Profile and Sensitivity Pattern of Bacteria Isolated from Various Cultures in Tropical Medicine Department, Ain Shams University

Thesis Submitted For Partial Fulfillment of Master Degree in
Tropical Medicine

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قَالُوا سُبْحَانَكَ
لاَ عِلْمَ لَنَا
إِلاَّ مَا عَلَّمْتَنَا
إِنَّكَ أَنتَ
الْعَلِيمُ الْحَكِيمُ
صدق الله العظيم
الآية (32) سورة البقرة

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List of Abbreviations

A/V fistula	: Arteriovenous fistula
ALT	: Alanine aminotransferase
AST	: Aspartate aminotransferase
BUN	: Blood urea nitrogen
C. difficile	: Clostridium difficile
CAI	: Community acquired infection
CDC	: Center for Disease Control
CDK	: Concentration dependent killing
COPAT	: Community Based Parenteral Antibiotic Therapy
CRP	: C- reactive protein
CVL	: Central intravenous lines
DC	: Dendritic cell
DVT	: Deep venous thrombosis
E. coli	: Escherichia coli
ESBL	: Extended spectrum B-lactamase
ESR	: Erythrocyte sedimentation rate
GISA	: Glucopeptide intermediate Staphylococcus aureus
GNB	: Gram negative bacilli
GPC	: Gram positive cocci
H. influenza	: Hemophilus influenza
HAI	: Hospital acquired infection
HICPAC	: Healthcare Infection Control Practices Advisory Committee
HIV	: Human immunodeficiency virus
INR	: International normalized ratio
KFT	: Kidney function test
LFT	: Liver function test
M. pneumonia	: Mycoplasma pneumonia
MBC	: Minimum bacterial concentration

MDRO	: Multidrug resistant organisms
MHC	: Major Histocompatibility Complex
MIC	: Minimal inhibitory concentration
MRSA	: Methicillin-resistant Staphylococcus aureus
N. meningitides	: Neisseria meningitides
NK cells	: Natural killer cells
P. aeruginosa	: Pseudomonas aeruginosa
PABA	: Para aminobenzoic acid
PAE	: Post antibiotic effect
PALE	: Post antibiotic leucocyte effect
PASE	: Post antibiotic suppression effect
PBP	: Penicillin binding protein
PICC	: Peripherally inserted central catheter
PMN	: Polymorphonuclear cells
PTC	: Percutaneous transhepatic cholangiogram
S. Albumin	: Serum albumin
S. Creatinine	: Serum creatinine
S. maltophilia	: Stenotrophomonas maltophilia
S. pyogens	: Streptococcus pyogens
SARS	: Sever Acute Respiratory Syndrom
SBP	: Sponteous bacterial peritonitis
SSI	: Surgical site infections
ssp.	: Species
SSTI	: Skin and soft tissue infection
Staph. aureus	: Staphylococcus aureus
T. Billirubin	: Total billirubin
TACE	: Transarterial chemoembolization
TDK	: Time dependent killing

TIPS	: Transjugular intrahepatic portosystemic shunt
Trimethoprim/ sulpha	: Trimethoprim/sulphamethoxazole
VISA	: Vancomycine intermediate Staphylococcus aureus
VRSA	: Vancomycine resistant Staphylococcus aureus
vs	: Versus
WBC	: White Blood Cells
WHO	: World Health Organization

INTRODUCTION

Antibiotic resistance is a global public health problem ***(Cars et al., 2008).*** The foundation of modern medicine is built on the availability of effective antibiotics, especially in economically deprived areas of the world where the disease burden due to bacterial infections remains high. Antibiotic resistance is predominantly fueled by antibiotic use ***(Goossens et al., 2005).***

The regular introduction of new antibiotic classes over the years has partly masked the problem of increasing resistance. However, this is no longer the case today because the pipeline for newer antibiotics is nearly empty ***(Alvan et al., 2011).***

Therefore, there is a need to preserve the currently available antibiotics for use by future generations ***(Cars et al., 2008).***

The World Health Organization and European Commission have recognized the importance of studying the emergence and determination of resistance as well as the need for control strategies. The need for strategies to control antibiotic resistance is greater in resource constraint settings because antibiotic resistance puts further strain on an already

fragmented health care system in low and middle-income countries ***(Carlet et al., 2011).***

Rapid evolution of bacterial resistance may be due to a complex interaction of several factors such as higher burden of infectious disease, treatment uncertainty, lack of treatment guidelines, inadequate access to standard laboratory facilities, self-medication, prescription based on availability, government support to pharmaceutical industries, market forces, antibiotics prescribed by unqualified health professionals, less strict law enforcement, fragmented public health system, poor population-wide insurance coverage, inadequate adherence to universal hygiene and infection control measures, and to low population-wide education level ***(Varghese et al., 2010).***

Antibiotic susceptibility surveillance is fundamental for creating an antibiotic stewardship program with the aim of defining resistance magnitude and patterns of bacterial pathogens and providing locally applicable data to guide empirical therapy ***(Shanmugam, 2011).***

AIM OF THE WORK

To determine the profile and the antimicrobial sensitivity pattern of the frequently isolated bacteria from various cultures in Tropical Medicine Department, Ain Shams University Hospital in order to:

1. Identify the proper empirical antibiotics used in different situations (antimicrobial policy).
2. Identify the resistant organisms (if present) with its suitable antibiotic.

IMMUNOLOGY

History of immunology

Immunology is a science that examines the structure and function of the immune system. It originates from medicine and early studies on the causes of immunity to disease. The earliest known reference to immunity was during the plague of Athens in 430 BC ***(Retief and Cilliers, 1998).***

Other observations of acquired immunity were later exploited by Louis Pasteur in his development of vaccination ***(Plotkin, 2005).***

Viruses were confirmed as human pathogens in 1901, with the discovery of the yellow fever virus by Walter Reed ***(Major Walter Reed Army Medical Center, 2007).***

I. Innate immunity

The immune system protects human from infection with layered defenses of increasing specificity. In simple terms, physical barriers prevent pathogens such as bacteria and viruses from entering the organism. If a pathogen breaches these barriers, the innate immune system provides an immediate, but non-specific response ***(Litman et al., 2005).***

If pathogens successfully evade the innate response, vertebrates possess a second layer of protection, the adaptive

immune system, which is activated by the innate response. Here, the immune system adapts its response during an infection to improve its recognition of the pathogen. This improved response is then retained after the pathogen has been eliminated, in the form of an immunological memory, and allows the adaptive immune system to mount faster and stronger attacks each time this pathogen is encountered ***(Gene, 2006).***

Both innate and adaptive immunity depend on the ability of the immune system to distinguish between self and non-self molecules. In immunology, self molecules are those components of an organism's body that can be distinguished from foreign substances by the immune system ***(Smith, 1997).***

Surface barriers

Several barriers protect human from infection, including mechanical, chemical, and biological barriers. Skin is an example of mechanical barriers that are the first line of defense against infection ***(Bruse et al., 2002).***

Other systems act to protect body openings such as the lungs, intestines, and the genitourinary tract. In the lungs, coughing and sneezing mechanically eject pathogens and other irritants from the respiratory tract. The flushing action of tears and urine also mechanically expels pathogens, while mucus secreted by the respiratory and gastrointestinal tract serves to trap and entangle microorganisms ***(Boyton and Openshaw, 2002).***