Acknowledgments
Although I find it hard to believe, this PhD journey has come to an end. Looking back over the last few years, I am grateful for every decision I made, for every success, and mistake, that brought me to this point and that made me grow on an academic and personal level. There were many lessons learned and I believe, that one of the most important ones was that there is no unattainable accomplishment when you have the support of others. This thesis would not have been possible without the support of many of you and for that I am incredibly grateful.

Dear Prashant and Theo, thank you very much for allowing me to do my PhD in the BME group. This has been the most wonderful and enriching experience I have had in my life. You were the best team to bring this multidisciplinary research to a happy ending. Prashant, I am sincerely grateful for your dedication and support over the past three years. Thank you for the respect you always showed, for listening to my suggestions and ideas, and for the direction and accuracy you provided to them. Thank you for encouraging me and for being willing to listen even in my difficult moments. Your words always motivated me to not give up. Theo, your door was always open for me. Thank you for the patience with which you answered my questions, for sharing your expertise, and for guiding me through the design and analysis of my experiments. I will never forget when I met you in Colombia. I had to present my project to you, and it went horribly, because I was very nervous!. But in the end, you smiled and only highlighted the positive. That smile on your face and your optimism always gave me a dose of reassurance.

Dear Henny, thank you very much for your support and all your contributions to this work. Your ability to guide my ideas has been an invaluable contribution, not only in the development of this thesis but also in my training as a researcher. Thank you for the thoroughness with which you always reviewed my manuscripts and, above all, for your availability and patience that made our discussions always fruitful. Your attention to detail on research always impressed me! You have my great admiration and respect.

Profe Luz Marina (Mona), no existen palabras!. Unos cuantos renglones nunca serán suficientes para expresar la inmensa gratitud que siento. Sin tu apoyo y confianza nada de esto hubiera sido posible. Infinitas gracias por creer en mi incluso mucho antes de que yo misma lo hiciera. Por compartir tu pasión por la ciencia y por ser una fuente de inspiración para quienes te rodean. Gracias a ti se me abrieron las
puertas a una cantidad de experiencias profesionales y personales que me han hecho crecer en todos los aspectos de mi vida. Siempre te llevaré en mi corazón.

Naty, tu experiencia y valiosos aportes fueron indispensables en el desarrollo de esta tesis. Gracias por el apoyo y la confianza que depositaste en mí. Por la paciencia y la dedicación con la que me guiaste durante los primeros años de doctorado, y por haber estado dispuesta a ayudarme siempre que lo necesité.

Un agradecimiento especial a los miembros de mi comité tutorial, Dr. Claudia Bernal, Dr. Juan Carlos Cruz y Dr. Mónica Mesa, por el tiempo dedicado a mi proyecto de investigación y por todos los valiosos consejos y sugerencias.

I would like to express my deepest gratitude to Prof. Marco Harmsen, Prof. Paul Jutte, Prof. Erik Biessen, and Prof. María Del Pilar Jiménez for agreeing to be part of the reading committee and for the valuable time dedicated to evaluating my thesis.

This work would not have been possible without the financial support of COLCIENCIAS National Doctoral program (code 727-2015) and the Abel Tasman Talent Program (ATTP) of the University of Groningen, to whom I am sincerely grateful.

Special thanks to the entire scientific staff: Patrick, Brandon, Inge, Jelmer, and Romana for the constructive discussions during the lunch meetings and the Kolff-days.

To the technical staff: Reinier, Gesinda, Willem, Ed, Corien, Jelly, Marja, Betsy, Joop, Hans and Willy. Thank you for the patience and dedication with which you train the students! Your experience is invaluable, and I am very grateful for the kindness with which you were always willing to help me. Ina and Wya, thank you for your support in all administrative matters, for your efficiency and good disposition.

Doing a PhD in two countries has resulted in a large number of colleagues throughout the years. It is impossible to mention everyone, but I am deeply grateful for all the good memories.
To my colleagues and friends at the GITTC: **Yina, Paulina, Carolina, Gabriel, Sergio, Ricardo y Diana.** Gracias por todos los momentos compartidos, por nuestras discusiones durante los clubes de revista, los almuerzos, las mañanas de café con pan de queso, las risas, las lágrimas y el apoyo incondicional. ¡No se imaginan cuánto los extrañé!

To all my colleagues and friends at BME: **Mari, Lais, Thaís, Damla, Abby, Valentina, Sara (Lu), Torben, Neda, Claudia, Can, Jeroen, Hongping, Ke, Fenghua, Linyan, Yue, Roksana, Arturo.** Thanks for the scientific discussions, the coffees, the lunches, and the conversations in the corridors. I wish you all the success in your careers! To my office mates: **Olga S and Thamir,** thank you for cheering me up and making my last days of writing more bearable.

