19

How to make a DIY Face Shield from a Shower Curtain???

FACE MASKS

The writer suggests using the face shield in conjunction with a face mask. In order of preference

1. A fitted N95 Mask
2. A standard surgical mask
3. A home made cloth mask with a piece of vacuum cleaner bag or coffee filter inserted
4. A home made cloth mask

It is the understanding of the writer that except for the first mask, that the main purpose of the mask is not to protect you but to protect others if you have become contagious. C19 is sneaky in that it makes you infectious from 2 to 14 days before you show symptoms. This is how is spreads so fast. The mask is to prevent others from getting sock as being right in front of your mouth and nose, virus laden water droplets are still large enough to be intercepted even by a tightly woven piece of cloth.

But as the droplets float through the air, the water evaporates and the viruses are floating around by themselves, they can slip through any but a properly fitted N95 mask. As a face shield is N100 the goad with a shield is to catch the smaller water droplets before you breathe them in. However because of our need to breathe they are not absolute protection. The face shield is of the best protection where physical distancing is not possible.

The writer feels we could get away without shields if everyone wore a surgical mask or at least a cloth one while practicing physical distancing.

But if you are forced to have closer interaction with people, as being a cashier for example, a face shield will improve your odds of not catching C19 by quite a bit.

DIY FACE MASKS

How To Make A Face Mask From A T-Shirt, Bandana Or Cloth

PROFESSIONALLY MADE CLOTH MASKS

In Canada one source is www.weddingstar.ca. They also ship to the USA and UK. They offer replaceableable filters for them as well. The writer has not tried their service at this time. And cannot vouch for them

REUSE OF FACE MASKS

Here is a link to professional instructions. These are neither tested nor endorsed by the writer.

Covid-19 Pandemic: Face Mask Disinfection & Sterilization for Viruses