

**ADHESION AND INHIBITION OF *Streptococcus mutans*
BY ELECTROSPUN FIBERS CONTAINING
PROPOLIS FOR FAST DISSOLVING
DOSAGE FORM**

CHAWALINEE ASAWAHAME

**DOCTOR OF PHILOSOPHY
IN PHARMACY**

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

**GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
JULY 2014**

**ADHESION AND INHIBITION OF *Streptococcus mutans*
BY ELECTROSPUN FIBERS CONTAINING
PROPOLIS FOR FAST DISSOLVING
DOSAGE FORM**

CHAWALINEE ASAWAHAME

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

GRADUATE SCHOOL, CHIANG MAI UNIVERSITY

JULY 2014

**ADHESION AND INHIBITION OF *Streptococcus mutans*
BY ELECTROSPUN FIBERS CONTAINING
PROPOLIS FOR FAST DISSOLVING
DOSAGE FORM**

CHAWALINEE ASAWAHAME

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

Examination Committee:

Srikanjana Klayraung..... Chairman
(Dr. Srikanjana Klayraung)

Jakkapan Sirithunyalug..... Member
(Assoc. Prof. Dr. Jakkapan Sirithunyalug)

Sukum Eitssayeam..... Member
(Asst. Prof. Dr. Sukum Eitssayeam)

Yingmanee Tragoolpua..... Member
(Asst. Prof. Dr. Yingmanee Tragoolpua)

B. Sirithunyalug..... Member
(Assoc. Prof. Dr. Busaban Sirithunyalug)

Advisory Committee:

Jakkapan Sirithunyalug..... Advisor
(Assoc. Prof. Dr. Jakkapan Sirithunyalug)

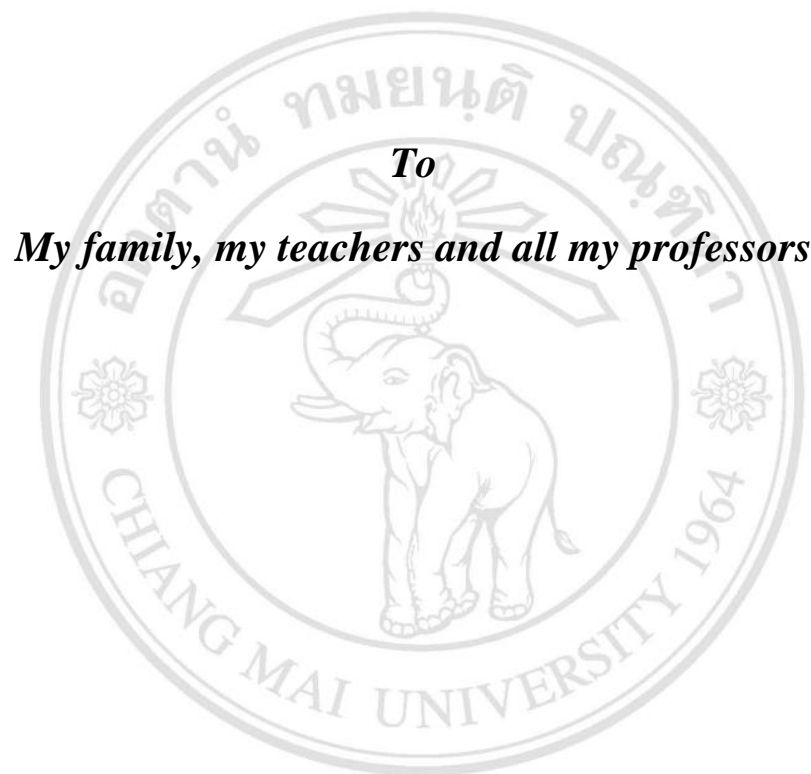
Sukum Eitssayeam..... Co-advisor
(Asst. Prof. Dr. Sukum Eitssayeam)

Yingmanee Tragoolpua..... Co-advisor
(Asst. Prof. Dr. Yingmanee Tragoolpua)

B. Sirithunyalug..... Co-advisor
(Assoc. Prof. Dr. Busaban Sirithunyalug)

24 July 2014

Copyright © by Chiang Mai University



To
My family, my teachers and all my professors

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved

ACKNOWLEDGEMENTS

It would never have been possible to finish this dissertation without the guidance of the committee members, help from friends, and support from my family.

More specifically, I would like to express my deepest gratitude to my advisor, Assoc. Prof. Dr. Jakkapan Sirithunyalug, for his excellent guidance, caring and patience while creating an excellent atmosphere for doing research. I would like to acknowledge Asst. Prof. Dr. Sukum Eitssayeam, who gave me experience about electrospinning research and supported me through all these years. My appreciation is also given to Asst. Prof. Dr. Yingmanee Tragoolpua for her kind consultations and encouragements. I'm very thankful to Assoc. Prof. Dr. Busaban Sirithunyalug for her support and advice. I would also like to thank the external committee, Dr. Srikanjana Klayraung for her advice, comments and suggestions.

I also thank all staff at the Department of Physics and Materials Science, Department of Biology, Faculty of Science and Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, for their assistance and while providing facilities and materials for my research. Also many thankful to Faculty of Agro-Industry, Chiang Mai university for providing viscosity instrument.

I would like to extend a special thanks to Dr. Krit Sutjarittangtham, who was always willing to help, give his best suggestions and supported this undertaking in many ways. A thank you to Dr. Wipawan Pukumpuang for her guidance on techniques used in the field of microbiology. Moreover, a thank you goes to Ms. Thida Kaewkod for her kindness and friendship while providing me with much information and discussing with me in the part of microbiology. A thank you is expressed to Mr. Patthanakorn Jaiturong and Ms. Nachtharinee Laosirisathian for their assistance and encouragement.

My appreciation is also extended to all my colleagues at the Faculty of Pharmaceutical Sciences, Huachiew Chalermprakiet University and all of my friends who have been there to support my journey towards the end of this thesis.

Finally, I would also like to thank my parents and my brother. They have always been supporting and encouraging me through their best wishes, throughout my years of study.

Chawalinee Asawahame



ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved