# Pathogens Removal from Indoor Air

# (Honeywell-CERCA Project Proposal)

**Introduction**

Freely suspended pathogens in the air are of sizes in the range of few nanometers to a few microns. Natural removal of particulate matter of this size takes place by adsorption or deposition on surfaces. A forced way of removing the particulate matter or clean air is to use a HEPA filter or electrostatic precipitation-based instruments. In addition to the conventional instruments used to remove particulate matter, air-containing pathogens can also be sterilized using UV radiations. In this work, we are interested in studying the removal efficiency of pathogens suspended in an indoor air environment using a couple of instruments supplied by Honeywell. One of the instruments uses electrostatic precipitation (F57A) to remove particulate matter from the air, and the other uses UV radiations (U-Prism) to remove pathogens and sterilize the air.

**Method**

We will be carrying out controlled experiments in an indoor environment containing suspended pathogens. We will use an office or meeting room of volume about 250-500 ft2 with both the instruments supplied by Honeywell installed in it. Pathogens will be dispersed in the room using an aerosol generator. A suspension of pathogens with water as the continuous media will be used in the aerosol generators. The generator will disperse water droplets of a few hundred nanometers containing the pathogens. We will use only harmless pathogens for this study, which do not infect humans or animals and are a good proxy for Covid-19. Once the pathogens are dispersed in the room, we will use a portable air sampler to collect the pathogens on sampling membranes to measure their concentration (number per unit volume of air). We all this time, t=0. At this time, the air cleaning or the air sterilization or both the instruments will be turned on. Depending on the size of the room, after time, t (probably a few hours), we will collect pathogens from an air sample to measure the pathogen concentration. An instrument measuring real-time PM2.5 concentration will be running in the room during the entire experiment.

**Deliverable**

- The PM2.5 removal efficiency of the indoor air cleaning instrument.
- Relative pathogen removal efficiency of the F57A and U-Prism instruments.
- Absolute pathogen removal efficiency of U-Prism instrument in the absence of F57A.

**Future Work**

In the follow-up work, we will be interested in using the portable hand-held sampler for measuring pathogen concentrations in the indoor air of hospital OPDs, common facilities, classrooms, seminar halls, etc. The work will also help in determining how good an indicator CO2 concentration is for pathogens in indoor air.

**Budget**

| Particulars | Cost |
|---|---|
| Portable hand-held sampler | 4,00,000/- |
| Consumable | 2,00,000/- |
| Student Honorarium | 15kX2X6months = 1,80,000/- |

| | |
|---|---|
| F57A+U-Prism | Instrument cost and installation cost |
| Contingency | 2,00,000/- |
| Sharp Qnet | 1,00,000/- |
| Institute Overhead (20%) | 2,16,000/- |
| Total | 12,96,000/- |