

**IDENTIFICATION OF BACTERIA CAUSING PNEUMONIA  
IN AIR CONDITIONING UNITS IN TERTIARY  
HOSPITAL IN CAVITE**

**THESIS**

**ARIANNE ROSE A. LIM  
CHARLES ANGELO P. VILLA**

**College of Nursing  
CAVITE STATE UNIVERSITY  
Indang, Cavite**

Cavite State University (Main Library)



**T5626**

THESIS/SP 579.3 L62 2014

**April 2014**

**IDENTIFICATION OF BACTERIA CAUSING PNEUMONIA IN AIR  
CONDITIONING UNITS IN A TERTIARY  
HOSPITAL IN CAVITE**

An Undergraduate Thesis  
Submitted to the Faculty of the  
Department of Medical Technology  
College of Nursing  
Cavite State University  
Indang, Cavite

In partial fulfillment  
of the requirements for the degree  
Bachelor of Science in Medical Technology



00009138

*Identification of bacteria causing  
pneumonia in air conditioning units in*  
579.3 L62 2014  
T-5626

**ARIANNE ROSE A. LIM**  
**CHARLES ANGELO P. VILLA**  
April 2014

## ABSTRACT

**LIM, ARIANNE ROSE A., AND VILLA, CHARLES ANGELO P., Identification of Bacteria Causing Pneumonia in Air Conditioning Units in a Tertiary Hospital in Cavite.** Undergraduate Thesis. Bachelor of Science in Medical Technology, Cavite State University, Indang, Cavite, April 2014. Adviser: Fedelyn P. Estrella, RMT, MPH

This study was conducted from May to June 2013 at the Department of Medical Technology, College of Nursing, Cavite State University, Indang, Cavite. The study aimed to identify the bacteria causing pneumonia in air conditioning units in a tertiary hospital in Cavite.

The samples were cultured in 4 different culture media and subjected to different biochemical tests to identify the isolated organisms. Cetrinide test was done to identify *Pseudomonas aeruginosa*. Thirteen isolates were found out as *Pseudomonas aeruginosa*.

*Haemophilus influenzae* were identified by X and V factor requirement and satellitism test. In the X and V factor requirement, 100 % or 18 samples had a positive result indicating that these samples were *Haemophilus* species. On the second test, 15 samples were positive as *Haemophilus influenzae*.

Optochin susceptibility test was done to identify *Streptococcus pneumoniae*. Out of the 20 samples, only 2 had a zone of inhibition of  $\geq 14$  mm in diameter, this denotes susceptibility to optochin and was *Streptococcus pneumoniae*. The remaining samples were all resistant having a zone of inhibition lower than 14 mm.

Triple sugar iron (TSI) test was performed to identify *Klebsiella pneumoniae*. The results showed that of all the samples, there were no positive for *Klebsiella pneumoniae*.

Based on the results gathered, the isolated organism with the highest incidence was *Haemophilus influenzae* and was isolated and identified in 15 samples that were gathered in the private rooms and wards. It was followed by *Pseudomonas aeruginosa* which were identified among the 13 samples and *Streptococcus pneumoniae* were identified in 2 samples based on the results of the tests.

## TABLE OF CONTENTS

	Page
TITLE PAGE.....	i
APPROVAL SHEET.....	ii
BIOGRAPHICAL SKETCH.....	iii
ACKNOWLEDGEMENT.....	iv
ABSTRACT.....	vi
TABLE OF CONTENTS.....	viii
LIST OF TABLES.....	xi
LIST OF FIGURES.....	xii
LIST OF APPENDIX TABLES.....	xiii
LIST OF APPENDIX FIGURES.....	xiv
INTRODUCTION.....	1
Objectives of the Study.....	3
Significance of the Study.....	3
Scope and Limitations of the Study .....	4
Time and Place of the Study .....	4
Definition of Terms.....	5
Conceptual Framework.....	6
Theoretical Framework.....	7
REVIEW OF RELATED LITERATURE.....	8
Bacteria causing pneumonia.....	8
<i>Haemophilus influenzae</i> .....	9

