



Evaluation of Effectiveness of Blue, Red and UV Light for Decontamination of Toothbrushes against Common Pathogens

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Abstract: *Toothbrushes serve as critical oral hygiene tools but can also harbor and transmit microbial pathogens, posing a potential health risk. This study evaluated the antimicrobial efficacy of blue light, red light, and UV light as innovative decontamination methods for toothbrushes. The investigation focused on their ability to inactivate common oral and environmental pathogens, including Staphylococcus aureus, Escherichia coli, and Candida albicans. Toothbrushes contaminated with these pathogens were exposed to specific wavelengths and durations of each light type. Results demonstrated significant variations in microbial reduction*

rates, with UV light achieving the highest decontamination efficiency, followed by blue light, while red light showed moderate effects. These findings highlight the potential of non-invasive, light-based technologies in maintaining toothbrush hygiene, offering a safe and effective alternative to chemical disinfectants. Further research is recommended to optimize exposure conditions and assess long-term efficacy under real-world usage scenarios.

Keywords: *Antimicrobial properties, Blue light, Red light, UV light, Toothbrush hygiene, Phototherapy, Photosensitizers.*

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Introduction:

Oral health is an essential part of systemic health and the overall well-being of an individual (Karibasappa et al. 2011). Oral microbiome consists of various bacteria, viruses, and fungi that are responsible for causing a number of oral diseases (Paster et al. 2001). The oral cavity contains more than 700 types of bacteria and has the ideal temperature and humidity level for bacterial growth. It is, therefore, necessary to periodically remove bacteria from the teeth or tongue in the mouth, and one of the most common and effective methods for this is tooth brushing (Beneduce et al., 2010). Toothbrushes may become heavily contaminated with microorganisms from the oral cavity, environment, hands, aerosol contamination, and storage containers (Gujjari et al., 2011). Toothbrushes are likely to be stored