Dear **Yanyan,** I am very lucky to have met you in Groningen. Thank you for your sincere friendship, for always being willing to listen to me and giving me advice when I most needed it. Thank you for our coffee afternoons, the walks around the city, and for our trips together. I appreciate you very much!

To my friends **Olga C** and **Carlos,** I will never forget all the support you gave me during my stay in the Netherlands. People like you make the world a better place! **Viraj** and **Yoshita,** meeting you was a wonderful gift, thank you for your advice, for all the delicious dinners and for opening the doors of your home to me.

A special thanks to my paranimfen, whom I deeply appreciate and admire:

**Alejo,** quiero agradecerte porque desde que te conocí siempre he podido contar contigo. Gracias por tus consejos y por darme ánimos en los momentos difíciles. Tenerte como colega ha sido un privilegio y como amigo un gran regalo. La determinación con la que siempre consigues lo que te propones siempre me ha sorprendido, y estoy segura de que te esperan muchos éxitos en tu vida profesional. Sigue brillando!

**Cata,** soy muy afortunada de tenerte como amiga. Siempre estuviste ahí desde el comienzo de esta aventura apoyándome incondicionalmente. A pesar de estar tan lejos de nuestras familias y amigos, nunca me sentí sola gracias a ti. Eres una mujer increíble, inteligente y centrada (así pienses que no es así). No te imagináis lo mucho que te admiro por tu dedicación y la tranquilidad con la que trabajas por alcanzar tus metas.
Anita, gracias por tu apoyo incondicional y por cada palabra de motivación. Cata y tú son dos de mis personas favoritas en el mundo y sé que no importa dónde estemos, siempre seremos amigas.

To the friends that the Netherlands brought me:

Juanito, Fabio, Eli, Angie, Javi and Marthijs. Thank you very much for everything we shared, the best memories of my life in Groningen have you in them and I hope to have the opportunity to meet you again in any other place in the world. Francisco, I want to thank you especially not only for your support and your sincere friendship, but also for your invaluable contribution in the last chapter of this thesis. ¡Los quiero mucho chicos!

To my housemates, Kieu, Natalia, Pata and Eva, thank you for making our cozy house a home. For the conversations, dinners, parties, and evenings of baking cakes. I will miss you so much!

A mi familia, en especial a aquellos que siempre han estado presentes a pesar de la distancia. Gracias por su amor y apoyo incondicional.

Mami, tu amor es el motor de mi vida y todo lo que soy es gracias a ti. Estar lejos de casa ha sido un sacrificio enorme, pero tú nunca dejaste que me diera por vencida. Gracias por darme las fuerzas suficientes para perseguir mis sueños. Te amo mucho y mi mayor recompensa siempre serás tú.

Tío Rodrigo, nunca olvidaré todo lo que has hecho por mí. Gracias por apoyarme en todas las etapas de mi vida y por enseñarme con tu ejemplo que todo es posible si te lo propones. Esta tesis también es para ti.

Maria Isabel Patiño Vargas

November 2021
Maria Isabel was born on the 18th of April 1991 in Medellin, Colombia. She completed a five-year B.Sc. degree in Microbiology and Bioanalysis at the University of Antioquia, in Medellin. During her studies, she joined as a Young Researcher in the Tissue Engineering and Cell Therapy Research Group within the Faculty of Medicine. There she carried out her degree project focused on the production of decellularized tracheal extracellular matrices for the repair of the airway. This project obtained a mention of recognition by the School of Microbiology.

In 2016, Maria Isabel started her doctoral program at the Corporation of Basic Biomedical Sciences of the University of Antioquia with an emphasis on Tissue Engineering and Regenerative Medicine. She was awarded a scholarship (COLCIENCIAS national doctorates) to finance her project. Then she moved to Groningen, the Netherlands to start a double degree program at the University of Groningen, in the department of Biomedical Engineering. During that period, she worked under the supervision of Dr. Prashant Sharma, Dr. Theo van Kooten, and Prof. Henny C. van der Mei. Her research focused on the development and validation of a robust fibrin-based human skin equivalent with over-expression of the antimicrobial peptide LL-37 to prevent infections in skin wounds. During her PhD she participated in different scientific events, including the TERMIS World Congress, the European Pharma Congress, and the European Society for Artificial Organs Congress. Maria is ready to accept new challenges that will allow her to enrich her career in research.