

## **Safety of 222 nm Band-Pass Filtered Irradiation: A Review and Analysis of Current Data**

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Ultraviolet radiation (light at wavelengths shorter than 400 nm) has well-known disinfectant properties. These properties stem from the ability of UV light to damage the proteins and genome of microbial cells and viruses through the disruption of chemical bonds. Unfortunately, for the same reasons, exposure to UV light in the 250–300 nm region of the spectrum (254 nm sources being most prevalent) is also known to cause damage, including DNA lesions, erythema, eye injuries, photo-keratitis and other associated effects.

Recent studies suggest that such tissue damage is not caused by shorter (222 nm) wavelengths, due to reduced penetration depths in live tissue when compared to 254nm light. While the effects on live tissue are diminished, 222 nm light has *increased* efficacy for killing bacteria, and deactivating viruses. Current safety guidelines do not, however, account for the true 222 nm exposure limits, in part resulting from poorly characterized light sources in heritage publications. We find the historical data taken at 222 nm to be lacking and propose a reexamination herein.

In this paper, we provide a review of existing literature, including a summary of the efficacy of 222 nm light for disinfection. Based upon recent empirical data, we propose that the accepted spectral effectiveness of 222 nm light should be reexamined and that the Threshold Limit Values for 222 nm light be newly established.