FACULTY OF BIOSCIENCE ENGINEERING

The Chancellor of Ghent University has the honour of inviting you to attend the public defense of the doctoral dissertation of

ir. Karen Delbaere

Title of the doctoral dissertation:

In vitro modelling of the small intestinal microbiome by introducing the oral-gut axis

The public defense will take place on the 4th of February 2026 at 17:00 in auditorium Oehoe, at the faculty of bioscience engineering, Ghent University (Auditorium E1, building E, Coupure Links 653, 9000 Ghent).

There will be a contiguous reception to which you are heartily invited.
Please confirm your attendance before the 16th of January 2026 by filling out this form or via mail to karen.delbaere@ugent.be.

Dissertation supervisors

Prof. dr. ir. Tom VAN DE WIELE
Faculty of Bioscience Engineering,
Ghent University

Dr. ir. Kim DE PAEPE
Faculty of Bioscience Engineering,
Ghent University

Dr. Ludovica MARINELLI
Faculty of Bioscience Engineering,
Ghent University

Board of examiners

Prof. dr. Bernard DE BAETS
Chairman
Faculty of Bioscience Engineering,
Ghent University

Prof. dr. ir. Nico BOON
Secretary
Faculty of Bioscience Engineering,
Ghent University

Prof. dr. Stéphanie BLANQUET-DIOT
UMR 454 MEDIS UCA-INRAE,
University of Clermont Auvergne

Dr. Ioanna CHATZIGIANNIDOU
Department of Biotechnology and Biomedicine,
Technical University of Denmark

Prof. dr. Massimo MARZORATI
Faculty of Bioscience Engineering,
Ghent University

Prof. dr. Lucas WAUTERS
Faculty of Medicine,
KU Leuven

GHENT UNIVERSITY

Abstract of the doctoral research

The small intestinal microbiota plays a key role in human health, yet remains largely unexplored due to invasive and technologically demanding sampling methods. *In vitro* gastrointestinal models are a promising non-invasive method to study this microbial community, but existing small intestinal models often lack key bacteria known to be abundant in the human small intestine. To obtain a more representative small intestinal *in vitro* community, the use of the oral community is suggested. Oral microbes continuously enter the small intestine through saliva ingestion and have been shown to partly overlap with the small intestinal microbial community. This doctoral research evaluated whether oral-to-gut bacterial transfer can result in a more representative small intestinal microbial community *in vitro* when using human-derived bacterial communities. Short-term dynamics were assessed using the TNO gastro-small intestinal model (TIM-1), and long-term dynamics were explored using a modified Mucosal Simulator of the Human Intestinal Microbial Ecosystem (M-SHIME). Across both models, oral communities successfully contributed to the establishment of small-intestinal-like communities. In TIM-1, short term experiments revealed donor- and region-specific bacterial growth resembling *in vivo* observations. In the small intestinal M-SHIME (SI-M-SHIME) repeated oral inoculation established characteristic small intestinal bacteria, whereas faecal-derived inoculation enriched for bacteria typical of the distal small intestine. Although the *in vitro* communities still differed from *in vivo* profiles, the overall findings highlight the value of incorporating oral bacteria into *in vitro* models. Together, the results support the SI-M-SHIME as a promising tool for future mechanistic studies of the small intestinal microbiome.

Brief Curriculum Vitae

Karen Delbaere (°Ghent, Belgium, 31/10/1997) is a PhD candidate in Bioscience engineering at Ghent University, specializing in *in vitro* modelling of the small intestinal microbiome. She holds a BSc and MSc in Bioscience Engineering, with a major in Food Science and Nutrition. She obtained a predoctoral scholarship from the Research Foundation of Flanders (FWO) to pursue a PhD at the Center for Microbial Ecology and Technology (CMET). As part of her doctoral research, she completed a research stay at the University of Clermont Auvergne, where she expanded her expertise in advanced small intestinal *in vitro* models. During her PhD, she (co)-authored three peer-reviewed publications and co-authored a popular science article in EOS. She presented her research through poster and oral presentations at several national and international conferences, including the INFOGUT COST action meeting. Further, she supervised three MSc thesis students, co-organized group meetings, and is a member of the international Host Microbes Interactions in the Human gut group (HOMIGUT).