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Covid-19: Open Innovation Challange Proposal

Abstract:

We are in the middle of a global pandemic and are already aware of the scale to which this pandemic can affect people. We have so many examples, Spain, USA and Italy for instance. It is necessary for Govt's to work toward minimizing the effects of this global disaster. In such trying times we as a society need to work collectively towards developing new methods to tackle the current situation and "flatten the curve".

Proposed solutions cover the following two themes:

1: Designing low cost masks.

2: Innovative Quick screening.

DESIGN OF LOW COST MASKS:

In the design of masks the costliest factor is the raw material. Not just the cost but the availability of the raw material also poses a problem to uninterrupted production when required. Use of material like cotton and other conventional fabrics also does not guarantee protection from pathogens especially minute viruses like the one we are dealing with right now.

I propose to make low cost highly effective face masks from rather an unconventional raw material: cigarette butts. Cigarette butts are made up of cellulose acetate. A porous material intended to trap 'tar' present in the smoke. But they can be reused to do better for society!!

Why cigarette butts:

1: Easily available on roadsides/beaches and elsewhere.

2: Cigarette butts are believed to be the most pervasive form of plastic pollution on the planet with trillions are discarded every year. It is believed that thousands of birds die every year chocking on cigarette butts. Putting them to a good use helps with pollution reduction and protection of biodiversity as well.

3: They are relatively easy to clean (Process explained later).

4: The diameter of most viruses including the coronavirus varies from **60 to 140 nm.** The effective pore size for cellulose acetate is between **12 and 226 nm.** This pore size is a huge improvement over the existing fabric masks and is at par with **N95 masks** which serve as a clinical standard when dealing with viruses.

Preprocessing the cigarette butts:

Step 1: Collection of butts.
 Butts can be collected by employees or preferably volunteers from beaches/roadsides etc. Smoking clubs and bars may also be asked to keep cigarette butts separate from regular waste.

Step 2: Separating the filter from leftover tobacco.
 Cigarette butts usually have some leftover tobacco or some burnt part attached to them. These can be separated manually using sciccors. The paper wrapping should also be removed.

Step 3: Cleaning the cellulose acetate.
 This step is very important to remove the toxic tar and chemicals. This is usually achieved by soaking the processed cigarette butts in a polar solvent followed by boiling in water and drying. This leaves us with white cellulose acetate, a fabric-like substance.

Making the masks:

The fabric-like substance obtained above is shredded using a standard fabric shredder. The shredded cellulose acetate can now be prepared into cloth-like sheets using methods used for preparing cotton clothes. This gives us a cloth perfect for making masks with strength as much as other cloth masks and improved effectiveness against viruses.

Cigarette butts collected in a park.

Trimming the butts to remove tobbaco.

Cleaning the cigarette butts

Cleaned cellulose acetate fabric

QUICK SCREENING:

PCR(Polymerase chain reaction) still remains one of the fundamental processes in the test for Covid-19. So there is not much that can be done to reduce the time required to carry out the test . But the real problem is not performing the tests, it is tracing suspects and taking samples from them. This can be dealt with by setting up sample collection booths on already existing checkpoints(Nakas) laid out by the security agencies around the state. The common symptoms of Covid-19 include high fever and shortness of breath. The set up of the booth will be discussed later. These booths need to be manned with medical professionals.

Setup of the booth:

The booth will be a tent like structure made up of plastic/polyethene fitted on a frame. This Proposed size of this booth is 1m by 2m. A medical professional will sit inside the booth. On the front, this booth will have an Infrared thermometer and a sensitive microphone. Infrared thermometers do not require touching the suspect's body eliminating the chances of transmission via the thermometer. The Infrared thermometer will be fit so as the display faces the professional sitting inside the booth and the sensor faces the forehead of the person being checked for symptoms. The microphone would be connected to a headset the professional would be wearing. This would help the professional capture any wheezing sound caused by shortness of breath.

Taking samples from the suspects:

If the person being tested is detected with high fever and a wheezing sound is observed a sample would be taken from the person. This sample would be sent to a testing lab labelled with a number corresponding to the person's details. The name address and contact of the person would be noted and he would be advised to strictly stay home until the test results show up. These suspects could also be tagged with a seal using alcohol based ink. Alcohol based ink is especially useful in this case because alcohol acts as a disinfectant and would prevent transmission of virus through the seal. Sample should be taken from the nasal cavity using a cotton swab. These samples would be stored in air tight test tubes.

Infrared Thermometer

A swab with a swab tube.