



شبكة المعلومات الجامعية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



شبكة المعلومات الجامعية
@ ASUNET



شبكة المعلومات الجامعية التوثيق الالكتروني والميكرو فيلم



شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكرو فيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأفلام بعيدا عن الغبار

في درجة حرارة من ١٥-٢٥ مئوية ورطوبة نسبية من ٢٠-٤٠%

To be Kept away from Dust in Dry Cool place of
15-25- c and relative humidity 20-40%

بعض الوثائق الأصلية تالفة

بالرسالة صفحات لم ترد بالاصل

1981

Efficacy of Laser and Ultrasound Waves on Bacteria Isolated from Diabetic Foot Infection

THESIS

*Submitted to The High Institute of Public Health,
Alexandria University,
in partial fulfillment of the requirements for the
Degree of Master of Public Health Sciences
(Microbiology)*

By

Doaa Mohamed Abu Al-Nor El Khoully

B.Sc. Faculty of Science, University of Tanta, 1999

**High Institute of Public Health
Alexandria University
2002**

SUPERVISORS



Prof. Dr. Medhat Saber Ashour

Professor of Microbiology
High Institute of Public Health
Alexandria University

Prof. Dr. Moustafa Moustafa Mohamed Ahmed

Professor of Biophysics
Medical Research Institute
Alexandria University

Dr. Ola Ahmed Wasfi

Lecturer of Microbiology
High Institute of Public Health
Alexandria University

My Mother and Father
Dedicated to
My Beloved

*My Sister, Brothers,
Grandfathers & Uncles*

Acknowledgment

First of all, thanks to **ALLAH** for help and strength offered to me during this work.

Words can not adequately express my heartily thanks, profound gratitude, sincere appreciation and indebtedness to **Prof. Dr. Medhat Saber Ashour**, Professor of Microbiology, High Institute of Public Health, Alexandria University for his laborious continuous effort, precious advice, kind support and keen supervision throughout the whole course of this study. It is an honour working under his supervision. It is with pleasure that I express my everlasting deepest thanks, special appreciation and sincere gratitude, valuable advice, unlimited cooperation, talented careful review and endless support throughout this work.

I am greatly indebted and grateful to **Prof. Dr. Moustafa Mohamed Ahmed**, Professor of Biophysics, Medical Research Institute, University of Alexandria, for his precious advice, constructive guidance, willing assistance, kindness, valuable support, encouragement and unlimited help which made his supervision a great pleasure to me.

I am greatly thankful, indebted and sincerely grateful to **Dr. Ola Ahmed Wasfi**, Lecturer of Microbiology, High Institute of Public Health, Alexandria University for her willing assistance, kind support and fruitful effort during this work.

I would like to thank all members of staff and personnel of Department of Microbiology for helping me to accomplish this work.

Last but not least, I owe special thanks and gratitude to my parents, grandfather, uncles, sister and brothers who nurtured, loved and faithfully supported me throughout this entire work.

LIST OF ABBREVIATIONS

ADP	Aluminum Disulphonated phthalocyanine
Al Pc S ₂	Aluminum Disulphonated pthalocyanine
CU	Chronic Ulcer
CFU/ml	Colony Forming Unit
CW	Continuous Wave
DFI	Diabetic Foot Infection
DFU	Diabetic Foot Ulcer
Er:YAG	Erbium: Yttrium Aluminium Garnet
Ga Al As	Gallium Aluminum Arsenide
DM	Diabetes Mellitus
HI	Health Insured
In-Ga-Al-PO ₄	Indium-Gallium-Aluminum-Phosphoric
IR	Infrared Radiation
IDDM	Insulin Dependent Diabetes Mellitus
LLP	Lethal Laser Photosensitization
LASER	Light Amplification Stimulated Emission of Radiation
METS	MacFarland Equivalence Turbidity Standard

MRSA	Methicillin-Resistant <i>S.aureus</i>
MB	Methylene Blue
MS	Monosonication
MTS	Monothermosonication
Nd:YAG	Neodymium: Yttrium Aluminium Garnet
NHI	Non Health Insured
NIDDM	Non Insulin Dependent Diabetes Mellitus
PBS	Phosphate Buffer Saline
TB	Toludine Blue
TBO	Toludine Blue O
UHF	Ultra High Frequency
US Waves	Ultrasonic waves
U.V.	Ultraviolet

