ANTIBIOTIC SUSCEPTIBILITY PATTERNS OF BACTERIAL STRAINS ISOLATED FROM SKIN SAMPLES OF HEALTHY INDIVIDUALS

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ABSTRACT

Antibiotic resistant pathogens are becoming a more serious global threat. Due to natural selection, bacterial strains have developed resistance towards antibiotics and this has resulted in an increase in hospitalization, death and cost as the antibiotics are less effective towards these bacteria. This is why it is important to determine the antibiotic susceptibility pattern of bacterial strains to know which antibiotics can still be used to treat infections. The aims of this study were to isolate and identify bacterial strains from facial samples collect from individuals in INTI International University and to determine the antibiotic susceptibility profiles of these bacteria. The samples were incubated in nutrient broth which were further cultured on nutrient agar. Single colonies were picked and were subjected to biochemical tests such as Gram staining, catalase test, Mannitol Salt Agar, blood agar, MacConkey agar, IMViC tests, Triple Sugar Iron, Citrate test, Brilliance MRSA 2 agar and disk-diffusion assay. 49 isolates were obtained from the 30 samples collected. 98% were gram positive while 2% were gram negative bacteria. There was a higher percentage of *Staphylococcus aureus* (51%) while *Staphylococcus. epidermidis* (15%), *Enterococcus* species (12%), *Propionibacterium. acnes* (10%) and *Streptococcus. pneumoniae* (2%). 10% of the bacteria could not be identified. The single *S. pneumoniae* was identified to be PRSP since it was resistant to penicillin. 18% and 6% were identified to be MRSA and MRSE respectively. All the MRSA strains were resistant to cefoxitin, ampicillin and penicillin G while all the MRSE strains were resistant to cefoxitin and ampicillin. There were five different antibiograms for the MRSA and only two antibiograms for MRSE strains. 40% of the *P. acnes* were resistant to erythromycin. From the study, 5% of the isolates were not sensitive to the antibiotics while 95% were resistant to at least one antibiotic. The results obtained from this study allows the determination if the antibiotic resistant bacteria are increasing in Malaysia and it also enables the determination of which antibiotic can still be used to treat infections caused by the bacteria.

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LIST OF ABBREVIATIONS

%	Percentage
-	Negative
$(NH_4)H_2PO_4$	Ammonium dihydrogen phosphate
(v/v)	Volume to volume ratio
+	Positive
×	Magnification
≤	Less than or equal to
≥	More than or equal to
µg	Microgram
µg/L	Microgram per mililitre
µL	Microliter
AK	Amikacin
AMP	Ampicillin
AMX	Amoxicillin
CDC	Centers for Disease Control and Prevention
CFU/mL	Colony forming per unit millilitre
CFX	Cefoxiti
CLSI	Clinical and laboratory standard institute
CN	Gentamicin
DA	Clindamycin
E	Erythromycin
E.coli	*Escherichia coli*
ESBL	Extended spectrum beta-lactamases
etc	et cetera
g	gram

g/L	Gram per liter
GAS	Group A streptococcus
h	Hour
H_2O_2	Hydrogen peroxide
HGT	Horizontal gene transfer
I	Intermediate
I_2	Iodine
ICU	Intensive care units
IMViC	Indole Methyl red Voges-Proskauer Citrate tests
IU	International University
K_2HPO_4	Dipotassium phosphate
KI	Potassium iodide
Klebsiella sp	*Klebsiella* species
KOH	Potassium hydroxide
LTD	Limited
LTRI	Lower respiratory tract infection
$MgSO_4 \cdot 7H_2O$	Magnesium sulphate heptahydrate
MIC	Minimum inhibitory concentration
min	minutes
mL	millilitre
mL	mililiter
mm	milimeter
MR	Methyl red
MRSA	Methicillin-resistant *Staphylococcus aureus*
MRSE	Methicillin-resistant *Staphylococcus epidermidis*
MRVP	Methyl-red and Voges-Proskauer
MSA	Mannitol Salt Agar

NA	Not applicable
NaCl	Sodium chloride
ND	Not determined
NDM-1	New Delhi metallo-ß-lactamase
NI	Nosocomial infections
°C	degree Celsius
ODRI	Orthopedic device-elated infection
OFX	Oflaxicin
OX	Oxacillin
P	Probability
P	Penicillin G
P. acnes	*Propionibacterium acnes*
PBP	Penicillin-binding proteins
pH	Potential of hydrogen
PRSP	Penicillin-resistant *S. pneumoniae*
Pseudomonas sp	*Pseudomonas* species
R	Resistant
R	Resistant
RD	Rifampicin
rRNA	Ribosomal ribonucleic acid
s	Seconds
S	Sensitive
S	Sensitive
S. aureus	*Staphylococcus aureus*
S. epidermidis	*Staphylococcus epidermidis*
S. pneumonia	*Streptococcus pneumonia*
S. pyogenes	*Streptococcus pyogenes*

TET	Tetracycline
TMPD	*N,N,N',N'*-tetra-methyl-*p*-phenylenediamine
TSI	Triple sugar iron
USD $	United State dollar
UTI	Urinary tract infections
VA	Vancomycin
VP	Voges Proskauer
W	Watt
α	Alpha
β	Beta

CHAPTER 1

INTRODUCTION

Antibiotic resistance among bacterial strains is becoming more prevalent and alarming in today's world and this has resulted in an increase in the mortality rate among patients in hospitals. Due to high resistance among bacterial species, the number of people who have been infected with these bacteria has increased causing more patients to undergo prolonged hospitalization with increased costs up to USD $10,000 (Sarkar et al., 2017). This is mainly due to the fact that bacteria that previously were easily cured with antibiotics are now becoming more difficult to treat (Mazel & Davies, 1997). Some bacteria develop resistance to multiple drugs such as *Staphylococcus epidermidis* which is resistant to rifampicin, gentamicin and clindamycin resulting from acquisition of genes harboured in plasmids or integrons (Jones, Peters, Weersink, Fluit, & Verhoef, 1823). Resistance of bacteria to drugs is due to gene mutations, acquisition of genes and by passing genetic material through horizontal gene transfer. The resistant genes can be transmitted to the population of bacteria using different mechanisms such as conjugation, transduction and transformation. Thus, to be able to overcome this problem the conditions required for the transfer of the gene and the process of the procurement of the gene should be known.

Resistant bacteria cause damage to the host by disrupting the functions of its cells that are essential due to conditions available such as temperature and availability of nutrients required for their reproduction. Some people who are physically well, harbour resistant strains of bacteria making them carriers of these pathogens (Perron, Quessy, & Bell, 2008). It is considered as a danger when someone is a carrier of antibiotic-resistant bacteria since the bacteria can be transferred to other people thereby increasing the spread of bacterial resistance. This might result in the ineffectiveness of many drugs to cure the infections caused by these pathogens. In addition, some bacteria are resistant to certain conditions such as temperature, pH and high salt concentration making them more difficult to eradicate. Pathogens will infect, grow and reproduce in humans causing infections which could result in different types of diseases (Jaiswal et

al., 2016). Thus the antibiotics to which the microbes are resistant to, should be known to prevent the spread of such pathogens which cause diseases and might result in death.

The aim of this project was to determine different species of bacteria that could be isolated from the facial skin of healthy individuals in INTI IU. The confirmed bacterial isolates were further tested to determine the antibiotic susceptibility profiles of the identified bacterial isolates. The overall aim of this project was to identify if the people in INTI International University are carriers of pathogens that are resistant to antibiotics which can be passed on to other individuals and what antibiotics are still effective in the treatment of skin pathogens.