Acknowledgements
Acknowledgements

I bow in utmost reverence to the “Almighty Allah” (Most beneficent and Most Merciful) whose benevolent sanction led me to produce this “oeuvre” in its present façade and giving me the strength to pass through difficult periods and complete this task. Completing a PhD is truly a marathon event, and I would not have been able to complete this journey without the aid and support of countless people over the past four years.

I must first express my gratitude towards my supervisor, Dr. Asad Ullah Khan, whose invaluable guidance, support, attention to detail, hard work, expertise, understanding, and patience, added considerably to my research experience. Dr. Asad is the one teacher who truly made a difference in my life. It was under his tutelage that I developed a focus and became interested in research. I also appreciate his vast knowledge and skill in many areas (e.g., molecular and microbiological techniques), and his assistance in writing reports (i.e., grant proposals, research papers and this thesis), which have on occasion made me “GREEN” with envy. He provided me with direction, moral support and became more of a friend than a mentor. His persistence, enthusiasm and kindness have helped me to complete this work. I doubt that I will ever be able to convey my appreciation fully, but I owe him my eternal gratitude.

I thank Prof. M. Saleemuddin, Coordinator, Interdisciplinary Biotechnology Unit, for his constant support in providing me all the facilities for this study. I also thank other faculty members in the department, Dr. R. H. Khan, Dr. M. Owais, and Dr. H. Yunus for the assistance they provided at all levels of the research work.

I would like to thank Dr. M. Shahid from the Faculty of Medical Microbiology, J. N. M. C. H for taking time out from his busy schedule to serve as my Co-supervisor. He provided timely and instructive comments and insights that guided and challenged my thinking, substantially improving the finished work.
Acknowledgements

Appreciation also goes out to Mr. Lal Mohammad, Mr. Faisal Maqbool, Mr. Iqtedar, and Mr. Ramesh Singh, for all of their computer and technical assistance throughout my research program, and to the Mr. Amir, Mr. Isham Khan, Mr. Chanderpal Singh, Mr. Nasir, Mr. Aslam, Mr. Maspoor, Mr. Rajinder, Mr. Rajesh, and Mr. Zakir, office staff for all the instances in which their assistance helped me along the way.

Special thanks to those postgraduate students who have worked with me along the way; Shariq, Afroz, Ayesha, Shazi, Bilal and Aanisa.

I also thank some of my fellow Ph.D. students: Tahseen, Iram, Rubab, Anees, Sayeed, Danish, Faraz, Mairaj, Hafeeza, Nazia, Sadaf, Sahar, Zainab, Nisht, Ankita, Munzna, Sana, Rosina, Priyankar, Eijaz, Eizaj, Maroof, Varun, Azmat, Arun, Qamar, Javed, Rabban and Badar.

I am really at loss of words in thanking Barira and Shahper for their whole hearted co-operation and frequent suggestions to me in the lab at various stages during the course of my work. The present work bears at every stage the impress of their collaborative efforts. I shall ever remain indebted to them. They each helped make my time in the PhD program more fun and interesting. I appreciate you both and would not have made it without you!

Deepest thanks to one of my best friend Atif. He has been through the thick and thin of my life and I don't have right words to describe his love, support and sacrifice. May Allah give him what he wants in life.

I cannot thank enough Zakir for your advice and guidance and for your willingness to support me through the writing process—your help make the Ph.D. journey more enjoyable while redefining the meaning of “format” at the same time!

To the rest of my colleagues and juniors — thanks for their insightful feedback and words of encouragement.

I would also like to thank my friends in the hostel, particularly Ahmad Raza Faruqi, Ameer Ahmad, Hasan, Kaleem and Tanseer for our philosophical
debates, exchanges of knowledge, skills, and venting of frustration during my research program, which helped enrich the experience.

I would also like to thank my family for the support they provided me through my entire life and in particular, I must acknowledge my brother and best friend, Aslam Wali, without whose love, encouragement and moral support, I would not have finished this thesis.

Finally, I would be remiss without mentioning Dr. Jacoby and Dr. M. Grape, whose extreme generosity will be remembered always.

In conclusion, I recognize that this research would not have been possible without the financial assistance of CSIR, Human Resource and Development Group, India, and express my gratitude to this agency.