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Original Research Article

Application of the Nd:YAG, Semiconductor and He-Ne laser on *Micrococcus spp.* Bacteria Isolated from Malignant Tumors from Patients with Leukemia, liver and Colon Cancer

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Abstract

Objective*:** The aim of the research is to apply the Nd:YAG, Semiconductor, He-Ne laser to kill *Micrococcus spp*. bacteria isolated from various human cancers. ***Study Design*:** The clinical study design for this research was case–control in analytical and Cross-sectional in descriptive. ***Backgrounds: Carcinobacteria are bacterial infections organisms that cause cancer by cause mutate of one or several genes. *Micrococcus spp.*is a genus of non-spore forming Actinomycetes, gram positive, opportunistic pathogen for the immunocompromised patients, related to bacteremia, ventricular shunt, continuous ambulatory peritoneal dialysis peritonitis and central catheters. septic arthritis, meningitis, intracranial abscesses and endocarditis. ***Methodology*:** Study patients, specimens, collection of bacteria from cancer patients during malignant tumor eradication. Applying and exposing to Nd:YAG laser at different times. ***Results*:** The number of live cells and the percentage of killing of *Micrococcus spp*. bacteria after exposing them to radiation emitted from Nd:YAG, Semiconductor, He-Ne laser at different times including (5, 10, 20, 30) and comparing them with the control, with (2-4) replications. ***Conclusion*:** The conclude that He-Ne, Semiconductor and Nd:YAG lasers are very effective and powerful in killing *Micrococcus spp.* bacteria isolated from leukemia, liver and colon cancer at different times and the longer the exposure time the higher the killing rate.

Keywords: Carcinogenesis, Bacterial Cancer and Radiation.

INTRODUCTION

Cancer is a large clusters or tumors of diseases by convert normal cells to cancerous cells that multiply and spread because mutate of a one or several genes [1, 2]. Carcinobacteria are bacterial infections organisms that cause cancer [3], also cancer- related bacteria infecting healthy tissues after cancer established itself directly cause carcinogen like H. pylori which strongest evidence to gastric cancer and others [4].

Micrococcus spp. is a genus of non-spore forming Actinomycetes, gram-positive, oxidase-positive and robustly aerobic cocci pertinence to the family Micrococcaceae and non-motile which reside or besmirch the skin, mucosa and oropharynx, opportunistic pathogens for the immunocompromised [5, 6]. It is correlating to the human skin microbiome [7], nonpathogenic, though several species comprise the perpetrator of various contagious [8]. It is related to diverse contagious inclusive persistent ambulatory peritoneal dialysis peritonitis, contagious related to ventricular shunts, bacteremia and central venous catheters secluded of blood and surgical pattern in several patients with coronary and contagious status [9]. *Micrococcus spp.* occasional agent in states of pneumonia, intracranial abscesses, endocarditis, meningitis and septic arthritis [10]. Transportation through inhalation of polluted droplets and dust. Impedance has been loadcontra macrolides (erythromycin), nitrofurantoin and lincomycin [11, 12].

Nd YAG is a kind of solid-situation laser which utilizes a crystal synthetic of neodymium-painted yttrium aluminum agate as a laser medium, while a crystal is agitated via light or electrical power, it emanate light to a certain wavelength of 1064 nm. Medical applications of Nd YAG laser has enormous extent inclusive laser surgery, ophthalmology, laparoscopic, dermatology and

oncology. In laser surgery, Nd YAG lasers are utilized in process likelithoste shatter, endoscopy and soft tissueobstruction. In dermatology, Nd YAG laser is utilized to skin surface restorationobstruction tattoos and hair abstraction. In ophthalmology, Nd YAG laser is utilized in process likeglaucoma therapy and cataract surgery [13, 14]. Semiconductor laser high competence, very tiny and consolidated, slick to relate to optical fibers, essentially low price, light can be produced in enormous spectral part and huge tunable laser arrays with optical energy of hundreds of kW can be erected. Consequently they are vastly utilized in several applications inclusive in medicine [15]. He- Ne Low-level laser is generally utilized in treatment and has usefulness of having valuable impacts on tissue recovery and ache repose [16].

METHODOLOGY

Study Design: The clinical study design for this research was case-control in the analytical and cross-sectional in the descriptive.

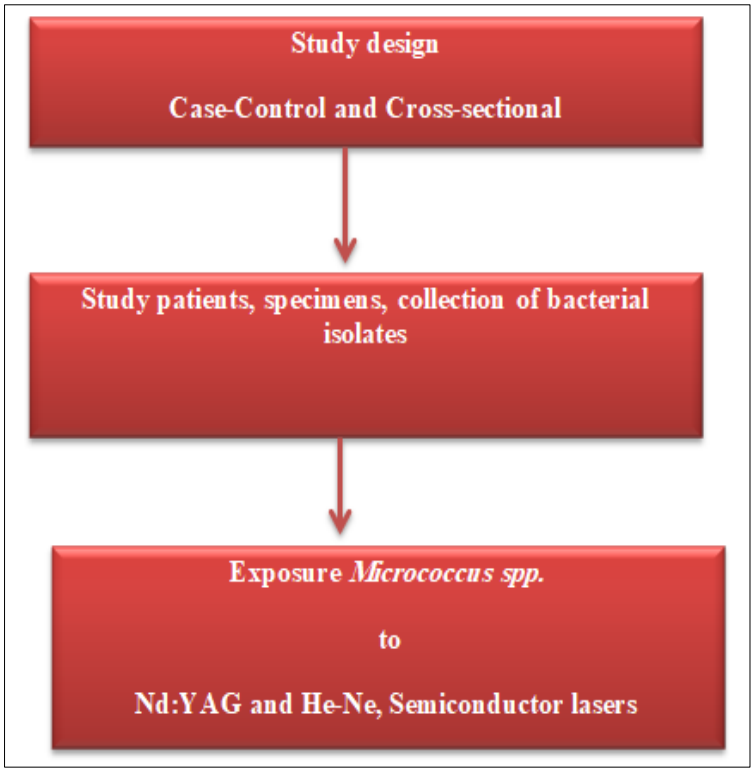

Figure 1: Planner of study design for this research.

Study Patients, Specimens, Collection of Bacterial Isolates

Micrococcus spp. bacteria were collected from cancer patients and the bacteria were associated with malignant tumors and were isolated from leukemia, liver and colon cancer patients from Baghdad hospitals in the year 2023/2024 [17].

Exposure *Micrococcus spp.*to Nd:YAG and He-Ne, Semiconductor Lasers

One ml of *Micrococcus spp.* bacteria were exposed to Nd:YAG laser, Semiconductor laser and He-Ne laser at different times (5, 10, 20, 30) minutes, then incubated in the incubator for 24 hours at 37°C [18]. The equation of kill rate:

$$\textbf{Kill Rate } \% = \frac{\textbf{Control} - \textbf{Processing}}{\textbf{Control}} \textbf{ 100}$$

RESULTS AND DISCUSSIONS

The results in table (1) show the number of live cells and the percentage of killing of Micrococcus spp. bacteria after exposing them to radiation emitted from Nd:YAG, Semiconductor, He-Ne laser at different times including (5, 10, 20, 30) and comparing them with the control, with (2-4) replications.

Table 1: The number of live cells and the killing rate of *Micrococcus spp.* to different types of lasers including Nd:YAG, Semiconductor, He-Ne laser

Type of Laser	Sample	Time min	Number of viable cell	Percentage of Killing
He-Ne	M1	30	15	95%
	M2	20	14	95.3%
	M3	10	16	94.6%

Type of Laser	Sample	Time min	Number of viable cell	Percentage of Killing
	M4	5	9	97%
Semiconductor	M1	30	10	96.6%
	M2	20	13	95.6%
	M3	10	26	91.3%
	M4	5	97	67.6%
Nd:YAG	M1	500 pulse (6 sec. between each pulse)	13	95.6%
	M2	500 pulse (6 sec. between each pulse)	9	97%
Control= 300 colony				

