MOLECULAR EPIDEMIOLOGY OF NOROVIRUS AND SAPOVIRUS, AND EVOLUTIONARY GENETIC ANALYSIS OF NOROVIRUS STRAINS CIRCULATING IN CHIANG MAI PROVINCE DURING THE

PAST DECADE

KANITTAPON SUPADEJ

DOCTOR OF PHILOSOPHY
IN MICROBIOLOGY
Copyright
A light service of the service of

GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
MARCH 2018

MOLECULAR EPIDEMIOLOGY OF NOROVIRUS AND SAPOVIRUS, AND EVOLUTIONARY GENETIC ANALYSIS OF NOROVIRUS STRAINS CIRCULATING IN CHIANG MAI PROVINCE DURING THE PAST DECADE

KANITTAPON SUPADEJ

A THESIS SUBMITTED TO CHIANG MAI UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

IN MICROBIOLOGY

GRADUATE SCHOOL, CHIANG MAI UNIVERSITY

MARCH 2018

MOLECULAR EPIDEMIOLOGY OF NOROVIRUS AND SAPOVIRUS, AND EVOLUTIONARY GENETIC . ANALYSIS OF NOROVIRUS STRAINS CIRCULATING IN CHIANG MAI PROVINCE DURING THE PAST DECADE

KANITTAPON SUPADEJ

THIS THESIS HAS BEEN APPROVED TO BE A PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN MICROBIOLOGY

Examination Committee:	Advisory Committee:
Leera Kittigul Chairman	Khan Pattar Advisor
(Prof. Dr. Leera Kittigul)	(Assoc. Prof. Dr. Pattara Khamrin)
Khain Pattan Member	Divat Mancelson Co-advisor
(Assoc. Prof. Dr. Pattara Khamrin)	(Prof. Dr. Niwat Maneekarn)
Diwat Manerkam Member	Kum thip h - Co-advisor
(Prof. Dr. Niwat Maneekarn)	(Dr. Kattareeya Kumthip)
(Dr. Kattareeya Kumthip)	
Aksara Thongprachum Member	
(Dr. Aksara Thongprachum)	

28 March 2018 Copyright © by Chiang Mai University

ACKNOWLEDGEMENT

I would like to express my grateful gratitude to my thesis advisor, Associate Professor Dr. Pattara Khamrin, and co-advisors, Professor Dr. Niwat Maneekarn and Dr. Kattareeya Kumthip for giving me great opportunity, invaluable advice, excellent guidance, teaching, understanding, support, and warm encouragement throughout my thesis work.

My grateful gratitude is also given to the examining committee, Professor Dr. Leera Kittigul and Dr. Aksara Thongprachum for their valuable points of suggestions and comments that were essential in improving my thesis manuscript.

My sincere thanks go to Professor Dr. Hiroshi Ushijima, Division of Microbiology, Department of Pathology and Microbiology, Nihon University School of Medicine, Tokyo, Japan and to Professor Dr. Hitoshi Oshitani, Associate Professor Dr. Mayuko Saito, Assistant Professor Dr. Michiko Okamoto, and Assistant Professor Dr. Yuki Furuse, Department of Virology, Tohoku University Graduate School of Medicine, Sendai, Japan for their invaluable supporting and giving me an opportunity for short term training that were very useful for my thesis work.

My special thank is also given to Dr. Aksara Thongprachum, Dr. Rungnapa Malasao, and Dr. Natthawan Chaimongkol for their good guidance, supporting, teaching, and encouraging me throughout my thesis work in the molecular techniques. And many thanks to Ms. Arpaporn Yodmeeklin, Ms. Watchaporn Chuchaona, Mr. Pakawat Kochjan, Ms. Sirithorn Surajinda, Ms. Lauren Wilburn, and Ms. Lucy Menage my laboratory colleagues (Emerging and Re-emerging Diarrheal Viruses Research Center) for their help, love, good suggestion for solving my thesis problem, and assisting me in many ways during my study.

My grateful acknowledgment is extended to the CMU 50th Anniversary Ph.D. program and the Center of Excellence (Emerging and Re-emerging Diarrheal Viruses Research Center), Department of Microbiology, Faculty of Medicine, Chiang Mai University, for the main financial support of my thesis research.

I would also like to thank all staff and friends in the Department of Microbiology, Faculty of Medicine, Chiang Mai University for wonderful friendship and encouraging me on my work.

I am deeply thankful to my lovely family for their love, understanding, supporting, and endless encouragement.

