

I Gde Bagus Yatna Wibawa. 091425053004, 2016. Design and Optimization of Instrument Diode Laser Inactivation (DLI) for Periodontal Disease Therapy (An in Vitro Study). Thesis supervised by Dr. Suryani Dyah Astuti, M.Si. and Dr. Ernie Maduratna S., drg., M.Kes., Sp.Perio(K), Master of Biomedical Engineering Program, Sekolah Pascasarjana, Airlangga University

ABSTRACT

The aim of this study is to determine the potential of the laser diode 445 nm and 650 nm with a extract chlorophyll of *Moringa oleifera* leaf as photosensitizer to inactivate *Aggregatibacter actinomycetemcomitans* (A.a.) bacteria in photodynamic inactivation (PDI). Laser diodes is used as a source of monochromatic light which harmless with low output power and can be adjusted by controlling the input voltage. Statistical test results showed the control group with 20% extract chlorophyll photosensitizer does not show different results with a control group without the photosensitizer. So it can be concluded that the photosensitizer is not toxic for the A.a. bacteria. This study used multimode optical fiber 8 mm to guide the laser diode beam. The laser diode 445 nm can generate 9.2 mW, 23.3 mW, 37.5 mW, and 51 mW output power, while the laser diode 650 nm can generate 15.3 mW, 25.7 mW, 35 mW, and 45.5 mW output power. Four doses of energy ($2,5\text{J}\cdot\text{cm}^{-2}$, $5\text{J}\cdot\text{cm}^{-2}$, $7,5\text{J}\cdot\text{cm}^{-2}$, and $10\text{J}\cdot\text{cm}^{-2}$) are used for both laser diodes in the *in vitro* photodynamic inactivation test . The test showed that there are more deaths of A.a. bacteria in treatment group with photosensitizer than group without photosensitizer. The highest percentage of deaths occurred in the group treated with the photosensitizer and exposed to laser diode 650 nm with $10\text{J}\cdot\text{cm}^{-2}$ energy dose, which is 83%.

Keywords : *Photodynamic inactivation, laser diode, Aggregatibacter actinomycetemcomitans, chlorophyll, Moringa oleifera.*