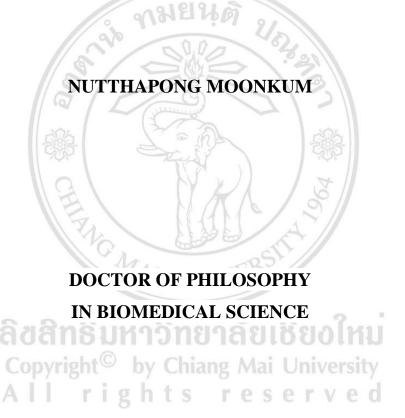
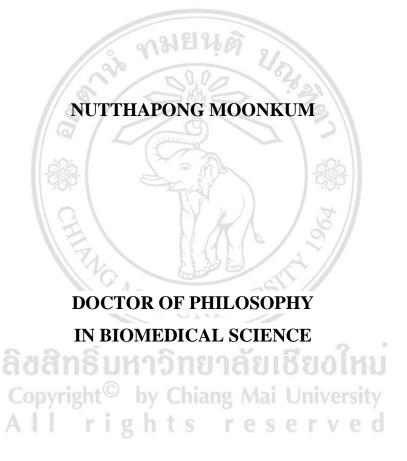
CHARACTERIZATION AND EVALUATION OF CIRCULATING ENDOGENOUS STEM CELLS IN DEGENERATIVE DISEASE



GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
DECEMBER 2017

CHARACTERIZATION AND EVALUATION OF CIRCULATING ENDOGENOUS STEM CELLS IN DEGENERATIVE DISEASE



GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
DECEMBER 2017

CHARACTERIZATION AND EVALUATION OF CIRCULATING ENDOGENOUS STEM CELLS IN DEGENERATIVE DISEASE

NUTTHAPONG MOONKUM

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

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่ Copyright[©] by Chiang Mai University All rights reserved

GRADUATE SCHOOL, CHIANG MAI UNIVERSITY
DECEMBER 2017

CHARACTERIZATION AND EVALUATION OF ENDOGENOUS STEM CELLS IN DEGENERATIVE DISEASE

NUTTHAPONG MOONKUM

THIS THESIS HAS BEEN APPROVED TO BE A PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY
IN BIOMEDICAL SCIENCE

Examination Committee:	Advisory Committee:
Chairman Chairman	Panle lan U- Advisor
(Assoc. Prof. Dr. Rajesh Ramasamy)	(Prof. Dr. Samlee Mankhetkorn)
Member	Im Jam Co-advisor
(Prof. Dr. Chaleaw Piyachon)	(Prof. Pasuk Mahakknaukrauh, M.D.)
Member	Co-advisor
(Assoc. Prof. Dr. Siriporn Okonoki)	(Dr. Wipob Suttana)
Joonwight by Chiang	g Mai University reserved
(Asst. Prof. Dr. Phuanjai Rattakorn)	
Vala Member	
(Dr. Tassanee Permthai)	

18 December 2017

Copyright © by Chiang Mai University

ACKNOWLEDGEMENT

There are many persons to whom I am indebted for their help in successful this study.

My sincere gratitude is to Prof. Dr. Samlee Mankhetkorn, my advisor, for the encouragement, exceptional ideas and support during the course of this study and for providing the excellent facilities for my work.

My sincere gratitude thank is also to the Cancer Research and Treatment Center Co., Ltd. who allow me doing and accessing to all research facilities and totally provided financial support my thesis.

My special thanks are to members in Cancer Research and Treatment Center, Co., Ltd Doi Saket District, Chiangmai, Thailand and Laboratory of Physical Chemistry Molecular and Cellular Biology (PCMCB), Department of Radiologic Technology, Faculty of Associated Medical Sciences, Chiang Mai University, Chiang Mai that have been very cooperative and help.

Finally, I would like to express my deepest gratitude to my parents, my whole family and close relatives for their everlasting love, understanding and numerous supports.

Copyright[©] by Chiang Mai University

All rights reserved

Nutthapong Moonkum