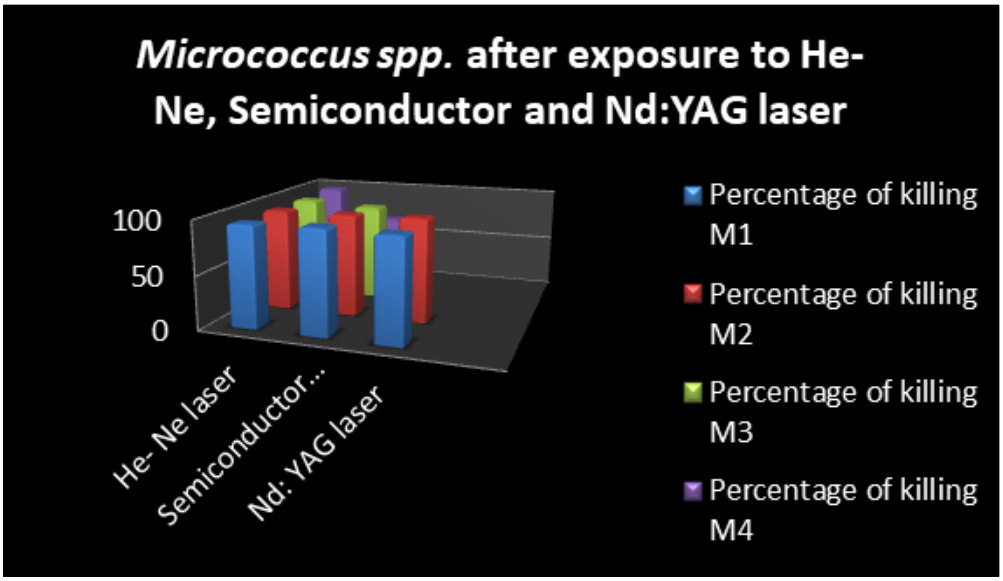

Figure 2: *Micrococcus spp.* after exposure to He-Ne, Semiconductor and Nd:YAG laser

A preceding via [19], there was evidence of inhibition activity on *S. aureus* and *P. aeruginosa* bacteria by the high energy effect of Nd:YAG laser of 500-700 J which caused a decrease in the growing.

Previous study by [20], the effect of laser radiation on 9 bacterial isolates isolated from the intestine whose growth was inhibited when exposed to the radiation emitted by the laser for 15 minutes.

The results in figure (3) show a very high killing rate of Micrococcus spp. bacteria, reaching (95, 95, 96, 97)% when exposed to the He-Ne laser at different times (5, 10, 20, 30) minutes, and the number of live cells is very low, reaching (6, 15, 1, 14, 9) colonies.

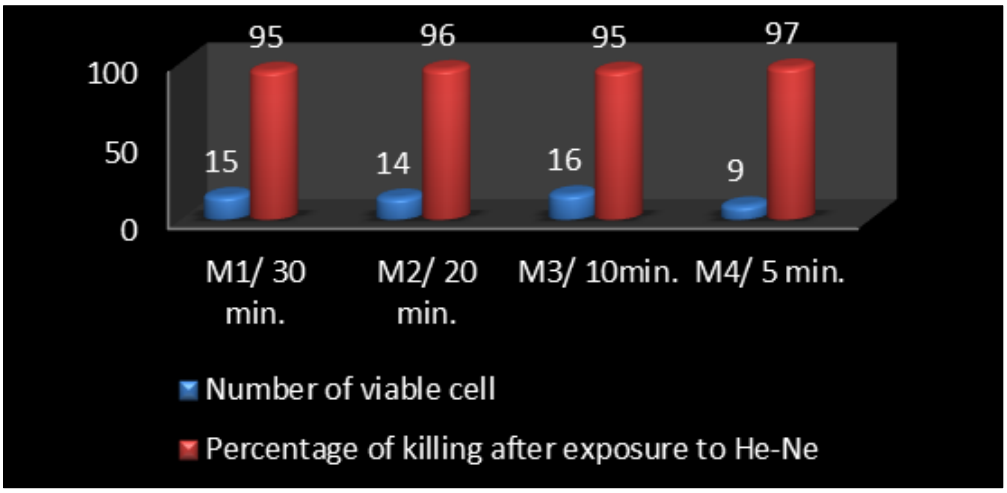

Figure 3: Exposure of *Micrococcus spp.* to He-Ne laser for different times (5, 10, 20, 30) minutes

The results in figure (4) show a very high killing rate of Micrococcus spp. bacteria, which reaches (97, 96, 91)% when exposed to the Semiconductor laser at different times (5, 10, 20, 30) minutes, and the number of live cells is very low, reaching (10, 13, 26) colonies.

