

ACKNOWLEDGEMENTS

For the successful completion of this work, I would like to express my deepest gratitude and profound appreciation to Professor Dr. Wanpen Chaicumpa, Faculty of Allied Health Sciences, Thammasat University, Rangsit Campus, Pathumthani, Thailand, my advisor, for her ingenious supervision, kindness, innumerable guidance, understanding, insight and resources which facilitated the speedy completion of this study. Without her virtues, this study would not have been accomplished.

I would like to express my deepest gratitude to person I am deeply indebted as following: Associate Professor Dr. Pramuan Tapchaisri, my co-advisor, Dean of Faculty of Allied Health Sciences, Thammasat University, Rangsit Campus, Pathumthani, Thailand. Dr. Pongsri Tongtawe, my co-advisors, Faculty of Allied Health Sciences, Thammasat University, Rangsit Campus, Pathumthani, Thailand, for her kindness, helps supervision and instruction of dot ELISA technique. To Associate Professor Dr. Manas Chongsa-nguan, Head, Department of Microbiology and Immunology, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand, for his kind acceptance to be my external thesis examiner

Sincere appreciation is expressed to Mr. Boonchay Eampokalap, Chief of Microbiology Laboratory, Bamrasnaradura Infectious Disease Institute, Ministry of Public Health, Nonthaburi, Thailand, for his permission to use laboratory facilities including patient samples, support, encouragement, and help throughout this study.

Special thanks are given to Assistant Professor Dr. Urai Chaisri, all of my seniors, juniors and friends, for the unforgettable warm friendship, cheerfulness, understanding, invaluable assistance, consultations and their help during my study.

Thanks are due to The Royal Bangkok Sports Club (R.B.S.C.), Bangkok, Thailand, the Thailand Research Fund (TRF) and the Faculty of Allied Health Sciences, Thammasat University, for the financial supports.

Finally, I also would like to thank my beloved parents, and sister for their everlasting true love, encouragement, mental and material which supported me throughout the study.

Unchana Thawornwan