<i>Pseudomonas aeruginosa</i> .....	10
<i>Streptococcus pneumoniae</i> .....	12
<i>Klebsiella pneumoniae</i> .....	14
Organisms and air conditioning units.....	16
Tertiary Hospital in Cavite.....	17
METHODOLOGY.....	18
Research Design.....	18
Sampling Technique.....	18
Data Gathering Procedure.....	19
Statistical Treatment.....	21
RESULTS AND DISCUSSION.....	24
Isolation of Organisms.....	24
Organisms in Nutrient Agar.....	25
Organisms in Chocolate Agar.....	25
Organisms in Blood Agar Plate .....	25
Organisms in Cetrimide Agar .....	26
Identification of Isolated Organisms.....	26
Triple Sugar Iron (TSI) test for <i>Klebsiella pneumoniae</i> .....	26
Cetrimide test for <i>Pseudomonas aeruginosa</i> .....	27
Optochin Susceptibility test for <i>Streptococcus pneumoniae</i> .....	28
Factor X and V Requirement for <i>Haemophilus</i> species.....	30
Satellitism test for <i>Haemophilus influenzae</i> .....	32

Incidence of identified organisms.....	33
SUMMARY, CONCLUSION, AND RECOMMENDATION.....	35
Summary.....	35
Conclusion.....	36
Recommendation.....	37
BIBLIOGRAPHY.....	38
APPENDICES.....	41

## LIST OF TABLES

Table		Page
1	Samples with colony growth in each culture media.....	24
2	Results of Triple Sugar Iron (TSI) test.....	27
3	Results of cetrimide test.....	28
4	Results of optochin susceptibility test.....	29
5	Results of factor X and V requirement test.....	30
6	Results of satellitism test.....	32
7	Summary of the tests conducted and result for each sample.....	33
8	Incidence of identified organisms.....	34



## LIST OF FIGURES

Figure		Page
1	Conceptual framework of the study.....	6
2	Theoretical framework of the study.....	7
3	Isolation of organisms.....	22
4	Identification of organisms.....	23

## LIST OF APPENDIX TABLES

Appendix Table	Page
1      Frequency and percentage of possible organisms in TSI test.....	44
2      Frequency and percentage of possible organisms in cetrimide test.....	44
3      Frequency and percentage of possible organisms in optochin susceptibility test.....	44
4      Frequency and percentage of possible organisms in factor X and V requirement test.....	45
5      Frequency and percentage of possible organisms in satellitism test.....	45

## LIST OF APPENDIX FIGURES

Appendix Figure		Page
1	Sample collection.....	46
2	Colony growth in blood agar plate.....	46
3	Colony growth in cetrimide agar.....	47
4	Colony growth in chocolate agar.....	47
5	Colony growth in nutrient agar.....	48
6	Results of triple sugar iron (TSI) test (a) Acid/Acid (A/A) without gas (b) Alkaline/Acid (K/A) (c) No change (KNC) (d) Acid/Acid (A/A) with gas.....	49
7	Results of optochin susceptibility test (a) Susceptible (b) Resistant.....	50
8	Results of requirement for factor X and V.....	50
9	Results of satellitism test.....	51
10	Gram positive bacilli.....	51
11	Gram negative bacilli.....	52
12	Gram positive cocci.....	52
13	Gram negative cocci.....	53

# **IDENTIFICATION OF BACTERIA CAUSING PNEUMONIA IN AIR CONDITIONING UNITS IN A TERTIARY HOSPITAL IN CAVITE**

**Arianne Rose A. Lim  
Charles Angelo P. Villa**

---

An undergraduate thesis manuscript submitted to the faculty of the Medical Technology Department, College of Nursing, Cavite State University in partial fulfillment of the requirements for graduation with the degree of Bachelor of Science in Medical Technology with contribution No. SPCON-MT-2014-06 prepared under the supervision of Mrs. Fedelyn P. Estrella, RMT, MPH.

---

## **INTRODUCTION**

Pneumonia is an inflammatory illness of the lung. It has 4.8 million cases recorded annually. It is a common illness in all parts of the world in all age groups. Majority of deaths occur in the newborn period in children, with over two million deaths a year worldwide (Nurses Labs, 2012). The World Health Organization [WHO] (2012) estimated that one out of three newborn infant's death is due to pneumonia.

Pneumonia is one of the top five leading causes of mortality in the Philippines. According to the National Statistical Coordination Board of the Philippines, there are 776, 562 of pneumonia in the country in 2004 alone. This could be an implication that pneumonia is one of the leading causes of morbidity and mortality in the country (Mateo, 2012).

According to the University of Maryland Medical Center [UMMC] (2011), bacteria are the most common cause of pneumonia. However, pneumonia can also be