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Evaluation of Energy Dose and Output Power Optimum of Diode's Laser of 450 nm and 650 nm in Photoantimicrobial Mechanisms Against Inhibition of C. Albicans Biofilm Cells

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Abstract. Photoantimicrobial as a pathogenic microbial inhibitory therapy system such as C. albicans in biofilms forms has been studied in vitro. Mechanisms of inhibiting called inactivating used the absorb principles of a dye agents such as chlorophyll against the photon energy of diode laser which any number of ROS product depend on energy doses of a laser, time of irradiation, concentration and time of incubation the dyes agent. The inactivation profile of C. albicans biofilm cells was observed based on cell viability reduction after photoantimicrobial treatment with or without oxygenation by *XTT assay* test. Results show that the inhibiting significantly with the time incubation of the dye agents and the oxygen degree inside the sample. The inhibition for oxygenation biofilm's group 10% lower than without oxygenation biofilm's group at the maximum of reduction of cell viability occurred in the 3-hour incubation group. Optimum of inactivation are 89.6% (without oxygenation) and 94.8% (with oxygenation) after irradiation with 450 nm laser (power output 128.73 at energy dose 86.09 J/cm^2), While, by 650 nm laser (power output 164.53 mW at energy dose 92.52 J/cm^2) irradiation treatment obtained optimum of inactivation are 89.5% (without oxygenation) and 92.3% (with oxygenation).

1. Introduction

The photodynamic therapy known as PDT began to be studied in 1900 by Oscar Raab which saw the effects of light on dyestuffs in medicine, followed by Lipson and Schwartz in 1960 which found a neoplasm lesions emit fluorescence light during surgery after *hematoporphyrin* injection [1]. Initially, PDT therapy was studied to kill cancer cells (malignant cells) but has evolved and proven effective against infectious diseases caused by pathogenic microbes known as *antimicrobial photodynamic therapy* (aPDT) which popular kind photoinactivation [2].

In the photonic, aPDT mechanisms are therapy that involves interaction between light and biomolecule and throught photophysics process and photochemistry process like absorbtion of photon energy, electronic transition, energy or electron transfer against other molecule, sustainable of chemical reaction and produce the radical compounds. The radical compounds produced in the aPDT mechanism can be superoxide anions, hydrogen peroxide, and hydroxyl radicals or oxygen singlet