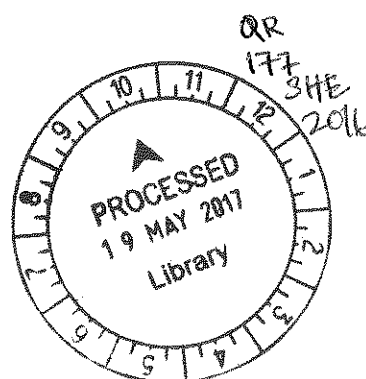


ISOLATION OF ANTIBIOTIC-RESISTANT BACTERIA FROM TOUCH  
SCREEN MOBILE PHONE

DS1 012

SHEE HUI PING

DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS FOR THE DEGREE OF  
BACHELOR OF BIOTECHNOLOGY (HONOURS)



FACULTY OF HEALTH AND LIFE SCIENCES  
INTI INTERNATIONAL UNIVERSITY  
PUTRA NILAI, MALAYSIA

AUG2016

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## ACKNOWLEDGEMENTS

With boundless love and appreciation, I would like to extend my sincere gratitude and appreciation to everyone who helped me in my final year project study. Besides, I would like to extend my profound gratitude to the following:

My supervisor, Ms. Lalita Ambigai Sivasamugham. I appreciate her expertise, consistent guidance and advices that helped me to bring this study into success. Thank you for your guidance and support in writing proposals, thesis and also lab work.

My co-supervisor, Dr. Geetha Subramaniam. I appreciate her expertise, enthusiasm, patience and comments regarding my study. Thank you!

Students in INTI International University that participate in my study. I appreciate your voluntary participation and time spent in answering the questionnaires that helped me to conduct my study.

My dearest family. Thank you for their love, concern, encouragement and support all these years.

## ABSTRACT

Nowadays, people are inevitable indispensably to mobile phones including touch screen mobile phones. Although touch screen mobile phones offer a lot of advantages such as rapid communication, they are also a reservoir for bacteria transmission. This study has identify the counts and types of bacteria contaminating touch screen mobile phones used by students of INTI International University. Forty-three touch screen mobile phone samples were collected. Along with the questionnaire, an area of 3cm<sup>2</sup> on the surface of the touch screen mobile phones had been aseptically rubbed over using the sterilized cotton swabs. Samples were cultured to obtain pure isolates. The percentage of the presence of bacterial on touch screen mobile phones was 100% and 79 isolates were found. The pure isolates were identified through some biochemical test including gram staining, catalase test, oxidase test and IMViC test. Sixty-nine isolates (87.34%) were gram positive whereas 10 isolates (12.66%) were gram negative. Besides, the pure isolates were streaked on MSA and MacConkey Agar in order to differentiate different type of bacteria such as *S. epidermidis* that produced pink colonies on MSA and *S. aureus* that produced yellow colonies on MSA. The identification of isolates were done by using Bergey's Manual (Bergey & Holt, 1994). The most common isolate in this study was *S. epidermidis* and followed by *S. aureus*. Therefore, The pure cultures were subjected to antibiotic susceptibility test to investigate their antibiotic susceptibility profiles. Forty-one isolates showed antibiotic resistance, 32 of them were gram positive and 9 of them were gram negative. Among the 32 gram positive antibiotic-resistant isolates, 15 of them were oxacillin-resistant while 17 of them were clindamycin-resistant. Among 20 (28.99%) possible *S. aureus*, four (5.8%) of them showed oxacillin resistance and eight (11.60%) of them showed clindamycin resistance. The four possible *S. aureus* that showed oxacillin resistance were grown on Brilliance MRSA 2 Agar, but only one grew as blue colonies, indicating only one of them was MRSA. Among 21 (30.43%) possible *S. epidermidis*, 11 of them were oxacillin-resistant and 9 of them were clindamycin-resistant. The oxacillin-resistant *S. epidermidis* might be the possible MRSE. For the gram negative isolates, one (10%) possible *Neisseria* species was chloramphenicol-resistant. Three (30%) possible *Salmonella* species were amikacin-resistant and four (40%) of them were chloramphenicol-resistant.

