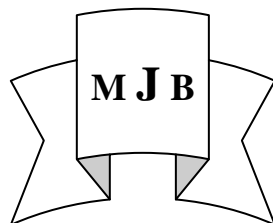


The Effect of Laser Irradiation on Phagocytosis in Rabbits Vaccinated with Measles Vaccine

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Abstract

The objective of this in vivo study is to investigate the effects of 80J/cm N2 laser on cellular immune response represented by phagocytosis activity in laboratory animals Immunized by Measles vaccine. The samples include (10) adult male albino rabbits, were divided into (2) control group and (8) experimental groups. The experimental groups were divided into two main groups , the first group immunized with Measles vaccine, the second immunized by the vaccine and exposure to 10.8 J/cm N2 laser.

The results of immunological tests demonstrated that the exposure to 10.8 J/cm2 of N2 laser radiation induce adverse effect to cellular immune response .The findings of phagocytosis assay showed that the activity of phagocytic cells increased in subgroups that treated with 80 J/cm2 more than the untreated group(P<0.05).

الخلاصة

إن هدف هذه الدراسة (داخل الجسم) هو التحري عن تأثير اشعة الليزر (80 J/cm N2) على الاستجابة المناعية الخلوية من خلال تأثيرها على عملية البلعمة في حيوانات مختبرية تم تمنيعها بأستخدام لقاح الحصبة. العينات تتضمن (10) أرانب قوقازية ذكور بالغة ، قسّمت إلى مجموعتين، مجموعة سيطرة عدد (2) ومجموعة أختبار عدد(8) والتي قسّمت بدورها إلى مجموعتين المجموعة الأولى تم تمنيعها بلقاح الحصبة ، والثانية تم تمنيعها باللقاح و عرضت إلى أشعة الليزر.

بينت نتائج الإختبارات المناعية بأنّ التعرّض إلى إشعة الليزر تؤدي الى تغير الاستجابة المناعية الخلوية حيث أضحرت نتائج تجربة عملية البلعمة ان نشاط الخلايا أزداد في المجاميع التي تم تعريضها الى أشعة الليزر 80 J/cm N2 أكثر من المجموعة الغير معاملة بالاشعة (P<0.05).

Introduction

In cell biology, **phagocytosis** is the process of engulfing a solid particle by a phagocyte or a protist to form an internal phagosome (from Ancient Greek *φαγεῖν* (phagein), meaning "to devour", *κύτος*, (kytos), meaning "cell", and *-osis*, meaning "process"). Phagocytosis was revealed by Élie Metchnikoff in 1882. Phagocytosis is a specific form of endocytosis involving the vesicular internalization of solids such as bacteria, and is, therefore, distinct from other forms of endocytosis such as the

vesicular internalization of various liquids. Phagocytosis is involved in the acquisition of nutrients for some cells, and, in the immune system, it is a major mechanism used to remove pathogens and cell debris. Bacteria, dead tissue cells, and small mineral particles are all examples of objects that may be phagocytized.

The process is homologous to eating only at the level of single-celled organisms; in multicellular animals, the process has been adapted to eliminate debris and pathogens, as opposed to taking in fuel for cellular

processes, except in the case of the animal *Trichoplax*.

Phagocytosis in mammalian immune cells is activated by attachment to Pathogen-associated molecular patterns (PAMPS), which leads to NF- κ B activation. Opsonins such as C3b and antibodies can act as attachment sites and aid phagocytosis of pathogens [1].

Engulfment of material is facilitated by the actin-myosin contractile system. The phagosome of ingested material is then fused with the lysosome, leading to degradation.

Degradation can be oxygen-dependent or oxygen-independent. Oxygen-dependent degradation depends on NADPH and the production of reactive oxygen species. Hydrogen peroxide and myeloperoxidase activate a halogenating system, which leads to the creation of hypochlorite and the destruction of bacteria [2].

Oxygen-independent degradation depends on the release of granules, containing proteolytic enzymes such as defensins, lysozyme, and cationic proteins. Other antimicrobial peptides are present in these granules, including lactoferrin, which sequesters iron to provide unfavourable growth conditions for bacteria.

It is possible for cells other than dedicated phagocytes (such as dendritic cells) to engage in phagocytosis.

Phagocytosis and subsequent degradation of pathogens by

macrophages play a pivotal role in host innate immunity in mammals. Laser irradiation has been found to produce photobiological effects with evidence of interference with organic functions [1].

