Ultraviolet C Induced Skin Reaction from Ultraviolet Germicidal Irradiation of N95 Respirators During the COVID-19 Pandemic

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Abbreviations used: PPE = personal protective equipment; FFRs = filtering facepiece respirators; UVC = Ultraviolet C, UVGI = ultraviolet germicidal irradiation

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With the depletion of personal protective equipment (PPE) during the COVID-19 pandemic, methods for decontamination of N95 filtering facepiece respirators (FFR) are being implemented at institutions throughout the United States. Ultraviolet germicidal irradiation (UVGI) involves administration of ultraviolet C (UVC) irradiation to cause DNA damage to inactivate pathogens on surfaces including FFRs. With the widespread use of this technology may come unintended side effects. We present the case of a patient who developed a skin reaction following UVC exposure from a UVGI device.

A 50-year-old male of South Asian decent had repeated exposure throughout the course of a day to UVC from a UVGI device (Daavlin desktop UVC lamp, Daavlin, Bryan, OH) (Figure 1). This exposure was accidental and unintentional and was not part of any therapeutic process. The irradiance of the UVGI device was 1.5 J/cm², and the patient was exposed to approximately 30 rounds of irradiation. He subsequently developed erythema and peeling after 4 days (Figure 2). The peeling resolved after several days with no other symptoms after 2 months follow-up.

With UVGI being implemented in hospitals throughout the country for disinfection of N95 FFRs, it is important to be aware of the cutaneous side effects of UVC irradiation exposure. It can result in cutaneous reactions including erythema and photoaging,¹ and these reactions vary based on time of exposure, distance and intensity from the UVC source, wavelength, and photosensitizing agents.² Since UVC does not penetrate Earth’s atmosphere, UVC exposure comes from manufactured UVC devices as with our patient. There have been other reported cases UVC exposure from UVGI lamps where 26 medical students received 90 minutes of accidental UVC exposure and developed significant skin erythema followed by desquamation.³ Because the depth of penetration of UVC is less than with UVB and UVA, it has been less associated with keratinocyte carcinomas or melanoma in humans but has been shown to induce squamous cell carcinoma in rats and DNA damage in human cells in vitro.⁴ This low risk for carcinogenesis could also be attributable to the very limited opportunities for humans to sustain significant UVC exposure in environmental or industrial settings. As such, the International Agency for Research on Cancer has stated that UVC is probably carcinogenic to humans.⁴

Given the ongoing COVID-19 pandemic, UVC will continue to play a role in PPE disinfection. Thus, it is important to inform the heath care workers and operators of the UVGI devices
to practice photoprotection, ensure light containment of the device, and avoid unnecessary UVC exposure to the skin.


FIGURE LEGENDS

**Figure 1.** Ultraviolet germicidal irradiation N95 filtering facepiece respirator using a UVC lamp

**Figure 2.** 50-year-old male with peeling of forehead 4 days after ultraviolet C exposure from ultraviolet germicidal irradiation device