TABLE OF CONTENTS	
	Page
ACKNOWLEDGEMENTS	iii
ABSTRACT (THAI)	V
ABSTRACT (ENGLISH)	vii
LIST OF TABLES	5 x 2
LIST OF FIGURES	xi
CHAPTER I INTRODUCTION	1-
1.1 Rationale	1
1.2 Objective	2
1.3 Hypothesis	2
CHAPTER II REVIEW OF THE LITERATURE	3
2.1 Amelogenesis	4
2.2 Enamel proteins	7
2.3 Amelogenesis imperfecta	801-9 1211
2.4 Etiology and candidate genes	11

CHAPTER III MATERIALS AND METHODS	34
3.1 Materials	34
3.1.1 Sample Selection	34
3.1.2 PCR materials	35
3.2 Methods	37
3.2.1 Mutation Analysis	37
3.2.2 Data Analysis	39
CHAPTER IV RESULTS	40
CHAPTER V DISCUSSION	58
CHAPTER VI CONCLUSIONS	64
BIBLIOGRAPHY	65
APPENDICES	79
Appendix A Coding sequence of <i>ENAM</i>	80
Appendix B ENAM amino acid sequence	90
CURRICULUM VITAE	91

## LIST OF TABLES

Table		Page
2.1	Previously reported mutations of human <i>ENAM</i>	19
3.1	The phenotypes of patients with hypoplastic amelogenesis imperfecta in this study	34
3.2	Oligonucleotides and polymerase chain reaction (PCR) conditions for <i>ENAM</i> mutation analysis	36
3.3	Oligonucleotides and polymerase chain reaction (PCR) conditions for <i>ENAM</i> mutation analysis	37
3.4	Reagents and concentration used in PCRs of all exons	38
3.5	PCR conditions of exons 1-10 (for all primers except 10F/10R,	38
	12F/12R and 13F/13R)	
3.6	PCR conditions of exon 10 (Primer 12F/12R and 13F/13R)	38
4.1	ENAM single nucleotide polymorphisms in proband 1	44
4.2	ENAM single nucleotide polymorphisms in proband 2	49

LIST OF FIGURES	6).1
Figure	Page
2.1 Cycle of ameloblasts in amelogenesis	5
2.2 Changes in morphology of rat ameloblasts during amelog	genesis 7
2.3 AI classification by Witkop	11
2.4 Phenotype of mutation in signaling peptides of <i>AMEL</i>	12
2.5 Phenotype of <i>AMEL</i> mutation in the N-terminus of amelo	ogenin 13
protein	
2.6 Phenotype of AMEL mutation in the C-terminus of amelo	ogenin 13
protein	
2.7 Phenotype of <i>MMP-20</i> mutation by Kim and colleagues	15
2.8 Phenotype of <i>KLK4</i> mutation by Hart and colleagues	16
2.9 Phenotype of <i>FAM83H</i> mutation by Kim and colleagues	17
2.10 Phenotype of <i>FAM83H</i> mutation by Hyun and colleagu	es 18
2.11 Schematic view of human <i>ENAM</i> with location of know	n 19
mutations	
2.12 Phenotype of <i>ENAM</i> mutation reported by Rajpar and c	olleagues 21
2.13 Phenotype of <i>ENAM</i> mutation reported by Mardh and c	olleagues 21
2.14 Phenotype of <i>ENAM</i> mutation reported by Kida and col	leagues 22
2.15 Phenotype of <i>ENAM</i> mutation reported by Hart and coll	leagues 23

2.16	Phenotype of heterozygous carriers with <i>ENAM</i> mutation	24
	reported by Hart and colleagues	
2.17	Phenotype of <i>ENAM</i> mutation reported by Hart and colleagues	24
2.18	ENAM mutation reported by Kim and colleagues	26
2.19	ENAM mutation in another family reported by Kim and colleagues	27
2.20	ENAM mutation reported by Ozdemir and colleagues	29
2.21	ENAM mutation in another family reported by Ozdemir and	30
	colleagues	
2.22	Phenotype of <i>ENAM</i> mutation reported by Gutierrrez and colleagues	31
	Contragues	
2.23	ENAM mutation reported by Kang and colleagues	32
2.24	ENAM mutation in another family reported by Kang and	33
	colleagues	
4.1	Gel electrophoresis of exons 1-10 using different primers	40
4.2 I	Pedigree of the family of proband 1	41
4.3 1	Phenotypes of proband 1	42
4.4 l	Panoramic radiograph of proband 1	43
4.5	Clinical and radiographic findings in proband 1	43
4.6	Clinical and radiographic findings in proband 1's mother	44
4.7	SNPs in proband 1 compared with a normal sequence	45
4.8 I	Pedigree of the family of proband 2	45
4.9	Clinical and radiographic findings in proband 2	46

4.10	The periapical radiograph of the first permanent mandibular	47
	molars in proband 2	
4.11	Panoramic radiograph of proband 2	48
4.12	Photomicrograph of the gingival biopsy of proband 2	49
4.13	SNPs in proband 2 compared with a normal sequence	50
4.14	Pedigree of the family of proband 3	50
4.15	Clinical and radiographic findings in proband 3 when he was 10 years old	52
4.16	Clinical and radiographic findings in proband 3when he was 13 years old	53
4.17	Cone beam computed tomography of proband 3	54
4.18	Pedigree of the family of probands 4 and 5	55
4.19	Clinical and radiographic findings in probands 4 and 5	56
4.20	Clinical and radiographic findings in proband 6	57

## ลิขสิทธิ์มหาวิทยาลัยเชียงใหม Copyright<sup>©</sup> by Chiang Mai University All rights reserved