UV Published Research References

1 222nm Published Research

1.1 Comparison of stratum corneum thickness in children and adults

Fairley J.A, Rasmussen J.E. (1983). Comparison of stratum corneum thickness in children and adults. *Journal of the American Academy of Dermatology*, 8(5): 652–654. https://doi.org/10.1016/s0190-9622(83)70074-5

1.2 Higher effectiveness of photoinactivation of bacterial spores, UV resistant vegetative bacteria and mold spores with 222 nm compared to 254 nm wavelength subtilis Spores in Aqueous Suspensions at 172, 222 and 254 nm

Clauss, Marcus. (2007). Higher effectiveness of photoinactivation of bacterial spores, UV resistant vegetative bacteria and mold spores with 222 nm compared to 254 nm wavelength. *Clean Soil Air Water*, 34: 525-532. https://doi.org/10.1002/aheh.200600650

1.3 Comparison of the Disinfection Effects of Vacuum UV (VUV) and UV Light on *Bacillus subtilis* Spores in Aqueous Suspensions at 172, 222 and 254 nm

Wang, D., Oppenländer, T., El-Din, M.G. and Bolton, J.R. (2010). Comparison of the Disinfection Effects of Vacuum UV (VUV) and UV Light on *Bacillus subtilis* Spores in Aqueous Suspensions at 172, 222 and 254 nm. *Photochemistry and Photobiology*, 86: 176-181. https://doi.org/10.1111/j.1751-1097.2009.00640.x

1.4 207-nm UV Light - A Promising Tool for Safe Low-Cost Reduction of Surgical Site Infections. I: *In Vitro* Studies*

Buonanno M., Randers-Pehrson G., Bigelow A.W., Trivedi S., Lowy F.D., *et al.* (2013). 207-nm UV Light - A Promising Tool for Safe Low-Cost Reduction of Surgical Site Infections. I: *In Vitro* Studies. PLOS ONE, 8(10). https://doi.org/10.1371/journal.pone.0076968

1.5 Action spectra for validation of pathogen disinfection in medium-pressure ultraviolet (UV) systems

Sara E. Beck, Harold B. Wright, Thomas M. Hargy, Thomas C. Larason, Karl G. Linden. (2015). Action spectra for validation of pathogen disinfection in medium-pressure ultraviolet (UV) systems. *Water Research*, 70: 27-37. https://doi.org/10.1016/j.watres.2014.11.028

1.6 207-nm UV Light—A Promising Tool for Safe Low-Cost Reduction of Surgical Site Infections. II: *In-Vivo* Safety Studies*

Buonanno M., Stanislauskas M., Ponnaiya B., Bigelow A.W., Randers-Pehrson G., *et al.* (2016). 207-nm UV Light—A Promising Tool for Safe Low-Cost Reduction of Surgical Site Infections. II: *In-Vivo* Safety Studies. PLOS ONE, 11(6): e0138418. https://doi.org/10.1371/journal.pone.0138418

* Study is referenced because it includes a discussion of biological safety of far UVC light on mammalian cells and tissues.Inclusion of the study is not intended to make any medical claim regarding the cure, mitigation, treatment, or prevention ofdisease.

1.7 Germicidal Efficacy and Mammalian Skin Safety of 222-nm UV Light

Buonanno, M., Ponnaiya, B., Welch, D., Stanislauskas, M., Randers-Pehrson, G., Smilenov, L., Lowy, F. D., Owens, D. M., & Brenner, D. J. (2017). Germicidal Efficacy and Mammalian Skin Safety of 222-nm UV Light. *Radiation Research*, 187(4): 483–491. https://doi.org/10.1667/RR0010CC.1

1.8 Disinfection and healing effects of 222-nm UVC light on methicillin-resistant *Staphylococcus aureus* infection in mouse wounds*

Narita, K., Asano, K., Morimoto, Y., Igarashi, T., Hamblin, M. R., Dai, T., & Nakane, A. (2018). Disinfection and healing effects of 222-nm UVC light on methicillin-resistant *Staphylococcus aureus* infection in mouse wounds. *Journal of photochemistry and photobiology B: Biology*, 178: 10–18. https://doi.org/10.1016/j.jphotobiol.2017.10.030