List of Figures

Figure		Page
(1)	Schematic representation of a typical laser source	15
(2)	Atom structure	16
(3)	Atomic energy states	18
(4)	Structure of ruby laser	20
(5)	Laser thermal and nonthermal effects	21
(6)	Radius-time curves for cavitating bubbles in an ultrasonic field	29
(7)	13050-LAS 50 Hi-Tech diode laser 50 w device	53
(8)	Right: Model-Bransonic ultrasonic B-220 Left: Model-ultrasonic therapy CSL device	53
(9)	Schematic representation of experimental setup	59
(10)	Bacterial suspension exposure to laser beam	61
(11)	Bacterial suspension exposure to US waves	61
(12)	Bacterial suspension exposure to laser beam + US waves	63
(13)	Total bacterial viable counts before exposure to laser beam or/and US waves	64
(14)	Total bacterial viable counts after exposure to laser beam	64
(15)	Total bacterial viable counts after exposure to US waves	65
(16)	Total bacterial viable counts after exposure to laser beam + US waves	65
(17)	Frequency of isolated species from diabetic foot infection of 63 patients	69

Figure		Page
(18)	Change in <i>Enterobacter SP</i> count due to exposure to laser or/and ultrasound	78
(19)	Change in <i>S.pyogenes</i> count due to exposure to laser or/and ultrasound	81
(20)	Change in <i>K.pneumoniae</i> count due to exposure to laser or/and ultrasound	84
(21)	Change in <i>S. faecalis</i> count due to exposure to laser or/and ultrasound.	87
(22)	Change in <i>E.coli</i> count due to exposure to laser or/and ultrasound	90
(23)	Change in <i>K. Ozaenae + oxytoca</i> count due to exposure to laser or/and ultrasound.	93
(24)	Change in <i>P.aeruginosa</i> count due to exposure to laser or/and ultrasound	96
(25)	Change in <i>P.vulgaris</i> count due to exposure to laser or/and ultrasound	99
(26)	Change in <i>C.freundii</i> count due to exposure to laser or/and ultrasound	102
(27)	Change in <i>S.aureus</i> count due to exposure to laser or/and ultrasound	105
(28)	Change in <i>P.mirabilis</i> count due to exposure to laser or/and ultrasound	108

Table	Page
(XI) Changes in <i>S. pyogenes</i> (n=2) count due to exposure to laser, US waves, or laser + US waves	80
(XII) Changes <i>K. pneumoniae</i> (n=4) in count due to exposure to laser , US waves, or laser + US waves	83
(XIII) Changes in <i>S. faecalis</i> (n=5) count due to exposure to laser, US waves, or laser + US waves	86
(XIV) Changes in <i>E. coli</i> count (n=5) due to exposure to laser, US waves, or laser + US waves	89
(XV) Changes in <i>K. ozaenae</i> + <i>K. oxytoca</i> (n=6) count due to exposure to laser, US waves, or laser + US waves	92
(XVI) Changes in <i>P. aeruginosa</i> (n=9) count due to exposure to laser, US waves, or laser + US waves	95
(XVII) Changes in <i>P. vulgaris</i> (n=10) count due to exposure to laser, US waves, or laser + US waves	98
(XVIII) Changes in <i>C. freundii</i> (n=13) count due to exposure to laser, US waves, or laser + US waves	101
(XIX) Changes in <i>S. aureus</i> (n=15) count due to exposure to laser, US waves, or laser + US waves	104
(XX) Changes in <i>P. mirabilis</i> (n=30) count due to exposure to laser, US laser, or laser + US waves	107

List of Tables

Table	Page
(I) Biochemical reactions for identification of <i>Staphylococci</i> and <i>Streptococci</i> Gm +ve cocci isolates	56
(II) Identification of oxidase negative lactose fermenting Gm -ve isolates	56
(III) Identification of oxidase negative lactose fermenting Gm -ve isolates	57
(IV) Identification of oxidase positive Non lactose fermenting Gm -ve isolates	57
(V) Identification of oxidase negative non-lactose fermenting Gm -ve isolates	58
(VI) Number, percentage of bacterial species isolates from 63 patients with diabetic foot infection	68
(VII) Age, sex and blood sugar distribution among the 63 diabetic foot patients	71
(VIII) Results of pre-experimental study before and after exposure to laser & US to determine the best doses of exposure	73
(IX) Temperature changes of bacterial suspension before and after exposure to laser, US waves and laser + US waves for 20 min	75
(X) Changes in <i>Enterobacter sp</i> (n=1) count due to exposure to laser, US waves or laser + US waves	77