222nm Wavelength UV Published Research

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

Higher effectiveness of photoinactivation of bacterial spores, UV resistant vegetative bacteria and mold spores with 222 nm compared to 254 nm wavelength
Claußˇ, M. (2006). Higher effectiveness of photoinactivation of bacterial spores, UV resistant vegetative bacteria and mold spores with 222 nm compared to 254 nm wavelength. *Acta hydrochim. hydrobiol.*, 34: 525-532. https://doi:10.1002/aheh.200600650

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:10.1111/j.1751-1097.2009.00640.x

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 HM, 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

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, Pages 611-617. https://doi.org/10.1080/10715762.2019.1603378

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

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.
Action spectra for validation of pathogen disinfection in medium-pressure ultraviolet (UV) systems. *Water Research*, Volume 70, 2015, Pages 27-37, ISSN 0043-1354.
https://doi.org/10.1016/j.watres.2014.11.028

Far-UVC light (222 nm) efficiently and safely inactivates airborne human coronaviruses
Buonanno, M., Welch, D., Shuryak, I. et al. Far-UVC light (222 nm) efficiently and safely inactivates airborne human coronaviruses. *Sci Rep* 10, 10285 (2020). https://doi.org/10.1038/s41598-020-67211-2

222-nm UVC inactivates a wide spectrum of microbial pathogens
Narita, Kouji & Asano, Krisana & Naito, Keisuke & Ohashi, Hiroyuki & Sasaki, Masahiro & Morimoto, Yukihiro & Igarashi, Tatsushi & Nakane, Akio (2020). 222-nm UVC inactivates a wide spectrum of microbial pathogens. *Journal of Hospital Infection*, 23 March 2020, PREPROOF published by Elsevier Ltd on behalf of The Healthcare Infection Society. https://doi.org/10.1016/j.jhin.2020.03.030

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*, Accepted Author Manuscript. https://doi.org/10.1111/php.13269

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. DNA Damage Kills Bacterial Spores and Cells Exposed to 222-Nanometer UV Radiation. *Applied and Environmental Microbiology*, Apr 2020, 86 (8) e03039-19. https://doi.org/10.1128/AEM.03039-19

Far-UVC light: A new tool to control the spread of airborne-mediated microbial diseases
Welch, D., Buonanno, M., Grilj, V. *et al.* Far-UVC light: A new tool to control the spread of airborne-mediated microbial diseases. *Sci Rep* 8:2752 (2018). https://doi.org/10.1038/s41598-018-21058-w

Exploratory clinical trial on the safety and bactericidal effect of 222-nm ultraviolet C irradiation in healthy humans
Fukui T, Niikura T, Oda T, Kumabe Y, Ohashi H, et al. (2020). Exploratory clinical trial on the safety and bactericidal effect of 222-nm ultraviolet C irradiation in healthy humans. PLOS ONE 15(8): e0235948. https://doi.org/10.1371/journal.pone.0235948

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

Predicting airborne coronavirus inactivation by far-UVC in populated rooms using a high-fidelity coupled radiation-CFD model
Buchan, A.G., Yang, L. & Atkinson, K.D. Predicting airborne coronavirus inactivation by far-UVC in populated rooms using a high-fidelity coupled radiation-CFD model. *Sci Rep* 10, 19659 (2020). https://doi.org/10.1038/s41598-020-76597-y

Exposure of Human Skin Models to KrCl Excimer Lamps: The Impact of Optical Filtering
Buonanno, Manuela & Welch, David & Brenner, David. (2021). Exposure of Human Skin Models to KrCl Excimer Lamps: The Impact of Optical Filtering. *Photochemistry and Photobiology*: Article in Press. https://doi.org/10.1111/php.13383

Effect of intermittent irradiation and fluence-response of 222 nm ultraviolet light on SARS-CoV-2 contamination

Kitagawa, H., Nomura, T., Nazmul, T., Kawano, R., Omori, K., Shigemoto, N., Sakaguchi, T., & Ohge, H. (2021). Effect of intermittent irradiation and fluence-response of 222 nm ultraviolet light on SARS-CoV-2 contamination. *Photodiagnosis and photodynamic therapy*, 102184. Advance online publication. https://doi.org/10.1016/j.pdpdt.2021.102184