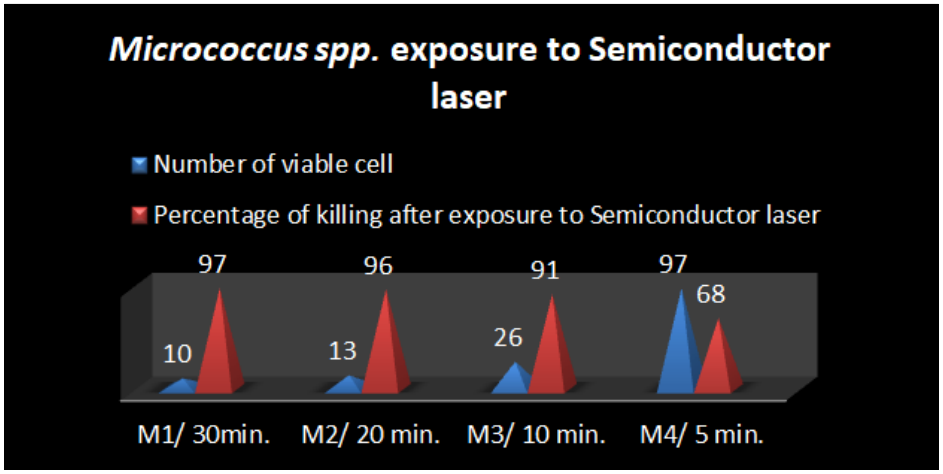

Figure 4: Exposure of *Micrococcus spp.* bacteria to a semiconductor laser for different times (5, 10, 20, 30) minutes

The results in figure (5) show a very high killing rate of Micrococcus spp. bacteria, reaching (97.96)% when exposed to the Nd:YAG laser at different times (5, 10, 20, 30) minutes, and the number of live cells is very low, reaching (9, 13) colonies.

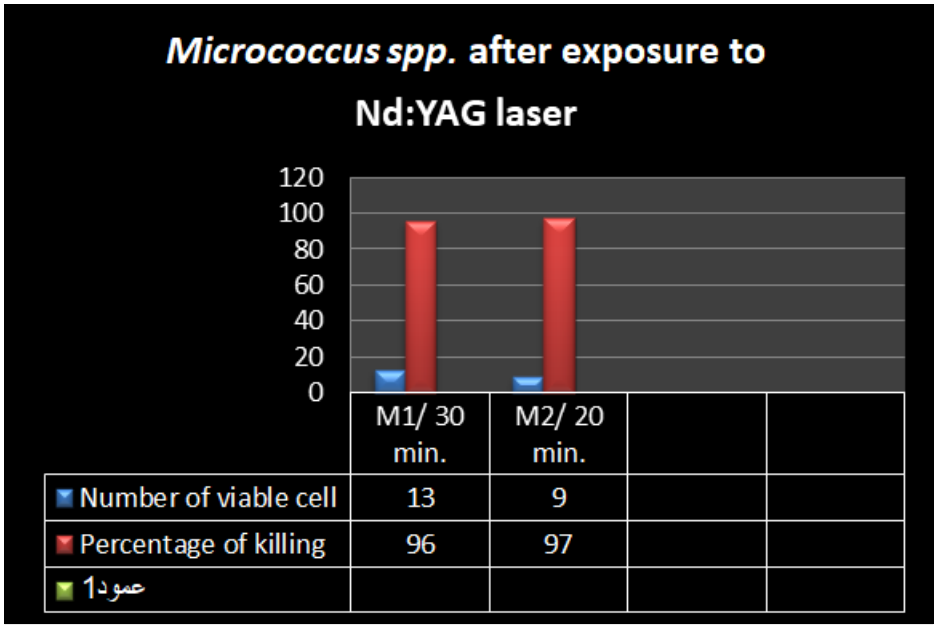

Figure 5: *Micrococcus spp.* bacteria were exposed to Nd:YAG laser for different times (5, 10, 20, 30) minutes

CONCLUSIONS

The conclude that He-Ne, Semiconductor and Nd:YAG lasers are very effective and powerful in killing *Micrococcus spp.* bacteria isolated from leukemia, liver and colon cancer at different times and the longer the exposure time the higher the killing rate.

Ethical Approval

All examination protocols were confirmed by the College of Ibn Sina University of Medical and Pharmaceuticals Sciences. All screening was achieved following the confirmed guidelines.

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Conflicts of Interest: The authors declare that there are no conflicts of interest.