1.9 Far-UVC light prevents MRSA infection of superficial wounds *in vivo**

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1.10 Far-UVC light: A new tool to control the spread of airborne-mediated microbial diseases**

Welch, D., Buonanno, M., Grilj, V., *et al.* (2018). Far-UVC light: A new tool to control the spread of airborne-mediated microbial diseases. *Sci Rep,* 8: e2752. https://doi.org/10.1038/s41598-018-21058-w

1.11 Chronic irradiation with 222-nm UVC light induces neither DNA damage nor epidermal lesions in mouse skin, even at high doses

Narita, K., Asano, K., Morimoto, Y., Igarashi, T., Nakane, A. (2018). Chronic irradiation with 222-nm UVC light induces neither DNA damage nor epidermal lesions in mouse skin, even at high doses. PLOS ONE, 13(7): e0201259. https://doi.org/10.1371/journal.pone.0201259

1.12 Effect of far ultraviolet light emitted from an optical diffuser on methicillin- resistant *Staphylococcus aureus in vitro*

Welch, D., Buonanno, M., Shuryak, I., Randers-Pehrson, G., Spotnitz, H.M., *et al.* (2018). Effect of far ultraviolet light emitted from an optical diffuser on methicillin-resistant *Staphylococcus aureus in vitro*. PLOS ONE, 13(8): e0202275. https://doi.org/10.1371/journal.pone.0202275

1.13 Evaluation of acute corneal damage induced by 222-nm and 254-nm ultraviolet light in Sprague–Dawley rats

Sachiko Kaidzu, Kazunobu Sugihara, Masahiro Sasaki, Aiko Nishiaki, Tatsushi Igarashi & Masaki Tanito (2019). Evaluation of acute corneal damage induced by 222-nm and 254-nm ultraviolet light in Sprague–Dawley rats. *Free Radical Research*, 53(6): 611-617. https://doi.org/10.1080/10715762.2019.1603378

* Study is referenced because it includes a discussion of biological safety of far UVC light on mammalian cells and tissues.Inclusion of the study is not intended to make any medical claim regarding the cure, mitigation, treatment, or prevention ofdisease.

** Study is referenced because it includes a discussion of the characteristics of far-UVC light and its ability to inactivate aerosolized viruses. Inclusion of the study is not intended to make any medical claim regarding the cure, mitigation, treatment, or prevention of disease.

1.14 DNA Damage Kills Bacterial Spores and Cells Exposed to 222-Nanometer UV Radiation

Willie Taylor, Emily Camilleri, D. Levi Craft, George Korza, Maria Rocha Granados, Jaliyah Peterson, Renata Szczpaniak, Sandra K. Weller, Ralf Moeller, Thierry Douki, Wendy W. K. Mok, Peter Setlow. (2020). DNA Damage Kills Bacterial Spores and Cells Exposed to 222-Nanometer UV Radiation. *Applied and Environmental Microbiology*, 86(8): e03039-19. https://doi.org/10.1128/AEM.03039-19

1.15 Long-term effects of 222 nm ultraviolet radiation C sterilizing lamps on mice susceptible to ultraviolet radiation

Yamano, N., Kunisada, M., Kaidzu, S., Sugihara, K., Nishiaki-Sawada, A., Ohashi, H., Yoshioka, A., Igarashi, T., Ohira, A., Tanito, M. and Nishigori, C. (2020). Long-term effects of 222 nm ultraviolet radiation C sterilizing lamps on mice susceptible to ultraviolet radiation. *Photochem Photobiol*, 96: 853-862. https://doi.org/10.1111/php.13269

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1.18 Predicting airborne coronavirus inactivation by far-UVC in populated rooms using a high-fidelity coupled radiation-CFD model

