

**SYNERGISTIC EFFECT OF  $\beta$ -LACTAM ANTIBIOTICS  
AGAINST VANCOMYCIN-RESISTANT  
*Staphylococcus aureus***



An Undergraduate Thesis Presented to  
The faculty of the Biological Sciences Department  
College of Science  
De La Salle University-Dasmariñas  
Dasmariñas, Cavite

In Partial Fulfillment of the Requirements  
for the Degree of Bachelor of Science Major in Human Biology

**LARMIE JOYCE A. PAZ  
CHRISTIAN KATHLEEN V. GABALES**

January 2006

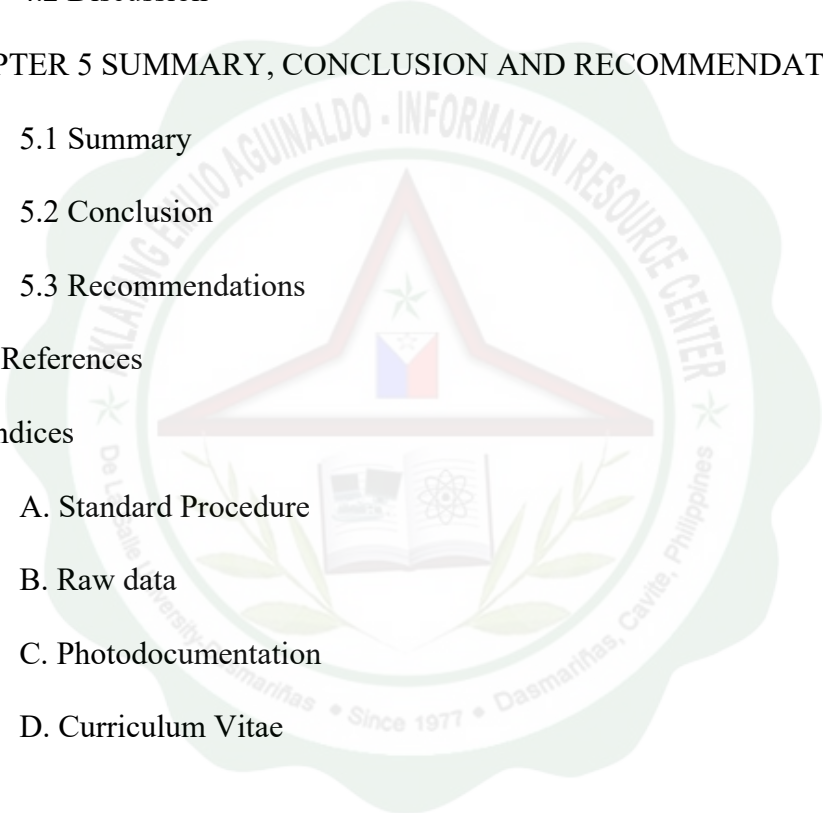
### Abstract

The study intended to determine the synergistic effect of two  $\beta$ -Lactam antibiotics, Amoxicillin and Ampicillin, against Vancomycin-resistant *Staphylococcus aureus* (VRSA). The study utilized a Randomized Complete Block Design, with six treatments. T<sub>0</sub> is water, T<sub>1</sub> is (100%) 50 mg/mL Ampicillin, T<sub>2</sub> is (100%) 50 mg/mL Amoxicillin. Combination drugs contain (50%) 25 mg/mL of both drugs for T<sub>3</sub>, (25%) 12.5 mg/mL Ampicillin and (75 %) 37.5 mg/mL Amoxicillin for T<sub>4</sub> and (25%) 12.5 mg/mL Amoxicillin and (75 %) 37.5 mg/mL Ampicillin for T<sub>5</sub>. The experiment was conducted at the De La Salle University-Dasmariñas Biology Research Laboratory. Methods used were screening of VRSA and disk diffusion assay. Twenty patients were subjected to facial swabbing. The swabs were inoculated in a nutrient broth for enrichment and after 24 hours it was inoculated on Mannitol Salt agar. The obtained bacteria were subjected to different dilution of Vancomycin for the screening of VRSA. Results showed that on the fifth dilution of 31,250 units, 5 isolates survived, and on fourth dilution, with the concentration of 62,500 units, only 1 isolate survived. These isolates were the VRSA. The obtained VRSA was subjected to anti-VRSA sensitivity testing. This determined whether there was synergy of none and it was done by measuring the inhibition zones. The inhibition zones from T<sub>1</sub> to T<sub>5</sub> that were measured in centimeters (cm) were 2cm, 2cm, 1.75cm, 1.6cm and 1.7cm respectively. Results showed that VRSA was sensitive to the different treatments, however, no synergy was observed.

