

**TABLE OF CONTENTS**

	Page
COVER .....	i
ENDORSEMENT FORM .....	ii
DECLARATION .....	iii
IDENTITY .....	iv
SUMMARY .....	vi
ABSTRACT .....	ix
ACKNOWLEDGEMENTS .....	x
TABLE OF CONTENTS .....	xii
LIST OF TABLES .....	xv
LIST OF FIGURES .....	xvi
LIST OF APPENDICES .....	xvii
ABBREVIATIONS AND SYMBOLS .....	xviii
CHAPTER 1 INTRODUCTION .....	1
1.1. Research Background .....	1
1.2. Problem Statement .....	4
1.3. Research Purpose .....	4
1.4. Benefits of Research .....	4
1.4.1. Theoretical benefits .....	4
1.4.2. Practical benefits .....	5
1.5. Theoretical Basis .....	5
1.6. Hypothesis .....	6
CHAPTER 2 LITERATURE REVIEW .....	7
2.1. Lemongrass ( <i>Cymbopogon citratus</i> (DC.) Staph) .....	7
2.1.1. Taxonomical classification .....	7
2.1.2. Distribution .....	9
2.1.3. Habitat .....	9
2.1.4. Botanical Description .....	10
2.1.5. Pharmacology .....	10
2.1.6. Composition .....	11
2.2. Periodontal Disease .....	12
2.2.1. Overview .....	12
2.2.2. Pathogenesis .....	12
2.2.3. Clinical findings and lesions .....	13
2.2.4. Diagnosis .....	15
2.2.5. Treatment .....	16
2.2.6. Prevention .....	16
2.3. Silk Thread Ligature .....	17
2.3.1. Overview .....	17

2.3.2. Characteristics of non-absorbable silk thread Ligature.....	17
2.4. Rat ( <i>Rattus norvegicus</i> ) .....	18
2.4.1. Taxonomical classification .....	18
2.4.2. Behaviour .....	18
2.4.3. Rat as Experimental Animal of Periodontal Disease.....	19
2.5. Clinical Pathology .....	19
2.5.1. Complete blood count (Hematology profile) .....	19
2.6. The Teeth .....	20
2.6.1. Overview .....	20
2.6.2. Anatomy of a tooth .....	21
2.6.3. Anatomy and physiology of periodontium .....	23
2.6.4. Inflammation process of periodontal disease.....	24
 CHAPTER 3 MATERIALS AND METHODS .....	 27
3.1. Research Plan .....	27
3.2. Research Sample .....	27
3.3. Research Variables .....	29
3.3.1. Independent variable .....	29
3.3.2. Dependent variable .....	29
3.3.3. Controlled variable .....	29
3.4. Operational Definition .....	30
3.5. Research Location and Time .....	30
3.6. Research Materials and Equipment .....	31
3.6.1. Lemongrass ( <i>Cymbopogon citratus</i> (DC.) Staph) extract irrigation .....	31
3.6.2. Rat ( <i>Rattus norvegicus</i> ) anaesthesia .....	31
3.6.3. Ligature placement .....	31
3.6.4. Experimental animals .....	32
3.6.5. Euthanasia of rats ( <i>Rattus norvegicus</i> ) .....	32
3.6.6. Complete blood count .....	32
3.6.7. Histopathology preparation .....	32
3.7. Research Procedure .....	33
3.7.1. Extract making .....	33
3.7.2. Inducement of periodontal disease .....	34
3.7.3. Treatment of induced periodontal disease .....	35
3.7.4. Euthanasia .....	35
3.7.5. Blood sample collection .....	36
3.7.6. Complete blood count .....	37
3.7.7. Histopathology slides .....	37
3.7.8. Scoring histopathology evaluation .....	38
3.8. Research Framework .....	40