Phagocytosis as an effector mechanism of the innate immune response could be triggered by attachment of antigens to the surface of macrophages. Laser irradiation has been found to modulate various biological processes. It is a beneficial clinical modality in enhancing the process of wound healing. Several animal studies have shown that low power laser irradiation modulates immune cell functions, such as cell-mediated [2,3].

Materials and Methods

Method

Blood samples were obtained from Rabbits by heart puncture for phagocytosis assay [4], to determine phagocytic capacity after vaccination with Measles vaccine before and after exposure to laser irradiation.

Phagocytosis % = $\frac{\text{No. of phagocytic PMNs}}{\text{Total No.}} \times 100$

Results

This study shows higher Phagocytosis percentage in rabbits treated with low power laser irradiation after vaccination with Measles vaccine than of non treated rabbits and the low group higher than of the control (Table) and (Figure 1).

Table 1 The mean of phagocytosis Percentage before and after exposure to irradiation in vaccinated rabbits.

control	vaccinated	Vaccinated & treated with irradiation
35%	56%	64%

P<0.05

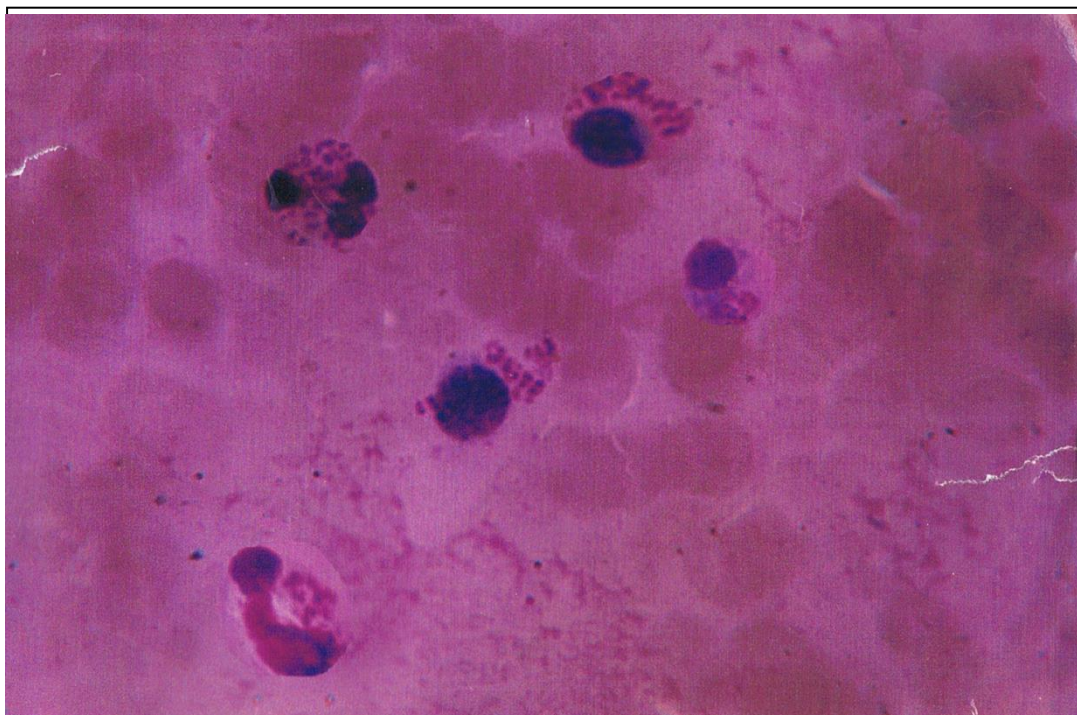


Figure 1 Phagocytosis of *S. aureus* by phagocytic cell.

Discussion

Neutrophils play a major role in host defense via the phagocytosis and destruction of pathogens during acute inflammation. The binding of opsonized microorganisms or immune complexes to neutrophil immunoglobulin receptors. The results of the present study was comparable with other results [5, 6], Dolgushin and Gizinger mentioned that the irradiation by low power laser light increased activity of phagocytosis, so they concluded that low power laser irradiation normalized disturbed neutrophil function [7]. The effect of laser irradiation on the biological systems are due to the presence of acceptors that can absorb visible light [8-10].

Conclusion

In conclusion the current study Showed that low power of laser can increase the phagocytic activity of PMNs which indicate that it can enhance the immune response to measles vaccine.

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