EXTENDED-SPECTRUM BETA-LACTAMASES PRODUCING Escherichia coli (ESBLS-PRODUCING E. coli) IN DAIRY FARMS IN BELJING, CHINA

FARONG XU

MASTER OF VETERINARY PUBLIC HEALTH

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่ Copyright[©] by Chiang Mai University

CHIANG MAI UNIVERSITY AND FREIE UNIVERSITÄT BERLIN SEPTEMBER 2013 EXTENDED-SPECTRUM BETA-LACTAMASES PRODUCING Escherichia coli (ESBLS-PRODUCING E. coli) IN DAIRY FARMS IN BELJING, CHINA

FARONG XU

A THESIS SUBMITTED TO CHIANG MAI UNIVERSITY AND FREIE UNIVERSITÄT BERLIN IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF VETERINARY PUBLIC HEALTH

CHIANG MAI UNIVERSITY AND FREIE UNIVERSITÄT BERLIN SEPTEMBER 2013

EXTENDED-SPECTRUM BETA-LACTAMASES PRODUCING Escherichia coli (ESBLS-PRODUCING E. coli) IN DAIRY FARMS IN BEIJING, CHINA

FARONG XU

THIS THESIS HAS BEEN APPROVED TO BE A PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF VETERINARY PUBLIC HEALTH

EXAMINING COMMITTEE

THESIS ADVISORY COMMITTEE

P. Poncusil. CHAIRPERSON

Assoc. Prof. Dr. Patamabhorn Amavisit

MEMBER

Prof. Dr. Reinhard Fries

MEMBER

Dr. Maximilian Baumann

Veryber / go Jour MEMBER

Asst. Prof. Dr. Khwanchai Kreausukon

10 September 2013

© Copyright by Chiang Mai University and Freie Universität Berlin

Prof. Dr. Uwe Rösler (FU-BERLIN)

ADVISOR

Asst. Prof. Dr. Khwanchai Kreausukon (CMU)

ACKNOWLEDGMENTS

I would like to express my heartfelt gratitude to the Veterinary Public Health Centre for Asia Pacific (VPHCAP) for granting my scholarship, and also would like express my sincere gratitude to Faculty of Veterinary Medicine, Chiang Mai University (CMU), Charoen Pokphand (CP) Group, the Thai Government, Freie Universität Berlin (FU-Berlin), Deutscher Akademischer Austausch Dienst (DAAD) and German Government for financial and other support which enabled me to pursue my studies in Thailand, Germany and Vienna. I would like to extend my appreciation to the Beijing General Station of Animal Husbandry and Veterinary Service for consenting me to undertake this study.

I am heartily thankful to my supervisor Professor Dr. Uwe Roesler of FU-Berlin and Assist. Prof. Dr. Khwanchai Kreausukon of CMU, whose encouragement, guidance, enthusiasm and immense knowledge enabled me to develop an understanding of the subject and to write this manuscript successfully. I especially extend my cordial gratitude to Dr. med. vet. Anika Friese and other staff working at the Institut für Tier- und Umwelthygiene in FU-Berlin for their great help and support.

I am particularly indebted to Prof. Dr. Leo Brunnberg, Dean of Faculty of Veterinary Medicine, FU-Berlin who kindly let me visit the clinic animal hospital and gave me kind encouragement and useful instructions during my studying in Berlin.

I sincerely express my cordial gratitude to Assoc. Prof. Dr. Lertrak Srikitjakarn, Dean of Faculty of Veterinary Medicine, CMU for tremendous amount of support and encouragement during my entire study period.

It is my great honor to be bestowed with the opportunities to attend to lectures from eminent professors. I consider myself fortunate to have gotten vast insights into Veterinary Public Health from Prof. Dr. Karl-Hans Zessin, Prof. Dr. Reinhard Fries,

iii

Prof. Dr. Thomas Alter, Prof. Dr. Franz Hoerchner from FU-Berlin and Assoc. Prof. Dr. Nopporn Sittisombut from Faculty of Medicine, CMU, Thailand. A special acknowledgement should be shown to Dr. Prapas Patchanee, Dr. Veerask Punyapornwithaya, Dr.Kannika Na Lampang, Dr. Sukolrat Boonyayatra and other lecturers, from whose excellent lectures I benefited greatly. My heartfelt gratitude should go to Prof. Dr. Peter Paulsen, Dr. Agathe Pfeifer, Dr. Nattakarn Awaiwanont and others in the Institute of Meat Hygiene, University of Veterinary Medicine Vienna, for the excellent course organization and laboratory practice, and making our three weeks in Vienna a lifelong memory.

I am particularly indebted to Dr. Maximillian Baumann for his tremendous support for my study and the excellent organization during our studies in Berlin. I am very much grateful to Dr. Antje Hoppenheit, Dr. Jana Roller and others in FU-Berlin who always found time to be with us and made our stay in Berlin very comfortable and conducive to pursue our studies. I would like to acknowledge my indebtedness to Deputy Director, Assist. Prof. Dr. Duangporn Pichpol, Deputy Director, Dr. Tongkorn Meeyam, Dr. Warangkhana Chaisowwong, Dr. Anucha Sirimalaisuwan, Mrs. Jariya Boontong, Mr. Aniwat Keufor, Ms. Khuanchanok Suriyawong, Mr. Sirote Sittisombut, Ms Chutimon Kumlor, Ms Chalita Jainonthee and other staff in VPHCAP, Faculty of Veterinary Medicine, CMU for being so supportive and always being there to help us around during our times of need.

I would extend my sincere thanks to director of Beijing General Station of Animal Husbandry and Veterinary Service, Dr. Haitao Wei, Chief Veterinary Officer, Prof. Dr. Junjie Zhu, Prof. Yongqiang Lu, Deputy Director Dr. Xiaodong Liu, Section Chief Prof. Dr. Jingyi Zhao and all my colleagues for their support during the time of this study. I especially appreciate Assoc. Prof. Dr. Baolinag Pan from China Agricultural University for his Lab support, and Prof. Dr. Yongqing Li and Prof. Xiaoling Chen from Beijing Academy of Agriculture and Forestry Sciences for their kind donation of the APE 20 E kit and Lab support.

iv

I would like to thank all my classmates of 5th MVPH course for the mutual understanding, inspiration, cooperation, support and for the sacrifices you all made to make our togetherness a wonderful experience and memorable one.

Last, but not the least, I would like to express my deepest appreciation for my wife for her encouragement, love, trust and support during the period of my studying abroad. Likewise I am grateful to my parents, my son and my family for their love, understanding and support for my study.

Farong Xu

Adansurphised Stru Copyright[©] by Chiang Mai University All rights reserved