SCIENCES & BIOENGINEERING SCIENCES

The Research Group
Brussels Center for Immunology

has the honor to invite you to the public defence of the PhD thesis of

Els Lebegge

to obtain the degree of Doctor of Bioengineering Sciences

Title of the PhD thesis:

Targeting tissue-resident macrophages using nanobody constructs

Supervisor:
Prof. dr. ir. Jo Van Ginderachter (VUB)
Co-supervisor:
Prof. dr. ir. Damya Laoui (VUB)

The defence will take place on
Thursday, October 30, 2025 at 14 p.m.

VUB Etterbeek campus, Pleinlaan 2, Elsene, Promotiezaal D.2.01

The defence can be followed through a live stream: PhD Defense_ElsLebegge

Members of the jury

Prof. dr. ir. Stefan Magez (VUB, chair)
Prof. dr. Karine Breckpot (VUB)
Prof. dr. Kim De Veirman (VUB)
Prof. dr. Calum Bain (University of Edinburgh, UK)
Prof. dr. Sebastiaan De Schepper (UAntwerpen/Vlaams Instituut Biotechnologie)

Curriculum vitae

Els Lebegge obtained the degree of Master of Science in Biomolecular Sciences with great distinction at the VUB in 2018. After performing her master thesis in the Brussels Center for Immunology, Els started as a doctoral student under supervision of Prof. Jo Van Ginderachter and Prof. Damya Laoui. The research during Els' PhD was supported by Fonds Wetenschappelijk Onderzoek and Kom Op Tegen Kanker. Els was a co-author of eight research articles, including two (co-)first articles. She is also a first-author on one review article. During her PhD Els supervised three master students.

Abstract of the PhD research

Macrophages are white blood cells that detect, engulf, and destroy hazardous compounds like pathogens, and clear cellular debris. When the pathogenic load remains high or when the tissue is severely damaged, macrophages will recruit other cells of the immune system for assistance, resulting in inflammation. To keep up with changing tissue environments, macrophages are continuously in touch with their surroundings and adopt different cell-specific traits to support the tissue they reside in. However, in diseased tissues, these macrophage-specific traits can support the disease progression, rather than combatting the disease. Therefore, selective therapeutic targeting of macrophages in pathological conditions is in demand.

In a first part of this study, we investigated whether VSIG4, which is expressed by a subset of tissue-resident macrophages in the peritoneal cavity, could play a role in peritoneal tumor progression and metastasis, and whether VSIG4-expressing macrophages could be targeted by nanobody constructs as a cancer therapy. We observed that while VSIG4 is dispensable for primary tumor progression and metastasis, the VSIG4-expressing macrophages display antimetastatic traits. In addition, these cells are antiparasitic upon an intraperitoneal infection with Trypanosoma parasites. Therefore, supporting their phenotype and abundance is an interesting therapeutic avenue.

In a second part of this study, we provided preliminary data for the concept of selective drug delivery to the resident liver macrophages, the Kupffer Cells, via their unique expression of the Clec4F receptor. Different chemical conjugation techniques were trialed to optimize the targeting capacity of Clec4F-specific nanobodies and the delivery of a therapeutic load. We confirmed that anti-Clec4F Nbs were able to bind liver macrophages in liver spheroids, which can be used as a high throughput screening system for future drug testing.

Altogether, different nanobody-derived biologics were used to target macrophages in the peritoneal cavity and liver in steady state and inflammation.