## **ACKNOWLEDGEMENT**

This research was supported by Medeze Research and Development. co. ltd. My Ph.D. study was funded by One Research One Graduate fellowships from SUT.

I would like to give my sincere gratitude to my thesis advisor, Assoc. Prof. Dr. Rangsun Parnpai, for giving me a second chance to accomplish this degree. This journey would not have been possible without his dedicated support.

My heartfelt gratitude next goes to Prof. Jun-ichi Masuyama and Dr. Veerapol Khemarangsan for granting me the invaluable opportunity to work in this esteemed field. Their unwavering support, mentorship, and expertise have played a pivotal role in shaping my academic and professional growth.

I extend my sincere gratitude to Assoc. Prof. Dr. Kulthida Vaeteewoottacharn, the esteemed Chairperson of my thesis examination. I am profoundly honored to have had the privilege of your guidance and oversight throughout this crucial phase of my academic journey.

My appreciation next goes to my thesis committee members, Assoc. Prof. Dr. Mariena Ketudat-Cairns, Assoc. Prof. Dr. Kaemwich Jantama, and Asst. Prof. Dr. Ruttachuk Rungsiwiwut, for their scientific advices, encouragements, and supports throughout my study. Thank you once again for the long-term mentorship since my master's degree studies. You have bestowed invaluable experiences on this magnificent scientific journey.

I am deeply grateful to Dr. Tatsanee Phermthai from the Faculty of Medicine, Siriraj Hospital, Mahidol University, for her invaluable guidance, both in terms of scientific insights and life advice. You are my elder sister in my career path and in real life.

Additionally, I would like to extend my sincere gratitude to Dr. Wannida Wongsakmanee (M.D.) and the nurses at the Division of Obstetrics and Gynaecology, Suranaree University of Technology Hospital for collecting umbilical cord blood used in this study. I would also like to extend my thanks to Dr. Sirilak Somredngan, the

Medeze NK laboratory staff, and all umbilical cord blood donors who participated in this work. This journey may not have come true without you.

Finally, knowing that you are searching for your name, I want to extend my endless appreciation to Dr. Tanut, little Manat and our family for always being there with me. Thank you, once again, for sharing this journey of life and growing together.

Hataiwan Kunkanjanawan