

## *ACKNOWLEDGEMENTS*

*Though words are seldom sufficient to express gratitude and feelings, it gives me an opportunity to acknowledge those who helped me during the course of my study.*

*First of all, I bow with reverence to thank 'Lord Shiva' who enriched me with such golden opportunity and infused the power in my mind to fulfill the task assigned to me.*

*It is definitely a pleasing privilege for me to express my insightful gratefulness to 'Mahamana Pandit Madan Mohan Malviya ji', founder of this beautiful temple, Banaras Hindu University and whose creation of this serene varsity gave me pleasant environment and facility to carry out this research work.*

*I wish to express my gratitude and indebtedness to my revered supervisor Prof. Sanjay Singh, Department of Pharmaceutics, Indian Institute of Technology (Banaras Hindu University), Varanasi, for his constant support, kind encouragement, immensely valuable ideas, suggestions and for having an unwavering attention. I have been amazingly fortunate to have a supervisor who gave me the freedom to explore the research findings on my own.*

*I am grateful to Prof. S.K. Singh, Head, Prof. R. S. Srivastava, Ex-Head and Prof. B. Mishra, Former-Head, Department of Pharmaceutics, IIT (BHU) for allowing me to access the facilities in the department for carrying out my research work and for their kind support during the course of my study. I always honour Prof. B. Mishra sir (who took my Ph.D interview and selected me) for giving me the wonderful opportunity to get the excellent turning point of my life.*

*I acknowledge my Research Progress Committee (RPC) members, Mr. A. K. Srivastava, DPGC Nomine, Department of Pharmaceutics, IIT (BHU); Prof. B. Mishra, Expert in the field from the Department and Dr. Pradeep Srivastava, External Subject Expert, School of Biochemical Engineering, IIT (BHU).*

*It is my pleasure to thank all other teachers of the Department of Pharmaceutics Prof. S.K. Singh, Prof. S.K. Srivastava, Dr. (Mrs.) Hema Latha, Dr. Sairam Krishnanmurthy, Dr. Vikas Kumar, Dr. Ashok Kumar, Dr. A. Senthil Raja, Dr. Alakh N. Sahu, Dr. S. K. Mishra, Ms. Ruchi Chawla, Dr. M.S. Muthu, Dr. Prasanta Kumar Nayak and Dr. Gyan Prakash Modi for their valuable suggestion and guidance throughout the course of my research.*

*My heartfelt thanks to **all my teachers** right from school until now who shaped and motivated me to do research and all my well-wishers for their constant encouragement and wishes for my career.*

*I pay my sincere thanks to **Mr. Ram Jiyawan, Mr. Sanjeev Kumar Singh, Mr. Yaswant Singh, Ms. Shyamali Ghosal, Mr. Chhote Lal, Mr. Virendra Kumar, Mr. Nand Lal, Mr. Madan Lal, Mr. Ram Hriday Pathak, Mr. Akhila Nand Upadhyay, Mr. Arun Kumar, Ms. Archana Singh, Mr. Mohd. Jameel, Mr. Kapil Dev Rai, Mr. Prakhar Mishra, Mr. Sunil Kumar Singh, Mr. Gopal Prasad** and all other non teaching staff of the department who had provided me all the requirements that I needed for my research.*

*I am indeed obliged and sincerely thankful to **Dr. M.S. Muthu**, Assistant Professor, Department of Pharmaceutics, IIT (BHU), Varanasi for his kind revisions and valuable suggestions of my manuscripts before publishing my research works. I learned a lot in manuscript writing, journal selection and publication within short period of his guidance.*

*I would like to convey my regards and thanks to **Dr. C. Periasamy**, Assistant Professor, Malaviya National Institute of Technology, Jaipur for carried out X-Ray diffraction studies and his moral support. I express my sincere thanks to **Prof. Sitaram Velaga** and **Dr. Parameshwara Rao Vuddanda**, Department of Health Science, Lulea University of Technology, Sweden for carried out my differential scanning calorimetry analysis. I wish to express my deep regards and thanks to **Prof. S.C. Lakhotia**, Emeritus Professor & DST/DAE Ramanna Fellow, Department of Zoology, Banaras Hindu University, Varanasi for providing confocal laser scanning microscope facility.*

*I would like to convey my sincere thanks to **Prof. Nira Misra, Dr. Sanjeev Kumar Mahto, Chelladurai Karthikeyan Balavigneswaran** and **Mr. Kiran Yellappa Vajanthri**, School of Biomedical Engineering, IIT(BHU) and **Prof. Gopeshwar Narayan** and **Mr. Chandra Bhushan Prasad**, Department of Molecular and Human Genetics, BHU for their support in cell line studies.*

*I thank **Prof. Kulbhushan Tikoo**, NIPER, Mohali for TEM analysis of my nanoformulations. I also express my sincere thanks to **Prof. Debabrata Dash**, and his students, Department of Biochemistry, IMS, BHU to carryout haemolytic evaluations. I wish to express deep regards and thanks to **Dr. Jyoti Wadhwa** for her sincere input in differential staining of blood cells, moral support and friendship. I acknowledge **Mr. Ramoji Kjsuru, Mr. Udipak Rai, Ms. Swati Prakash, Mr. Nitin Verma** and **Mr. Tushar Batra** for their tireless assistance in carrying out the pharmacokinetic and tissue distribution studies.*

