

## Acknowledgement

*अल्पमपि वातायनविवरं बहूनि दर्शयति।*

*“From a small window, many things can be seen.”*

*Though this thesis represents only a small window into the vast expanse of perspectives, the journey through it has allowed me to perceive, learn, and grow in ways far greater than I had imagined. This work, has opened broader perspectives made possible through the guidance, encouragement, and support of many individuals to whom I remain deeply grateful! This thesis holds my name but this is collective effort for all the people who have been an integral part of this journey, to every mentor, colleague, friend, and well-wisher—I am beyond grateful for you.*

First and foremost, I express my sincere and heartfelt gratitude to **Dr. Parth Pandya**, my research guide, for his invaluable guidance, thoughtful insights, and steadfast support throughout this journey. I bow down to the *almighty* for blessing me with such an exceptional guide; words often fall short when I try to express the depth of my gratitude for his invaluable mentorship. His mentorship has profoundly shaped both the direction and quality of this research, while also contributing significantly to my spiritual and professional front. I am particularly grateful for the encouraging and intellectually stimulating laboratory environment he cultivated, enriched by engaging group meetings, meaningful research discussions, and moments of camaraderie that lightened the intensity of the research process. This journey has had many challenges but the way he has been a core support in all of it is just beyond imagination, forever grateful for that. He has always remained approachable and generous with his time—whether for in-depth discussions, troubleshooting experimental challenges, or providing constructive and timely feedback.

I am deeply indebted to **Prof. A. V. Ramachandran** for his thoughtful mentorship and enriching guidance, which greatly broadened my scientific perspective and strengthened the rigor of this research. His insights have consistently encouraged me to think critically and approach scientific questions with greater depth. I extend my sincere gratitude to **Dr. Darshee Baxi** and **Dr. Elizabeth Robin** for their academic support and administrative guidance throughout this journey. Their encouragement and steady presence have been instrumental in ensuring the smooth progression of my doctoral work.

I am particularly grateful to **Dr. Lipi Buch** for her valuable feedback and thoughtful suggestions that contributed meaningfully to the refinement of this thesis. She holds a special place in my academic journey as my first mentor. Her early guidance, constant encouragement, and unwavering faith in my abilities played a pivotal role in shaping my academic path and inspiring me to pursue a Ph.D. For her foundational support and continued belief in me, I remain deeply grateful.

I am sincerely grateful to **Dr. Devendrasinh Jhala** and **Dr. Vinod Burade** for their guidance and support as external advisors on my doctoral research committee. Their critical insights, thoughtful suggestions, and consistent encouragement have contributed significantly to the strength and refinement of this work.

I would like to express my sincere appreciation to **Prof. Pratyush Shankar (Provost)**, **Dr. Sandeep Vasant (Registrar)**, **Dr. Jaydeep Raulji (Head, PhD Office)**, **Mr. Ketan Bhavsar (Assistant Registrar)**, **Dr. Jaydeepkumar Mehta (University Librarian)**, and the Management of Navrachana University for their steadfast institutional support, as well as for providing the infrastructure and resources essential for the successful completion of my research.

I am thankful to the **SHODH fellowship** program and the **Navrachana University Fellowship**, whose contributions I gratefully acknowledge. I also thank Navrachana University for providing a supportive academic environment and essential research infrastructure.

I am deeply grateful to all my teachers: **Dr. Khushali Upadhyay** and **Dr. Foram Patel** for their constant support in cell culture experiments, **Dr. Monisha Kottayi**, **Dr. Lipi Buch**, **Dr. Foram Patel**, **Dr. Ankita Doshi** and **Dr. Sumit Bhawal**, along with all the faculty members at the School of Science, for their constant encouragement and academic support throughout this journey.

I extend my special thanks to **Aparna Ma'am** for their generous assistance and unwavering support in the laboratory.

I would like to extend my heartfelt thanks to all my TREE lab members **Dr. Nehareeka**, **Dr. Harsh**, **Mr. Tejas**, **Mr. Mithil**, **Mr. Prince**, **Mr. Vyomil**, **Ms. Harshita**, **Ms. Sripriya**, and **Ms. Drashti** for their support throughout this research journey. **Dr. Nehareeka** for her very first ice-breaking moment for me in the lab and since then being a constant support; **Dr. Harsh** for all the western blot troubleshoots to scientific writing to my panic-stricken doubts, beyond thankful; **Mr. Tejas** for all the technical helps; **Mr. Mithil** for constant support in the collaborations and bringing all the light-hearted moments; **Mr. Prince** constant support, beyond grateful for his consistent help while writing papers; **Mr. Vyomil** for bringing the fun spirit to lab and helping with experimental work; **Ms. Sripriya** and **Ms. Harshita** for all the experiments I plan at last moment and helping me managing the deadlines always and lastly **Ms. Drashti** for her constant help in smoothly managing lab responsibilities.

I would like to thank all my cell culture members, **Mr. Karan**, **Ms. Khushboo** and **Ms. Bindusha** for their constant help. I would also like to thank **Ms. Riddhi** for her support and help in the collaborative project.

To **Parshva** and **Bhavya**, my 'kalyanmitras' for their constant encouragement and invaluable spiritual support, which strengthened my faith and gave me inner resilience throughout this journey. And to **Kelly**, **Kasturi**, and **Rashi**, my dearest best friends, whose unwavering support, constant

encouragement, and cherished companionship have been a steady source of strength and joy throughout this journey. And to **Henvi and Rushabh** for all the fun outings and keeping the moments light amidst everything.

To my sister, **Rujvi**, who has been my constant pillar of strength and my truest source of support throughout this journey. She has stood by me in every phase — through moments of self-doubt, long hours of work, emotional highs and lows, and everything in between. She has celebrated my smallest victories, lifted me during setbacks, and reminded me of my strength when I questioned it myself, eternally grateful. Above all, *I dedicate this thesis with profound love and gratitude to my parents, Mrs. Nileshwari Shah and Mr. Saurin Shah*, whose constant support, sacrifices, and unconditional faith have been the foundation of my academic and personal growth. This achievement is as much theirs as it is mine.

Lastly, I wish to express my deepest gratitude to my partner, **Abhishek**, whose presence has been a source of unwavering strength and comfort throughout this journey. His patience, understanding, and constant encouragement have carried me through moments of exhaustion, uncertainty, and self-doubt. He has stood beside me with quiet confidence, celebrating my successes and gently supporting me through challenges without ever letting me lose sight of my purpose. I am also sincerely grateful to my *extended family* for their warmth, blessings, and unwavering support throughout this journey.

*With heartfelt gratitude to everyone who has been a part of this journey, I dedicate this achievement to the collective love, guidance, and unwavering support that made it possible.*