

# Master's Thesis at the University Medical Center Groningen

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My time at the University Medical Center Groningen (UMCG) in the Netherlands was an incredibly great experience, both professionally and personally.

For my Master's Thesis, I aimed to synthesize metal-organic framework (MOF) nanoparticles (NPs) and integrate them into polymeric dissolvable microneedles (dMNs) for the polarization of macrophages. This project truly hit my definition of "medical nanoscience". In the first phase, I focused on the synthesis and characterization of crystalline NPs. Collaborating with talented researchers, I obtained electron microscopy images and assessed the crystallinity of the NPs. Additionally, I used dispersion-based particle characterization methods to evaluate the MOF NPs size and zeta potential. The second phase involved the fabrication of dMN patches, a novel transdermal drug delivery (TDD) platform. Here, I deepened my understanding of biomaterials and the stringent requirements they must meet for biomedical applications. Finally, I worked with cell cultures, particularly macrophages, to test the safety and efficacy of my system using a range of analytical techniques.

Overall, we successfully synthesized MOF NPs with favorable physicochemical properties for biomedical applications. Additionally, we demonstrated that these NPs could be incorporated into polymeric dMNs, exhibiting promising mechanical properties for TDD. As one of the first projects to explore MOF NPs for macrophage polarization via dMNs, the findings of this thesis might provide a valuable foundation for future research in the field.

During my time at UMCG, I felt very welcomed and appreciated in Prof. Santos' research group and at BBT. I particularly valued the close collaborations, which I hope will lead to future partnerships between the Swiss Nanoscience Institute and the UMCG. Weekly department meetings allowed me to expand my knowledge in various fields, such as nanomedical formulations for the treatment of cancer and cardiovascular diseases, and novel technologies in regenerative medicine. A highlight was attending a lecture by Professor Elisabeth Bik on research integrity and the challenges it faces in scientific publications.

I am very grateful to the Swiss Nanoscience Institute and Prof. Santos for this invaluable opportunity. I gained knowledge and practical experience, discovered new professional and personal avenues, and thoroughly enjoyed my time in Groningen, both in the lab and beyond.