*I would like to express my special thanks and indebtedness to my seniors and lab mates **Dr. Amit Mishra, Dr. Manoj Rawat, Dr. Subhashis Chakraborty, Dr. Achint Jain, Dr. Anuj Garg, Dr. Muthu, Dr. Bhagawati Saxena, and Dr. Parameshwara Rao Vuddanda** who guided and provided their valuable advice to carry out my research works. I honor valuable suggestions and support of my lab post doctoral fellows **Dr. Awaneesh Singh and Dr. Amritha Srivastava**. I express my hearty thanks to my batch mate **Sanjay Kumar Singh** for being with me in entire duration of Ph.D, helped me a lot and provided moral support. I thank my junior **Lakshmi** to explore and solve several problems of my nanoformulations during her Master Degree. I extend my heartfelt gratitude and indebtedness to my juniors **Priyanka, Hitesh, Krishna Kumar Patel, Meraj, Uddipak Kumar Rai, Swati and Prem Shankar** who always helped me whenever I was in need and spent their valuable time in my research works.*

*I would also like to thank my lab Master Degree students **Anand Kumar Kushwaha, Bhupender Singh, Patel Chitrang Girishbhai, Upadhyay Gayaprasad, Prabhjot Singh, Sarvesh Khoshla, Sandeep Kumar Mishra, Preethi Agrawal, Parth Dadhania, Yuraj Singh, Mahender Hidau, Babu Nageswararao, Santhosh Kumar Puttrevu, Durgesh Kumar, Priyadharshan Jain, Vijayakumar E, Raju Prasad Sharma, Ruchi Kumari Gupta, Ashit Kumar Sharma, Jagdeep Gaur Sandhu, Faruq Mohammed, Surbhi Soni, Nitin Verma, Tushar Batra, Nancy Kapoor and Neha Singh** for their support and help in lab hours.*

*This research work was financially supported by **University Grants Commission** in the form of Junior and Senior Research Fellowships under **Rajiv Gandhi National Fellowship Scheme**, Grant No. F.14-2 (SC)/2010 (SA-III). I also would like to thank **Special Assistance Programme of University Grants Commission (UGC-SAP)** and **Central Instrument Facility Centre (CIFIC)** of IIT (BHU), Varanasi for providing analytical instrumentation facility to carry out various nanoparticle characterizations. I thank **Guru Ghasidas University (GGU, a Central University)**, Bilaspur for providing an opportunity as 'Assistant Professor (Ad-hoc)' during my Ph.D tenure.*

***My parents** have been a strong pillar of support for me and my research wouldn't have seen the days light without their constant motivation. I owe them a lot. Thanks to **my mother, the living god** for helping me in touch with reality throughout the life. Special Thanks to **my father** for letting me do it 'my way' to reach my dreams. I must express my gratitude to my younger brother **Vinoth** and his wife*

*Anushya* and my youngest brother **Karthick** for their continued support and stand beside me during my research work; whose love and encouragement allowed me to finish this tough journey.

Words fail to express my immense appreciation for my wife **Ms. Anitha**, who has been a constant source of love, moral motivation and emotional support during the climax of my research works. Her endless support by offering her personal time to carrying out the experimental work contributed immensely in shaping and completing my thesis. Her struggle against new place, unknown language and freezing December chilliness during her stay at Banaras (up to 3 months of pregnancy) will never be forgettable which developed and multiplied my love to infinity on her. God has blessed me with an angel **Eeshanthika**, my daughter, who missed me the first 6 months from 6<sup>th</sup> day of her birth. I just forgot my worries while seeing her face after my busy academic schedule and thesis preparations at GGU, Bilaspur. I never forget the moment of my crying feeling and throat struck while acknowledge her during my Ph.D Pre-submission seminar on 19<sup>th</sup> July, 2016.

I would also take this opportunity to thank my **Chithappa, Athai, Periyamma, Peria mama, China mama, Chithi and their family members** for their blessings and encouragement in all aspects of my life. I would like to express my hearty thanks to my In-law family for their blessings and support during post marriage Ph.D life.

I would like to thank my friend **Baskar** (always being with me while taking life turning decisions) and his wife **Barathi** for their constant support and encouragement during my Ph.D. In the same breath, I thank my friends **Vinoth, Usha, Sudhakar, Mani, Saraswathi, Antony, Sathi and other dearest friends** for their sincere support in my life.

I would like to convey my hearty thanks to **Mr. Srinivasan**, a Tamilian lived at Banaras and often meets me at Limbdi corner, for spending his time to narrate some stories and for providing encouragement while I was diminished in my confidence at the dead end roads of my research failures. I prey Lord Shiva for giving peaceful 'Moksha' to the pure soul of the 'Unforgettable man'.

I would like to express my sincere thanks to BHU Tamil Seniors and Friends **Dr. Saravanan, Dr. K, Kesavan, Dr. Periasamy, Dr. Thottappan, Dr. Jayakumar, Venkat (M.Pharm), Sundharam, Satheesh, Vignesh, Gopu, Madhavan, Vinoth, Santhosh, Suganya, Vishal, Venkat (M.Tech., IDD), Gopal, Vikram, Ganesh, Sivaranjani (Ammni), Pothiraj, Ilangovan and Kumaresan** for their valuable friendship and unforgettable moments in BHU. I convey my special thanks to **Ramoji sir and Vidya mam** for their memorable friendship with me and my wife. I specially convey my thanks to **Mr. Gopal**

*Prasad and his son for arranging accommodation and Dr. Surendra Kumar uncle family for providing their home and care during my stay in Banaras after marriage.*

*Finally, I would like to thank everybody who was important in the successful realization of this thesis, as well as expressing my apology that I could not mention them personally one by one.*

*I pray to almighty for offering 'Jiva Shanthi' to the soul of my experimental animals, whose sacrifices proved the truth of my research work for the betterment of the ailing humanity.*

*Once again, I thank "Lord Shiva", for being with me and respond to all of my silent sincere prayers.*

*Date:*

*(Vijayakumar M.R.)*

*Place: IIT (BHU), Varanasi.*