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IIT Mandi develops novel hygiene products against COVID-19

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The prototype shows 99% efficacy to kill both bacteria within 40 seconds of UV-C light exposure

Researchers at the Indian Institute of Technology Mandi have developed an Ultraviolet-C (UV-C) light-based portable disinfection box at a cost of ?35,000 to disinfect metallic, plastic and cardboard products like wallets, keys, spectacles, bags, courier packages and parcels, among others, to minimise the risk of COVID-19. Minimising the risk is the key because this virus can live on these surfaces for up to 3 days.

Research has shown that UV-C light can achieve a high level of inactivation of a near-relative of COVID-19's virus. Thus, reducing the risks of contagion among healthy people. In the workplace, it can be an excellent tool for disinfecting transit of goods. The structure of the box is based on a UV-C opaque covered frame. It consists of a cuboid container made of a wooden board (furniture grade) with a two-layer aluminium foil coating to prevent UV-C light leakage. Ten UV-C lamps with designated ratings are used to provide UV-C light exposure to object surfaces. These lamps are connected with automatic

timer control that regulates the dose of UV-C light as per requirement for the specific object.

Dr. Himanshu Pathak and Dr. Sunny Zafar, Assistant Professors, School of Engineering, IIT Mandi, identified the capability of UV-C light for the disinfecting objects against contamination of the novel COVID-19 virus. “The developed prototype is capable of disinfecting non-living objects like courier packets, travel bags, currency, wallets, wrist watches, mobile phones, laptops, books, stationery among others”, said Dr. Himanshu Pathak.

“We are using ozone-free UV-C lamps (with 254 nm wavelength), as per the ISO: 15858:2016 standard for UV-C devices - safety information with almost no exposure to human operators.”, elaborates Dr. Sunny Zafar.

Highlighting the benefits of the Disinfection Box in the COVID-19 perspective, the researchers said, “The developed prototype can disinfect all kinds of metal, plastic and cardboard-based products from the bacteria and SARS-CoV-2 virus within one-minute exposure of UV-C light, by eliminating up to 99%.”

The research team providing expertise in this innovation include:

- Dr. Himanshu Pathak, Assistant Professor, School of Engineering, IIT Mandi
- Dr. Sunny Zafar, Assistant Professor, School of Engineering, IIT Mandi
- Dr. Hitesh Shrimali, Associate Professor, School of Computing & Electrical Engineering, IIT Mandi
- Dr. Prosenjit Mondal, Associate Professor, School of Basic Sciences, IIT Mandi
- Dr. Amit Prasad, Assistant Professor, School of Basic Sciences, IIT Mandi

The prototype has been tested in an in-house lab facility at IIT Mandi against the bacteria 'Escherichia coli' and 'Staphylococcus aureus'. The prototype shows 99% efficacy to kill both bacteria within 40 seconds of UV-C light exposure. Furthermore, on testing the researchers found that UV-C lamps did not heat up the disinfected product.

Foot-operated Hand Sanitiser Dispenser

Mr. Navish Sharma, Technical Assistant, Civil, IIT Mandi, along with his team members, Mr. Tilak Raj and Mr. Hans Raj, have developed a low-cost foot-operated hand sanitiser dispenser for sanitising hands without touching contaminated surfaces of the sanitiser bottle. In this dispenser, a spring reinforced foot pedal is installed which is connected to a pipe with a holder in which the sanitiser bottle will be placed. On pressing the foot pedal the sanitiser holder will lift and the bottle head will be pressed by a glass cap. This innovation costs less than ?1,400 and is being installed in the various parts of the IIT Mandi campus.