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## LIST OF ABBREVIATIONS

°C	Degree celsius
AID	Acquired immunodeficiency syndrome
BSAC	British Society for Antimicrobial Chemotherapy
CDC	Centers for Disease Control
cm	centimetre
DNA	Deoxyribonucleic acid
H <sub>2</sub> O <sub>2</sub>	Hydrogen peroxide
HIV	Human immunodeficiency virus
IDSA	Infectious Diseases Society of America
MDR	multi-drug resistant
mL	Milliliter
MRSA	Methicillin-resistant <i>Staphylococcus aureus</i>
MR-VP	Methyl Red-Voges Proskauer
MSA	Mannitol Salt Agar
NB	Nutrient broth
rpm	Revolutions per minute
WHO	World Health Organization

## CHAPTER 1

### INTRODUCTION

There are an estimated of 11 million smartphone users in Malaysia (Statista, 2016). With the increasing number of applications and convenience, most people do not seem to even walk without holding their mobile phones in their hands. Despite the vast use and convenience, there are some setbacks of using mobile phones especially with regards to health.

Studies show that mobile phones are good carriers for bacteria and disease transmission (Bhoonderowa, Gookool, & Biranjia-Hurdoyal, 2014). This is due to the suitable temperature and humidity level provided by the handphones. The heat produced when the mobile phone is used or the heat transferred from the hands of the users, facilitate the growth of bacteria. Thus, bacteria such as *S. aureus* (a common skin bacterium) can be transmitted from the hands of the users to other objects or people around them through casual contact (Elmanama, A., Hassona, I., & Marouf, A., 2015). For example, the bacteria can be transmitted from the surface of mobile phones to the face or ears when the users place their mobile phone close to the face during phone calls. (Sridhar G et al., 2013). These bacteria can also be transferred to food if the food handlers do not wash their hand properly. Besides, some of the bacteria could be transferred from the hands of the users from the places they have visited including the toilets. Studies showed that mobile phone users seldom clean their mobile phones and they seldom wash their hands before and after the use of mobile phone (Elmanama, A., Hassona, I., & Marouf, A., 2015) as they do not foresee the harmful bacteria that can be found on the touch screen of mobile phones.

Some of the bacteria that can be commonly found on the mobile phones include *Staphylococcus* and *Pseudomonas* species (Bhoonderowa, Gookool, & Biranjia-Hurdoyal, 2014). Some of the isolated bacteria were resistant to antibiotics, such as methicillin-resistant *S. aureus* (MRSA). In addition, MRSA also shows high resistance to other antibiotics such as ampicillin, cephalixin, clindamycin (Onanuga., 2005). This clearly shows that mobile phones including the touch screen mobile phones harbour

many types of bacteria including the resistant ones. Thus, there is a need to know the presence of antibiotic resistant bacteria on the touch screens of mobile phones so that the bacteria transmission can be prevented. The types of resistant bacteria found on the mobile phone in an educational sites such as INTI International University is always interesting to study.

Hence, the aim of this study is to isolate antibiotic-resistant bacteria from the touch screen mobile phones used by students of INTI International University. The data obtained will likely help to shed light on the distribution of antibiotic resistant bacteria on mobile phones and could possibly be used to educate the public on the importance of frequent cleaning of mobile phones and regular hand washing preferably before and after the use of mobile phones.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 ANTIBIOTICS

The term “antibiotics” were first created by a microbiologist named Selman Waksman in order to describe substances produced by microbes (Saswati Sengupta, 2013). These substances show the ability to inhibit the growth of other microbes. In other words, antibiotics are known as antibacterial compounds that are able to control the growth of bacteria. Antibiotics have been a very strong tool in the medical field as they are widely used to treat bacterial infections.

Antibiotics are usually produced by microbes such as bacteria or fungi. However, with the advance technology, antibiotics can also be chemically synthesized. These antibiotics are known as semi-synthetic antibiotics as they are produced by chemical modification of the natural antibiotics (Rolinson, 1998). Semi-synthetic antibiotics have been widely available for the market since the last 30 years. Some of the promising semi-synthetic antibiotics in the market include tazobactam, sulfonilamides, chloramphenicol, tigecycline and telavancin (Tor & Fair, 2014). Semi-synthetic antibiotics were developed and widely used in order to improve the stability and efficacy of antibiotics as well as to reduce side-effects and to deal with antibiotic-resistant bacteria (Todar, 2016).

##### 2.1.1 History of Antibiotics

The history of antibiotics can be divided into 2 segments; the early history and the modern history.

In the past, before the development of antibiotics, even a paper-cut could kill a person. Moreover, diseases caused by bacteria were often deadly and incurable. For example, in London in 1936, patients whom suffered from tuberculosis were treated by fresh air treatment. However, thanks to antibiotics, this disease is now under control.