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REFERENCES

1. Choices, N. H. S. (2014). "*Cancer*". World Health Organization.
2. Anand, P., Kunnumakara, A. B., Sundaram, C., Harikumar, K. B., Tharakan, S. T., Lai, O. S., ... & Aggarwal, B. B. (2008). Cancer is a preventable disease that requires major lifestyle changes. *Pharmaceutical research*, *25*(9), 2097-2116.
3. Alfarouk, K. O., Bashir, A. H., Aljarbou, A. N., Ramadan, A. M., Muddathir, A. K., AlHoufie, S. T., ... & Harguindey, S. (2019). The possible role of Helicobacter pylori in gastric cancer and its management. *Frontiers in oncology*, *9*, 75.
4. Khajuria, N., & Metgud, R. (2015). Role of bacteria in oral carcinogenesis. *Indian journal of dentistry*, *6*(1), 37.
5. Greenblatt, C. L., Baum, J., Klein, B. Y., Nachshon, S., Koltunov, V., & Cano, R. J. (2004). Micrococcus luteus-survival in amber. *Microbial ecology*, *48*, 120-127.
6. Bannerman, T. L., & Peacock, S. J. (2007). Staphylococcus, Micrococcus and Other Catalase-Positive Cocci. In Murray, P. R., Baron, E. J., Jorgensen, J. H., Landry, M. L., & Pfaller, M. A. (Eds.), Manual of Clinical Microbiology (9th ed., pp. 390-404). Washington, USA: ASM Press.
7. Nuñez, M. (2014). *Encyclopedia of Food Microbiology*. 2nd ed. Elsevier, 627–633.
8. Tizabi, D., & Hill, R. T. (2023). Micrococcus spp. as a promising source for drug discovery: A review. *J. Ind Microbiol Biotechnol*, *50*(1).
9. Kocur, M., Kloos, W. E., & Schleifer, K. H. (2006). The Genus Micrococcus. In M. Dworkin, S. Falkow, E. Rosenberg, K. H. Schleifer& E. Stackebrandt (Eds.), The Prokaryotes 3rd ed. 961-971. New York: Springer.
10. Harrison, W. A., Griffith, C. J., Ayers, T., & Michaels, B. (2003). Bacterial transfer and cross-contamination potential associated with paper-towel dispensing. *American journal of infection control*, *31*(7), 387-391.
11. Magee, J. T., Burnett, I. A., Hindmarch, J. M., & Spencer, R. C. (1990). Micrococcus and Stomatococcus spp. from human infections. *Journal of Hospital Infection*, *16*(1), 67-73.
12. Liebl, W., Kloos, W. E., & Ludwig, W. (2002). Plasmid-borne macrolide resistance in Micrococcus luteus. *Microbiology*, *148*(8), 2479-2487.
13. Crystals. (2023). *Advantages and applications of Nd YAG wavelength*. Chapter 1: Introduction to Wavelength Nd YAG.
14. Anderson, R. R., & Parrish, J. A. (1983). Selective photothermolysis: precise microsurgery by selective absorption of pulsed radiation. *Science*, *220*(4596), 524-527.
15. Hulicius, E., & Kubeček, V. (2013). Semiconductor lasers for medical applications. In *Lasers for Medical Applications* (pp. 222-250). Woodhead Publishing.
16. Mangi, F. A., Bayor, J., & Jamro, D. A. (2014). Medical Application of Output Intensity Characterization of Red He-Ne Laser. *International Journal of Scientific and Engineering*, *5*(10), 332-338.
17. Forbes, B. A., Sahm, D. F., & Weissfeld, A. S. (2007). Baily and Scott's Diagnostic Microbiology.11thedition. Mosby, Inc. Baltimore, USA, 384-398.
18. Ismail, M., Waleed, S., Jabbar, F., & Ibrahim, K. (2012). Effect of Diode Laser (805) nm on alpha-toxin production and antibioticsensitivity of Staphylococcus aureus. *Iraqi journal of science*, *53*(4), 755-759.
19. Ebid, A. A., Alhammad, R. M., Alhindi, R. T., Alghamdi, A. A., Alqarhi, A. K., Abdullah, H. A., ... & Rahali, S. (2021). Effect of high-power Nd: YAG laser on the growth of Staphylococcus aureus and Pseudomonas aeruginosa: an experimental study. *Journal of Physical Therapy Science*, *33*(3), 222-228.
20. Chung, W., Petrofsky, J. S., Laymon, M., Logoluso, J., Park, J., Lee, J., & Lee, H. (2014). The effects of low level laser radiation on bacterial growth. *Physical therapy rehabilitation science*, *3*(1), 20-26.