Molecular studies on antibiotic resistant Gram negative bacteria isolated from Neonatal Intensive Care Unit and their susceptibility to some medicinal plant extracts

Thesis submitted for a Ph.D. degree in Science (Microbiology)

(Medical bacteriology)

By

Eslam El-Sayed Mostafa Mikkawye

B.Sc. in Biochemistry &Microbiology, Ain Shams University (2005)

M.Sc. in Microbiology– Ain Shams University (2009)

Supervisors

Prof. **Dr. Mohamed Khaled Ibrahim**
Professor of Bacteriology
Vice Dean for education and students affairs
Faculty of Science,
Ain Shams University

Dr. **Sahar Tolba Mohamed**
Associate Prof. of Microbiology
Microbiology Department,
Faculty of Science,
Ain Shams University

Dr. **Amgad Ahmed Ezzat**
Lecturer of Medical Microbiology and Immunology
Faculty of Medicine
Al-Azhar University (Assiut)

Dr. **Amina Anwar Ateya Unis**
Associate Professor of Pharmacology
Ras Al Khaimah University
for Medicine and Health Sciences
UAE

Microbiology Department,
Faculty of Science,
Ain Shams University

2017

Approval Sheet

Molecular studies on antibiotic resistant Gram negative bacteria isolated from Neonatal Intensive Care Unit and their susceptibility to some medicinal plant extracts

Thesis submitted for a Ph.D. degree in Science (Microbiology)

By

Eslam El-Sayed Mosfata Mikkawye

B.Sc. in Microbiology& Biochemistry, Ain Shams University (2005)

M.Sc. in Microbiology– Ain Shams University (2009)

Supervision committee

1- Prof. Dr. Mohamed Khaled Ibrahim……

Professor of Bacteriology, Vice Dean for Education and Students Affairs, Faculty of Science, Ain Shams University

2- Dr. Sahar Tolba Mohamed……..

Associate Prof. of Microbiology, Microbiology Department, Faculty of Science, Ain Shams University

3- Dr. Amina Anwar Ateya Unis……

Associate Professor of Pharmacology, Ras Al Khaimah University for Medicine and Health Sciences, UAE.

4- Dr. Amgad Ahmed Ezzat ……

Lecturer of Medical Microbiology and Immunology, Faculty of Medicine, Al-Azhar University (Assiut).

This thesis is for Ph.D. degree in Science (Microbiology) has been approved by:

1- Prof. Rawya Fathy Mahmoud Gamal ……

Prof. Emeritus of Microbiology –Faculty of agriculture, Ain Shams University

2- Prof. Hala Mahmoud Nour El dein ……

Professor of Microbiology- National Center for Radiation Research Technology

3- Prof. Dr. Mohamed Khaled Ibrahim……

Professor of Bacteriology, Vice Dean for education and students affairs, Faculty of Science, Ain Shams University.

4- Dr. Sahar Tolba Mohamed……..

Associate Prof. of Microbiology, Microbiology Department, Faculty of Science, Ain Shams University.

Examination Date: / / 2017 **Approval date: / / 2017**

University council approval: / / 2017

بسم الله الرحمن الرحيم

"قالوا سبحانك لاعلم لنا إلا ماعلمتنا إنك أنت العليم الحكيم"

صدق الله العظيم

سورة البقرة الآية (32)

DEDICATION

I would like to dedicate this work to my beloved parents, sisters and my wife for their encouragement, cooperation, sincere help and support and also to my daughter wishing here a happy and successful life. Great thanks to all of them.

I would like to dedicate the benefit of this work to the soul of my grandfather.

Eslam Mikkawye

ACKNOWLEDGMENT

First, I am deeply thankful to ALLAH for giving me everything I wish, strengthen and helping me to complete this work.

I would like to express my gratitude and appreciation to Prof. Dr. Mohamed Khaled Ibrahim, Professor of Bacteriology, Microbiology Department, Faculty of Science, Ain Shams University for his help and continuous support. He was the best advisor, and expert supervisor to bring this thesis to more than satisfactory finish.

My grateful and sincere thanks to my dear Dr. Sahar Tolba Mohamed, Associate Professor of Microbiology, Microbiology Department, Faculty of Science, Ain Shams University, for her help, encouragement, continuous guidance, valuable comments, and constructive criticism which was a great assist for this work.

My deep thanks to my dear Dr. Amgad Ahmed Ezzat Othman, for his kind help and constructive criticism. My sincere gratitude is greatly expressed to him.

My special thanks to Dr. Amina Anwar Ateya Unis, Associate *Professor of Pharmacology, Ras Al Khaimah University for Medicine and Health Sciences, UAE.*

I would like to express my thanks to all of my friends, and colleagues from Tabuk and Ain shams Universities and my students in Tabuk University for their encouragement and support.

Finally, I would like to acknowledge the staff of Research, Studies and Training Center on vectors of diseases and Microbiology Department, Faculty of Science, Ain Shams University for making the research facilities available to me and for their help.

Eslam Mikkawye

CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

(A. baumannii)	*Acinetobacter baumannii*
(API)	Analytical profile index
(AST)	Antimicrobial susceptibility testing
(BHI)	Brain Heart infusion
(*bla*)	β-lactamase
(CF)	Cystic fibrosis
(COPD)	Chronic obstructive pulmonary disease
(CS)	Conserved sequence
(CSF)	Cerebrospinal fluid
(CTX-M)	Cefotaxime hydrolyzing capabilities
(CVL)	Central venous line
(DNA)	Deoxyribonucleic acid
(EDTA)	Ethylenediaminetetraacetic acid
(EONS)	Early-onset neonatal sepsis
(ESBL)	Extended-spectrum-ß-lactamase
(ETT)	Endotracheal tube
(EUCAST)	European Committee on Antimicrobial Susceptibility testing
(F)	Female
(FeCl)	Ferric Chloride

(I)	Intermediate
(ICU)	Intensive Care Unit
(*int*)	Integron
(K. pneumoniae)	*Klebsiella pneumonia*
(KPC)	*Klebsiella pneumonia* carbapenemase-producing
(M)	Male
(MDR)	Multi drug resistant
(MH)	Mueller-Hinton
(MHA)	Mueller Hinton Agar
(MIC)	Minimum inhibitory concentration
(NA)	Nutrient agar
(NaCl)	Sodium chloride
(NICU)	Neonatal Intensive Care Unit
(NIs)	Nosocomial infections
(PCR)	Polymerase chain reaction
(Ps. aeruginosa)	*Pseudomonas aeruginosa*
(R)	Resistance
(RNA)	Ribonucleic acid
(S)	Sensitive
(S. maltophilia)	*Stenotrophomonas maltophilia*
(SHV)	Sulfhydryl variable
(TEM)	Temoneira