

Kertas Asli/Original Article

Influence of Low Power He-Ne Laser Irradiation on Hemoglobin Concentration, Mean Cellular Volume of Red Blood Cell, and Mean Cellular Hemoglobin

(Pengaruh Sinaran Kuasa Rendah He-Ne Terhadap Konsentrasi Hemoglobin, Min Isi Padu Sel Darah Merah dan Min Hemoglobin Sel)

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ABSTRACT

The effect of low power 0.95 mW He-Ne laser irradiation ($\lambda = 632.8$ nm) on the subpopulations of human blood parameters such as hemoglobin concentration (HGB), mean cellular volume of red blood cell (MCV), and mean cellular hemoglobin (MCH) were investigated by electronic sizing at the Wellness Centre of Universiti Sains Malaysia (USM). These parameters were correlated with human characteristics such as age, gender, ethnic, and blood types. The correlations were obtained by finding patterns in changes of blood parameters after radiation, non-parametric tests using SPSS version 11.5, centroid and peak positions, and flux variations. The analysis revealed significant changes according to human characteristics, for age ($p = 0.067$), gender ($p = 0.044$), ethnic ($p = 0.094$), and blood types ($p = 0.099$). This finding shows that the centroid and peak positions, flux peak and total flux, were highly correlated with human characteristics and can become a significant indicator for blood analysis. Furthermore, the encircled flux analysis demonstrated a good future prospect in blood research, thus leading the way as a vibrant diagnosis tool to clarify diseases associated with blood.

Keywords: He-Ne laser irradiation, erythrocytes, hemoglobin, mean cellular volume, mean cellular hemoglobin.

ABSTRAK

Kesan penyinaran laser He-Ne kuasa rendah ke atas subpopulasi parameter darah manusia seperti kepekatan hemoglobin (HGB), isi padu sel min (MCV) (bagi sel darah merah (RBC), dan hemoglobin sel min (MCH) diselidiki dengan menggunakan pensazian elektronik di Pusat Sejahtera, Universiti Sains Malaysia (USM). Parameter tersebut dikorelasikan dengan ciri-ciri manusia seperti umur, jantina, etnik, dan jenis darah. Korelasi diperolehi dengan mencari corak dalam perubahan parameter darah selepas radiasi, ujian tak parameter menggunakan SPSS versi 11.5, kedudukan sentroid dan puncak, serta ubahan fluks. Analisis menunjukkan perubahan signifikan mengikut ciri manusia, bagi umur ($p = 0.067$), jantina ($p = 0.044$), etnik ($p = 0.094$), dan jenis darah ($p = 0.099$). Dapatan ini menunjukkan bahawa kedudukan sentroid dan puncak, puncak fluks dan jumlah fluks berkorelasi tinggi dengan ciri manusia dan boleh menjadi penunjuk penting bagi analisis darah. Tambahan, analisis fluks berkeliling menunjukkan prospek yang baik dalam penyelidikan darah. Ini membawa kepada kaedah yang jitu bagi menjelaskan penyakit berkaitan dengan darah.

Kata kunci: penyinaran laser He-Ne, erythrocytes, hemoglobin, isi padu sel min, hemoglobin sel min.

INTRODUCTION

There are widespread applications of low intensity laser radiation in various areas of the medical field (Lundeberg & Malen 1991; Kipshidze et al. 1994), however, the mechanisms of its effect on human blood components still have not been sufficiently studied and remain a topic for discussion. The most important interest is in photoreactions initiated by intravenous laser irradiation of blood, which is acknowledged to be the most effective laser biostimulation method. He-Ne laser radiation has been found to have a lot of important applications which led to the expanding biomedical use of laser technology, particularly in surgery (Mi et al. 2006). This experimental medicine practice requires detailed information on the

mechanisms of their biological effects (Wasik et al. 2007; Halevy et al. 1997) and the increasing understanding of the wavelength selective interaction and associated effects of laser radiation acting on biologic tissue. Despite the fact that the response of blood to the action of a low intensity laser radiation gives important information on the mechanism of interaction of laser radiation with a living organism (Zalesskaya & Sambor 2005; Korolevich et al. 1992), only a small number of works have been devoted to such investigation in living organisms. Also, there is still a lack of information concerning response of blood parameters, such as RBC with low laser light radiation. A wide research exists on the use of low intensity laser radiation in different experimental biological models. The most used laser of low level laser therapy studies is He-Ne