CHAPTER 4 RESEARCH RESULT .....	41
4.1. Macroscopic view .....	42
4.2. Microscopic view .....	43
4.3. Histopathological evaluation .....	46
4.4. Hematological profile evaluation .....	48
CHAPTER 5 DISCUSSION .....	51
5.1. Hematological profile discussion.....	51
5.1.1. Red blood cell variables.....	51
5.1.2. White blood cell variables.....	56
5.1.3. Thrombocytes variable.....	59
5.2. Histopathological changes discussion.....	60
CHAPTER 6 CONCLUSION AND SUGGESTIONS .....	63
6.1. Conclusion .....	63
6.2. Suggestions .....	63
BIBLIOGRAPHY .....	64
APPENDICES .....	72

**LIST OF TABLES**

Table	Page
3.1. Histopathological parameters and numerical scoring .....	39
4.1. Median scoring based on inflammation of gingiva, inflammation of periodontal ligament and osteolysis of alveolar bone on rats <i>Rattus norvegicus</i> treated using lemongrass <i>Cymbopogon citratus</i> (DC.) Staph. ....	46
4.2. Comparative analysis of red blood cells among groups .....	49
4.3. Comparative analysis of white blood cells among groups .....	49
4.4. Comparative analysis of thrombocytes among groups .....	50

## LIST OF FIGURES

Figure	Page
2.1. Image of lemongrass <i>Cymbopogon citratus</i> (DC.) Stapf .....	7
2.2. Chemical structure of cymbopogon .....	11
2.3. Chemical structure of the major constituents of lemongrass <i>Cymbopogon citratus</i> (DC.) Stapf .....	11
2.4. Stages of periodontal disease in cats .....	15
2.5. Incisors of a rat .....	20
2.6. Illustration of tooth anatomy with short descriptions .....	22
2.7. Illustration of the anatomy of periodontium .....	23
2.8. Section of the periodontal space of rat incisor- tooth (TH), periodontal ligament (PDL) and alveolar bone (AB) .....	26
2.9. Histopathological detail of the area which reveals the presence of a rich mixture of cellular debris and neutrophils .....	26
3.0. Histopathology of normal periodontium .....	26
3.1. Sample size formula .....	27
3.2. Randomization design for all treatment group .....	28
3.3. Inducement of periodontal disease using a non-absorbable silk thread ligature .....	34
3.4. Research framework .....	40
4.1. Macroscopic view of periodontitis before treatment .....	42
4.2. Macroscopic view of periodontitis after treatment .....	42
4.3. Overview of microscopic inflammation of all groups .....	43
4.4. Overview of microscopic periodontal ligament inflammation of all groups .....	44
4.5. Overview of microscopic alveolar bone osteolysis of all groups .....	45

**LIST OF APPENDICES**

Appendix	Page
1. Histopathology slides preparation procedure .....	72
2. Standard Operational Procedure (SOP) of Hematology Analyser of Small Animal Hospital of Faculty of Veterinary Medicine, Universitas Airlangga .....	75
3. Spss data for haematological profile .....	77
4. Histopathology scoring data .....	134
5. Spss data for histopathological scoring .....	136
6. Ethical clearance certificate .....	153
7. Hematological profile original result .....	154
8. Anaesthetic dose calculation .....	159
9. Decoction method concentration calculation .....	160
10. Research documentation .....	161

**ABBREVIATIONS AND SYMBOLS**

AB	= Alveolar Bone
C (-)	= Control Negative
C (+)	= Control Positive
CBC	= Complete Blood Count
cc	= Cubic Centimetre
DC.	= de Candolle.
d/L	= Decilitre
fL	= Femtolitres
EDTA	= Ethylene Diamine Tetra Acetic Acid
g	= Gram
Hct	= Haematocrit
HE	= Haematoxylin Eosin
Hgb	= Haemoglobin Concentration
Kg	= Kilograms
L	= Litre
MCH	= Mean Corpuscular Haemoglobin
MCHC	= Mean Corpuscular Haemoglobin Concentration
MCV	= Mean Corpuscular Volume
Mg	= Milligram
ml	= Millilitre
MPV	= Mean Platelet Volume
PDL	= Periodontal Ligament
PMN	= Polymorphonuclear
Pg	= Picogram
RBC	= Red Blood Cell
SPSS	= Statistical Package for the Social Sciences
T1	= Treatment 1
T2	= Treatment 2
T3	= Treatment 3
TH	= Tooth
WBC	= White Blood Cell
%	= Percentage