Dental Journal
Majalah Kedokteran Gigi

Dental Journal
(Majalah Kedokteran Gigi)
2016 December; 49(4): 195–200

Research Report

Aggregatibacter actinomycetemcomitans sensitivity towards chlorophyll of *Moringa* leaf after activated by diode laser

I Gde Bagus Yatna Wibawa,[1] **Suryani Dyah Astuti,**[2] and **Ernie Maduratna Setiawati**[3]
[1]Biomedical Engineering Magister Program, Post Graduate School, Universitas Airlangga
[2]Department of Physics, Faculty of Science and Technology, Universitas Airlangga
[3]Department of Periodontics, Faculty of Dental Medicine, Universitas Airlangga
Surabaya - Indonesia

ABSTRACT

Background: *Regular brushing teeth with scaling and root planning (SRP) cannot effectively decrease the periopatogen bacterial colonies. Even with the addition of antibiotics to support SRP, such as tetracycline given with low doses and for a long time may cause bacteria to become resistant and the effectiveness to eliminate colonies of bacteria being reduced. Photodynamic is a treatment modality that does not cause resistance and potentially to eliminate the growth of bacterial colonies. Moringa oleifera is a plant that can be easily found in Indonesia, by extracting chlorophyll of Moringa oleifera leaves, it can be used as a photosensitizer agent to increase the absorption of light on photodynamic method.* ***Purpose:*** *This study aimed to determine the potential photodynamic inactivation therapy to inactivate (eliminate) periopatogen bacterium.* ***Method:*** *This study used Aggregatibacter actinomycetemcomitans (A. actinomycetemcomitans). Laser diode 660nm as a light source with 8mm optical fiber to guide the beam, also used 20% extract chlorophyll of Moringa oleifera leaf as photosensitizer. Four diode lasers energy density exposures (2,5J.cm^{-2}, 5J.cm^{-2}, 7,5J.cm^{-2}, and 10J.cm^{-2}) are used from both at the in vitro photodynamic inactivation test.* ***Result:*** *The highest percentage of deaths occurred in the group treated with addition of photosensitizer and exposed by 660 nm diode laser with 10J.cm^{-2} energy density, which is 83.01%, compared to the results obtained in the group without addition of the photosensitizer.* ***Conclusion:*** *Chlorophyll of Moringa oleifera leaf after activated by diode laser effectively eliminates A. actinomycetemcomitans.*

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

Correspondence: I Gde Bagus Yatna Wibawa, Biomedical Engineering Magister Program, Post Graduate School, Universitas Airlangga. Jl. Airlangga No. 4-6, Gubeng, Surabaya 60115, Indonesia. E-mail: gde.yatna@gmail.com

INTRODUCTION

The antimicrobial effects of photodynamic method first described by Oscar Raab in 1900 when observing the lethal effect of acridine red combine with light on infusoria (malaria-causing protozoa).[1] Photodynamic therapy which used to reduce the growth of bacteria, known as photoinactivation or photodynamic antimicrobial chemotherapy (PACT), and nowadays known as antimicrobial photodynamic therapy (aPDT).[2,3] Photodynamic therapy requires three main elements, including light-sensitive substance (photosensitizer), a harmless light source, and oxygen availability.[3] Bacteria had their light-sensitive substance that called endogenous porphyrin, studies have demonstrated that bacteria containing porphyrins are sensitive to visible light, in the blue as well as the red spectral region. Study shows *Aggregatibacter actinomycetemcomitans (A. actinomycetemcomitans)* have protoporphyrin IX with 405nm soret band spectrum and peak Q band at 510 nm, 545 nm, 580 nm, 630 nm, 670 nm, and 700 nm.[4,5] Antimicrobial effect is a phototoxic response due to singlet oxygen which caused oxidative damage to cell DNA and changes in molecular mass of some cell membrane proteins and plasma membrane.[2,7,6] Oxidative damage in bacterial cells generally occurs in the DNA cells and other cell organelles, but damage to the cell organelles can differ, depended on types of bacteria and photosensitizer used.[8] The addition of exogenous photosensitizer has their role

Dental Journal (Majalah Kedokteran Gigi) p-ISSN: 1978-3728; e-ISSN: 2442-9740. Accredited No. 56/DIKTI/Kep./2012.

DOI: 10.20473/j.djmkg.v49.i4.p195-200