## TABLE OF CONTENTS

Title page	1
Approval Sheet	2
Abstract	3
Acknowledgment	4
Table of Contents	5
List of Tables	7
<b>CHAPTER 1 INTRODUCTION</b>	
1.1 Background of the Study	8
1.2 Conceptual Framework	10
1.3 Statement of the Problem	10
1.4 Scope and Limitation	11
1.5 Significance of the study	11
1.6 Definition of Terms	12
<b>CHAPTER 2 LITERATURE REVIEW</b>	
2.1 Conceptual Literature	14
2.2 Related Studies	23
<b>CHAPTER 3 METHODOLOGY</b>	
3.1 Research Design	27
3.2 Research Setting	27

3.3 Research Procedure	27
3.4 Data Gathering and Statistical analysis	29
CHAPTER 4 RESULTS AND DISCUSSION	
4.1 Results	30
4.2 Discussion	33
CHAPTER 5 SUMMARY, CONCLUSION AND RECOMMENDATIONS	
5.1 Summary	36
5.2 Conclusion	36
5.3 Recommendations	37
Cited References	39
Appendices	
A. Standard Procedure	41
B. Raw data	44
C. Photodocumentation	46
D. Curriculum Vitae	56



## LIST OF TABLES

Figure 2.1	Cell wall of <i>Staphylococcus aureus</i>
Figure 2.2	$\beta$ -Lactam ring on penicillin
Figure 2.3	Chemical structure of Amoxicillin
Figure 2.4	Chemical structure of Ampicillin
Figure 2.5	Chemical structure of Vancomycin
Figure 2.6	Trapping of Vancomycin on the cell wall of <i>S. aureus</i>
Table 4.1	Characteristics of <i>S. aureus</i> in MSA incubated at 37°C for 24 hours
Table 4.2	Number of resistant <i>S. aureus</i> per concentration
Table 4.3	Average inhibition zone of the different treatments
Table 7.1	Sensitivity of (VRSA) to the different concentrations of the combined drugs through their inhibition zone
Table 7.2	Computation of the significant difference of control and treatments
Table 7.3	Table of Tukey method where the significant and not significant of treatments were computed
Plate 7.1	Swabbing of the face of one patient to isolate the <i>S. aureus</i>
Plate 7.2	Preparation of nutrient broth
Plate 7.3	Preparation of nutrient broth
Plate 7.4	Inoculation of obtained bacteria
Plate 7.5	Inoculation of obtained bacteria
Plate 7.6	Obtained bacteria
Plate 7.7	Preparation of master plate
Plate 7.8	Preparation of master plate
Plate 7.9	Pouring of nutrient agar with Vancomycin in the plate
Plate 7.10	Replica plating
Plate 7.11	Placing the isolated <i>S. aureus</i> in the prepared plates with Vancomycin
Plate 7.12	Plate without <i>S. aureus</i> that survive
Plate 7.13	Plate with <i>S. aureus</i> that survive with the concentration of 62,500 units
Plate 7.14	Cultured VRSA
Plate 7.15	Preparation of drugs
Plate 7.16	Preparation of drugs
Plate 7.17	Drugs that was use
Plate 7.18	Prepared Mueller-Hinton agar
Plate 7.19	Results
Plate 7.20	Results