Ain Shams University
Faculty of Pharmacy
Microbiology & Immunology Department

Characterization of Multidrug Resistance Mechanisms of Some Bacterial Isolates

A Thesis

Submitted in Partial Fulfillment of the Requirments for the

Master Degree

In
Pharmaceutical Sciences
(Microbiology and **Immunology)**

By

Ghada Ahmed Badr El-Deen

Bachelor of Pharmaceutical Sciences,
Faculty of Pharmacy, Ain Shams University, 2002

كليـــة الصيدلـــة
قســـم الميكروبيولوجـــيا و المناعـــة

توصيف آليات المقاومة للعديد من المضادات الميكروبية لبعض العزلات البكتيرية

رسالـــة مقدمـــة
لنيـــل درجـــة الماجيستـــير فـــى العلـــوم الصيدليـــة
(الميكروبيولوجـــيا والمناعـــة)

اعـــداد

غـــادة أحمـــد بـــدر الديـــن

بكالوريوس العلوم الصيدلية
كلية الصيدلة ـ جامعة عين شمس – ٢٠٠٢
مساعد باحث بالهيئة القومية للرقابة و البحوث الدوائية

تحـــت إشـــراف

الأستاذة الدكتورة / نادية عبد الحليم حسونة

أستاذ الميكروبيولوجيا والمناعة
كلية الصيدلة – جامعة عين شمس

الأستاذ الدكتور / محمد مبروك أبو الوفا

أستاذ و رئيس قسم الميكروبيولوجيا والمناعة
كلية الصيدلة – جامعة عين شمس

الدكتور / سعيد محمد عبد العال

أستاذ مساعد الميكروبيولوجيا
الهيئة القومية للرقابة و البحوث الدوائية

٢٠١١

Ain Shams University
Faculty of Pharmacy
Microbiology & Immunology Department

Characterization of Multidrug Resistance Mechanisms of Some Bacterial Isolates

A Thesis

Submitted in Partial Fulfillment of the Requirments for the
Master Degree
In
Pharmaceutical Sciences
(**Microbiology** and **Immunology**)

By

Ghada Ahmed Badr El-Deen
Bachelor of Pharmaceutical Sciences,
Faculty of Pharmacy, Ain Shams University, 2002

Under Supervision of

Prof. Dr. Nadia Abd El-Haleem Hassouna, PhD
Professor of Microbiology and Immunology,
Faculty of Pharmacy, Ain Shams University

Prof. Dr. Mohammad Mabrouk Aboulwafa, PhD
Professor and head of Microbiology and Immunology Department,
Faculty of Pharmacy, Ain Shams University

Dr. Saied Mohamed Abd El-Aal, PhD
Assistant professor of Microbiology
National Organization of Drug Control and Research

2011

Acknowledgements

First, I would like to express my deepest gratitude and thanks to **ALLAH,** whose magnificent help was the main factor in accomplishing the work.

I would like to express my deep gratitude to **Prof. Dr. Nadia Abd El-Haleem Hassouna**, Professor of Microbiology and Immunology, and founder of the Microbiology and Immunology Department, Faculty of Pharmacy, Ain Shams University, for her attentive supervision and caring guidance throughout the whole work.

My sincere gratitude and appreciation is also expressed to **Dr. Mohammad Mabrouk Aboulwafa,** Professor and head of Microbiology and Immunology Department, Faculty of Pharmacy, Ain Shams University, for suggesting this research point, planning the work, following up and for his sustained support and supervision during the progress of this work.

Special thanks and deep appreciation to **Dr. Saied Mohamed Abd El-Aal,** Assistant Professor of Microbiology, National Organization of Drug Control and Research (NODCAR) for his valuable advice, kind guidance and encouragement throughout the period of the work.

Grateful thanks are extended to my dear colleagues and to all the workers at Microbiology laboratories in both National Organization of Drug Control and Research and faculty of pharmacy, Ain Shams University.

Finally, I would like to express my deepest and most sincere gratitude to **my parents, my husband,** my sisters, my brother and **MY KIDS** for their patience and motivation.

Ghada Ahmed badr

Abbreviations

Abbreviation	Definition
ABC	ATP-binding cassette
ADH	Arginine dihydrolase
AMY	Amygdalin
APS	Ammonium per sulphate
ARA	Arabinose
ATP	Adenosine triphosphate
BSA	Bovine serum albumin
CBBR-250	Coomassie brilliant blue R-250
CCCP	Carbonyl cyanide m-chlorophenyl hydrazone
CFU	Colony forming unit
CIT	Citrate
Cip	Ciprofloxacin
CTX	Cefotaxime
DMT	Drug metabolite transporters
EARSS	European Antimicrobial Resistance Surveillance System
EPI	Efflux pump inhibitor
ESBLs	Extended spectrum β-lactamases
EtBr	Ethidium bromide
FDA	Food and drug adminstration
FIC	Fraction inhibitory concentration
FQ	Fluoroquinolones
GEL	Gelatinase
GISA	Glycopeptide-insensitive *S. aureus*
GLU	Glucose
HPA	Health protection agency
Hr	Hour
IM	Inner membrane
IND	Indole
INO	Inositol
IRT	Inhibitor-resistant TEM

Abbreviation	Definition
KDa	Kilodalton
LB	Luria Bertani
LDC	Lysine decarboxylase
LPS	Lipopolysaccharides
MAN	Mannitol
MATE	Multidrug and toxic compound extrusion
MDR	Multidrug resistance
MEL	Melibiose
MF	Major facilitator
MFP	Membrane fusion protein
MICs	Minimum inhibitory concentrations
Min	minute
MR	Methyl red
MRSA	Methicillin-resistant *Staph. aureus*
NCCLS	National Committee for Clinical Laboratory Standards.
Nm	Nanometer
OD	Optical denisty
ODC	Ornithine decarboxylase
OM	Outer membrane
OMP	Outer membrane protiens
ONPG	Ortho nitrophenyl-βD-galactopyranosidase
PBPs	Penicillin-binding proteins
PMF	Proton motive force
QRDR	Quinolone resistance-determining region
RHA	Rhamnose
RND	Resistance-nodulation-cell division
SAC	Sacharose
SDS	Sodium dodecyl sulfate
SMR	Small multidrug resistance
SOR	Sorbitol
TDA	Tryptophane deaminase
TEMED	N N N'N' tetra methelyne diamine

Abbreviation	Definition
TMS	Transmembrane-spanning regions
UK	United kingdom
URE	Urease
VISA	Vancomycin-intermediate resistant *Staph.aureus.*
VP	Voges Proskauer reagent
µg	Microgram

Table of contents

List of Figures

Figure **Page**

List of Tables

Table **Page**