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Hiroki Kitagawa, Toshihito Nomura, Tanuza Nazmul, Keitaro Omori, Norifumi Shigemoto, Takemasa Sakaguchi, Hiroki Ohge. (2020). Effectiveness of 222-nm ultraviolet light on disinfecting SARS-CoV-2 surface contamination. *American Journal of Infection Controls*, 49(3): 299-301. https://doi.org/10.1016/j.ajic.2020.08.022

1.20 Exploratory clinical trial on the safety and bactericidal effect of 222-nm ultraviolet C irradiation in healthy humans

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1.22 Exposure of Human Skin Models to KrCl Excimer Lamps: The Impact of Optical Filtering***

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1.23 Ozone Generation by Ultraviolet Lamps

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1.24 A Need to Revise Human Exposure Limits for Ultraviolet UV-C Radiation

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1.25 Re-Evaluation of Rat Corneal Damage by Short-Wavelength UV Revealed Extremely Less Hazardous Property of Far-UV-C

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1.26 Extreme Exposure to Filtered Far-UVC: A Case Study

Eadie, E., Barnard, I.M.R., Ibbotson, S.H. and Wood, K. (2021). Extreme Exposure to Filtered Far-UVC: A Case Study. *Photochem Photobiol*, 97: 527-531. https://doi.org/10.1111/php.13385

1.27 Pilot study on the decontamination efficacy of an installed 222-nm ultraviolet disinfection device (Care222®), with a motion sensor, in a shared bathroom

Hiroki Kitagawa, Yuki Kaiki, Kayoko Tadera, Toshihito Nomura, Keitaro Omori, Norifumi Shigemoto, Shinya Takahashi, Hiroki Ohge. (2021). Pilot study on the decontamination efficacy of an installed 222-nm ultravioletdisinfection device (Care222™), with a motion sensor, in a shared bathroom, *Photodiagnosis and Photodynamic Therapy*, 34: 102334. https://doi.org/10.1016/j.pdpdt.2021.102334

1.28 Disinfection capabilities of a 222 nm wavelength ultraviolet lighting device: a pilot study

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1.29 Far-UVC efficiently inactivates an airborne pathogen in a room-sized chamber

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1.30 Anti-microbial effect of filtered 222nm excimer lamps in a hospital waiting area

Jacob Thyrsted, Søren Helbo Skaarup, Andreas Fløe Hvass, Sara Moeslund Joensen, Stine Y. Nielsen, Elisabeth Bendstrup, Pernille Hauschildt, Christian K. Holm. (2021). Anti-microbial effect of filtered222nm excimer lamps in a hospital waiting area. *medRxi*, Preprint. https://doi.org/10.1101/2021.09.03.21263096

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1.31 UV Inactivation of SARS-CoV-2 across the UVC spectrum: KrCL excimer, mercury-vapor, and LED sources

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1.32 Computer Modeling Indicates Dramatically Less DNA Damage from Far-UVC Krypton Chloride Lamps (222nm) than from Sunlight Exposure

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1.33 Minimal, Superficial DNA Damage in Human Skin from Filtered Far-Ultraviolet C

R.P. Hickerson, M.J. Conneely, S.K. Hirata Tsutsumi, K. Wood, D.N. Jackson, S.H. Ibbotson, E. Eadie (2021). Minimal, Superficial DNA Damage in Human Skin from Filtered Far-Ultraviolet C. *British Journal of Dermatology*, 184(6): 1197-1199. https://doi.org/10.1111/bjd.19816

1.34 UV and violet light can Neutralize SARS-CoV-2 Infectivity

Mara Biasin, Sergio Strizzi, Andrea Bianco, Alberto Macchi, Olga Utyro, Giovanni Pareschi, Alessia Loffreda, Adalberto Cavalleri, Manuela Lualdi, Daria Trabattoni, Carlo Tacchetti, Davide Mazza, Mario Clerici. (2022). UV and violet light can Neutralize SARS-CoV-2 Infectivity. *Journal of Photochemistry and Photobiology*, Vol. 10: e100107. https://doi.org/10.1016/j.jpap.2021.100107

1.35 Effect of ultraviolet C emitted from KrCl excimer lamp with or without bandpass filter to mouse epidermis

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